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LINDBERG GEOLOGIC CONSULTING
David N. Lindberg, Certified Engineering Geologist

ENGINEERING GEOLOGIC R-2 SOILS EXPLORATION

Report of Findings
Old Three Creeks Road
Indian Field Ridge

Assessor's Parcel Number:
522-021-010

Prepared for:
Stay Humboldt LLC,
Mr. Kevin Dobosh

David N. Lindberg, CEG 1895, Exp. 02/29/2020

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1.0 INTRODUCTION

1.1 Site and Project Description

This report presents the results of the site-specific, engineering-geologic soils exploration conducted by Lindberg Geologic Consulting (LGC) at parcel 522-021-010 (Figure 1). This is a rural property located approximately 20 miles northeast of Arcata, in Humboldt County near the southwest corner of the Hoopa Valley Indian Reservation (Figure 2). There is one existing residence, two seasonal-worker cabins, two drying barns, and approximately five cultivation areas on this parcel (Figure 3). Basic project site location information is listed in Table 1 below.

Table 1 – Project Location Information	
Assessor's Parcel: 522-021-010	
Latitude and Longitude*	40.9895° N and 123.7606° W
Legal Description	SE ¼ of Section 18, T7N, R1W; HB&M
Parcel Size	Approximately 168.0 Acres

*Centroid of parcel per Humboldt County Web GIS

Lindberg Geologic Consulting (LGC) was retained to conduct a soils investigation and prepare this R-2 soils exploration report to address the existing and proposed developments. The existing residence is a two-story, wood frame structure approximately 50 feet by 30 feet, and supported on reinforced concrete foundations. The residence is located in the southwestern part of the parcel. Southwest of this residence (~80 feet) is an existing 10 by 12 foot cabin for seasonal workers. A new pond, 100 feet by 100 feet, ten feet in depth (~500,000 gal.) is proposed on the southerly side of the existing two-story residence. Approximately 750 feet east of the residence the owner is proposing to construct a new two-story 30 feet by 60 feet processing building. Two other agricultural structures (drying barns?) are on this property.

Included in our report are brief assessments of the potential geologic hazards associated with this site, and recommendations to help mitigate any potential negative effects of those geologic hazards.

1.2 Scope of Work

The Scope of Services for this investigation included identifying potential geologic and soils hazards that could affect the existing construction, grading, construction of the pond, and the appurtenant structures for residential use and cannabis cultivation on APN 522-021-010. Our scope additionally included field-characterization of the subgrade soils, development of conclusions and recommendations, and preparation of this Report. The information, recommendations, and design criteria presented in this report are listed below:

- Description of site terrain and local geology.

- Interpretation of subsurface soil and groundwater conditions based on our observations.
- Discussion of the soil profile characteristics as observed in on-site cut faces.
- Assessment of potential earthquake-related geologic and geotechnical hazards including surface fault rupture, liquefaction, differential settlement, and site slope instability.
- Discussion of potential geologic hazard mitigation measures, where appropriate.
- Seismic design parameters per 2019 California Building Code (CBC), including Seismic Design Category, Site Class, and Spectral Response Accelerations.
- Recommendations for earthwork; fill placement and compaction requirements
- Criteria for temporary excavations, if any.
- Recommendations for construction materials testing and inspection, as appropriate.

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 of samples obtained. Roads issues (if any) should be addressed by an engineer.

1.3 Limitations

This report has been prepared for the exclusive use of Stay Humboldt LLC, and Mr. Kevin Dobosh, their engineers and contractors, and appropriate public authorities, for specific application to the existing site, and the proposed and existing developments. LGC complied with the engineering-geologic standard of care common to the local area at the time this work was performed, and makes no other warranty, expressed, or implied.

Analyses and recommendations contained in this report are based on data obtained from existing maps and reports, field observations and limited subsurface exploration. Methods used indicate subsurface conditions only at specific locations where observations could be made, and only to the actual depths penetrated. Our observations may not accurately reflect stratigraphic or lithologic variations that can exist between sampling locations. Observations may not be representative of conditions at any other time.

Recommendations included in this report are based, in part, on assumptions about subsurface conditions which may only be verified by excavation. Accordingly, the validity of our recommendations is contingent upon LGC being retained to provide a complete professional service. LGC cannot assume responsibility or liability for the adequacy of our recommendations when they are applied in the field unless LGC is retained to review plans and observe any foundation repair during construction.

Do not apply any of this report's conclusions or recommendations if additional work is proposed. If significant changes are contemplated, it is important that LGC be contacted and consulted to review the impact of the changes on the applicability of the recommendations in this report. This report should be reviewed, and the recommendations confirmed in writing, if this project is not completed within one year from the date of this report. LGC is not responsible for any claims, damages, or liability associated with any other party's interpretation of the soil descriptions and

subsurface data, or reuse of this report for other projects or at other locations without our express written authorization.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration Program

A Certified Engineering Geologist from our office visited the project site on December 20, 2019, to assess conditions at the locations of the existing and proposed developments. We also estimated some engineering characteristics of the subsurface materials at the site. Soils observed were classified in general accordance with ASTM D-2488 visual manual procedures.

2.2 Laboratory Testing

No laboratory analyses were performed for this project due to the generally-uniform nature of the stratigraphy of the subsurface soils; gravel with silty fine sand and clay (GW). Groundwater was not encountered; soils were moist to the ground surface.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Topography and Site Conditions

The subject parcel is approximately 168 acres in area and is located northeast of Arcata, and southwest of Hoopa in a forested rural setting. Private timber companies logged, and then sold this and surrounding parcels in the last century. Site elevation ranges from over 3,920 feet at the highest point to approximately 3,120 feet near the northeast corner, as interpolated from the USGS "Lord-Ellis Summit, Calif.", topographic quadrangle map (1973). On-site, this parcel straddles the divide between Pine Creek to the west and Supply Creek to the east. Both creeks drain to the Trinity River. Slopes range from less than 15 percent, to greater than 50 percent, based on USGS mapping. The site of existing residence, the proposed commercial greenhouses and the pond are on the more gently-sloping portion of the property. Existing and proposed developments all appear to be on "30 percent or less" slopes per the Humboldt County WebGIS.

3.2 Geologic Setting

This parcel is located near the coast within California's northern Coast Ranges Geomorphic Provence, a seismically active region in which large earthquakes are expected to occur during the economic life span (70 years) of any developments on the subject property. As mapped by the California Division of Mines and Geology in 1962, this parcel is underlain by undivided Pre-Cretaceous metasedimentary rocks (ms). Based on our subsurface explorations at this site, native soils are interpreted to be relatively-uniform across the existing and proposed developments. The soil profile consists of more than 5 feet of medium dense to dense, angular gravel with silty fine sand and clay (GW). Free groundwater was not encountered on-site on December 20, 2019.

3.3 Seismicity

This site is within a seismically active region where large earthquakes from a variety of sources have the potential to occur during the economic life span (50-years) of a structure on this parcel. Northeast 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 being actively subducted beneath the North American continental plate.

The Mad River fault zone is located approximately 13 miles southwest of the subject parcel, and as such, is the nearest recognized active fault (CDMG, 2000) to the site. The Mad River fault zone can be characterized as a northwest-striking, northeast-dipping, low-angle thrust fault system. The upper-bound earthquake considered likely to occur on the Mad River fault zone has an estimated maximum moment magnitude (M_w) of 7.3 on the Trinidad and or Big Lagoon faults (CDMG, 1996). An earthquake on the Mad River fault zone would generate moderate to strong ground shaking on the subject parcel.

Regionally, 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 subduction zone is also capable of generating great earthquakes which would affect this parcel. The CSZ extends from offshore of Cape Mendocino in Humboldt County, California, to Vancouver Island in British Columbia, and is considered capable of generating an upper-bound earthquake with a moment magnitude (M_w) of 8.3 on its southern, Gorda segment, and (M_w) 9.0 on the rupture of its entire length. Based on Japanese tsunami records and geophysical modelling, the CSZ has been interpreted to have ruptured over its entire length in 1700 A.D. in a (Mw) 9.0 earthquake event (Satake, et al, 2003).

Based on the record of historical earthquakes which spans approximately 150 years, faults within the plate boundary zone and internally-deforming Gorda plate have produced numbers of small-magnitude, and several moderate- to large- (i.e. M>6) magnitude earthquakes affecting the project area. Several active regional seismic sources in addition to the Mad River fault zone and the CSZ, are proximal to the project site and have the potential to produce strong ground motions. These seismic sources include the following:

- The Little Salmon fault is to similar other regional low-angle reverse or thrust faults (Mad River fault, McKinleyville fault and others) associated with the subduction of oceanic plates beneath the leading edge of the North American plate.
- Mendocino fault offshore: a high-angle, east-west trending, right-lateral strike-slip fault between the Gorda plate and Pacific plate more than 40 miles to the southwest.
- Northeast-trending, high-angle, left-lateral, strike-slip faults in the internally-deforming subducting Gorda, and Juan de Fuca plates.

3.4 Subsurface Conditions and Description of the Site Soils

To characterize soil and groundwater conditions at this location, we examined man-made and natural exposures as available. Using fresh exposures and hand samples in the field, the soil profile was described in general accordance with ASTM D 2488 standards.

Construction of the existing residence took place in the southwestern corner of this parcel. No significant fills were observed on the residence site. The new pond and several new greenhouses are proposed for this legacy log landing where the residence is located. Topsoil was typically less than 1-foot in thickness, and was underlain by soft, strong brown medium dense to dense, angular gravel with silty fine sand and clay (GW).

The site soil profile may then be generalized as consisting of topsoil over in-place native medium dense to dense, angular gravel with silty fine sand and clay (GW), to the total depth observable. Soils are anticipated to grade to bedrock by three to four feet below grade. In general, the following conditions were encountered in our exploratory test excavation:

- Native and imported topsoil was 1.0-feet thick, or less
- Topsoil is underlain by medium dense to dense, angular gravel with silty fine sand and clay (GW)in the undisturbed soil profile

3.5 Groundwater Conditions

Free groundwater was not encountered at this project location to the depths observable. Based on observation, soils encountered on-site appeared to have low permeability. Soil mottling, potentially-indicative of transient high groundwater conditions, was not observed Groundwater levels may fluctuate in accord with seasonal and or long-term climatic variations and changes in land use.

Groundwater is not expected to be encountered at depths less than seven feet during dry-season (May - September) earthwork. Earthwork during the wet season (October through May) have the potential to be adversely affected by saturated soil conditions at anticipated excavation or foundation depths. Groundwater conditions on-site are not anticipated to negatively affect long-term foundation or earthworks performance, or foundation construction during the dry season.

4.0 GEOLOGIC AND SOIL HAZARDS

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

4.1 Seismic Ground Shaking

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. Approximately 15 miles southwest of this parcel, near Korbel, the state of California has mapped the surface trace of the active Mad River fault zone, the nearest recognized active fault. Given the proximity of significant active faults (the Mad River fault zone and the Cascadia subduction zone to the southwest and west), as well as other active faults within and offshore of northern California, the project site can be expected to experience strong ground shaking during the economic life span (50 years) of the proposed as well as the existing site developments.

Site-specific seismic Spectral Response Accelerations, obtained from the SEA (Structural Engineers Society of California) and OSHPD (2018) are presented here in Table 2. The on-line SEA ground motion parameter calculator 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).

Table 2. Spectral Response Accelerations, APN 522-021-010		
Site Information	Latitude / Longitude*	40.9895°, -123.7606°
	Occupancy Risk Category (2019 CBC, Sect. 1604.5)	II
	Seismic Design Category (2019 CBC, Sect. 1613.2.5)	E
	Site Class (2019 CBC, Sect. 1613.2.2)	D
Spectral Acceleration	S_s	1.737
	S_1	0.720
Site Coefficients	F_a / F_v	1.0 / 1.5
Response Accelerations	S_{MS}	1.737
	S_{M1}	1.081
	S_{DS}	1.158
	S_{D1}	0.720

* Latitude and longitude of the centroid of Parcel 522-021-010, per Humboldt County WebGIS.

Based on the site conditions, and an assumption of the soils within 100 feet of the ground surface, we conservatively classified this site as Site Class D consisting of a "Stiff soil" profile (Section 1613.2.2, 2019 CBC). The parameters in Table 2 above 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.

Given the residential and agricultural uses, this structure is in Risk Category II (Table 1604.5, 2019 CBC). Due to the fact that the site-specific spectral acceleration S_1 is great than 0.75, the project parcel is assigned to Seismic Design Category E (Section 1613.2.5, 2019 CBC). Based on the site conditions observed, and assumptions about the soils within 100-feet of the ground surface, the site soil profile includes stiff clay overlying metamorphic rocks to an undetermined, but likely shallow, depth. We classified the site as Site Class D consisting of a "stiff soil" profile (Section 1613.2.2, 2019 CBC).

4.2 Surface Fault Rupture

As discussed, the nearest recognized zoned-active fault to the project is the Mad River fault zone, located approximately 15 miles southwest of the project location. The subject parcel however is not located within an Alquist-Priolo earthquake fault zone in which the state of California requires special studies to be conducted for construction of structures for human occupancy. Due to the distance from the project site to the surface trace of the nearest recognized active fault, and based on the information available, the potential for ground surface fault rupture within the proposed new building's footprint is considered low.

4.3 Liquefaction

Liquefaction is a phenomenon involving loss of soil strength that results in fluid mobility through the soil. Liquefaction typically occurs when uniformly-sized, loose, saturated sands or

silts that are subjected to repeated shaking in areas where the groundwater is less than 50 feet below ground surface. In addition to the necessary soil and groundwater conditions, the ground acceleration must be high enough, and the duration of the shaking must be sufficient, for liquefaction to occur. Given the anticipated strong ground shaking and a groundwater table presumably less than 50 feet bgs, two of these conditions appear to have been met at this site. However, due to the fact the soils are stiff gravelly clay with bedrock likely at depths of less than 10-feet; they do not qualify as liquefiable.

California Division of Mines and Geology, Special Publication 115, Map S-1 (CDMG, 1995), shows the project site outside areas of recognized liquefaction potential. Beneath the surface, we anticipate schist commencing at approximately five feet below the existing ground surface at this site. Groundwater was not encountered during our explorations. Earthquake-related liquefaction and lateral spreading due to liquefaction is not anticipated to affect the site, given that the soils underlying this site do not consist of loose saturated liquefiable sands.

4.4 Settlement

Differential settlement does not appear to be a concern for the proposed developments. Soils are medium dense to dense, angular gravel with silty fine sand and clay (GW). Undocumented fill soils appear to be absent. Foundation damage due to settlement appears to have low likelihood to affect the residence. Foundation systems in gravelly clay soil can experience slow differential settlement due to low rates of permeability which limits consolidation rates in clay.

4.5 Landsliding

The subject property is located on a gently-sloping surface at an elevation of approximately 3,000 to 4,000 feet above sea level. Slopes fall away steeply toward the northeast and south west of this parcel. Humboldt County Planning's Web GIS database classifies this parcel as Moderate" instability; the residence and propose developments appear to be in areas of low instability. Based on our observations and the county's stability classification, the residence and the existing and proposed developments, do not appear to be impacted by, or at risk from, slope instability.

4.6 Flooding and Groundwater

4.6.1 Flooding

According to the Humboldt County Web GIS database, the parcel is located outside of the 100-year flood zone. Potential for flooding to affect the proposed and existing developments is low.

4.6.2 High Groundwater

In our opinion, based on our field exploration and professional experience, seasonally high groundwater conditions have low potential to occur at the site. The lack of free groundwater suggests groundwater is unlikely to rise to within approximately seven feet of the ground surface during the winter wet season. Shallow groundwater conditions do not appear to have had, and are not expected to have, any adverse effects on the performance of the foundation systems.

4.7 Tsunami

As mapped by the State of California, this site is not within any Tsunami Hazard zone.

4.8 Soil Swelling or Shrinkage Potential

Subsurface soils at foundation load bearing depths (~18-inches) consist of medium dense to dense, angular gravel with silty fine sand and clay (GW). Soils were moist to the ground surface in December. Soils appeared to be of relatively low permeability. Based on their clay content, site soils might be expected to be subject to shrink and swell associated with cyclic seasonal (or other periodic) wetting and desiccation. Soils below a foundation in the climate of this region are typically considered unlikely to be subject to soil shrink-swell.

5.0 CONCLUSIONS AND DISCUSSION

Based on the results of our explorations, and from an engineering-geologic perspective, it is our opinion that the this property may be developed as proposed without being subject to, or contributing to, the geologic hazards associated with this location. The existing residence did not appear to have experienced differential settlement. In our opinion, differential settlement appears unlikely at this site, given the age and density of the earth materials comprising the native subgrade. In our opinion, the proposed development work will not be subject to, nor contribute to adverse impacts from geologic instability, steep slopes and erosion, seismic activity or flooding.

6.0 RECOMMENDATIONS

6.1 Slope Setback Considerations

From an engineering geologic viewpoint, we recommend that all developments be set back at least 10 feet from slopes steeper than 30 percent. In our opinion the existing and proposed developments are, and will be, situated on gently-sloping ground, sufficiently set back from steeper slopes common in the vicinity. The steeper slopes northeast and southwest of the subject parcel are areas of moderate to high slope instability, according to the Humboldt County planning department. In our opinion, slopes proximal to the existing and proposed developments appeared stable in their present configuration, at the time of our field explorations.

No perennial streams flow on or near this this parcel. The USGS topographic map shows one ephemeral tributary with a 50-foot streamside management area. Given the location of this minor watercourse in relation to the adjacent slopes and developments, it appears that no slope setback recommendations are necessary.

6.2 Site Preparation

Earthwork, including, but not limited to, site clearing, grubbing, and stripping, or foundation excavation should be conducted during dry weather conditions. Sod and topsoil, loose or undocumented fill soils, and any debris encountered below the existing ground surface, approximately 12 inches of material, should be removed from within the area five feet beyond the proposed footprint perimeter. Excavated soil may be stockpiled on-site for later use as landscaping material or non-structural fill. If there is any possibility that wet-weather earthwork of foundation construction might occur, approved erosion and sediment controls should be

emplaced, and an extra level of effort and care will be necessary to prevent rutting or mixing of disturbed soils with the underlying bearing soil materials.

Failure to adequately implement our dry weather earthwork recommendation could result in ponding or flooding of excavations, excessive or detrimental erosion or sedimentation. Except in the case of an emergency, no grading or excavation work should be undertaken during the rainy season (November through April).

All earthwork, including but not limited to, site clearing, grubbing, stripping, excavating and grading should be conducted only during dry weather conditions; generally May through October. Note that significant rainfall and subsequent runoff and erosion may occur during any season in the region. Recommendations for erosion and sediment control, we anticipate, will be provided by the project engineer or architect. Regardless of the season, we recommend placing erosion controls concurrently with ground-disturbing earthwork.

6.3 Subgrade Preparation

Strip the uppermost one foot of soil (at minimum) from the footprints of the new developments, and from five-feet beyond their perimeters. Segregate and stockpile the excavated soil for later use as non-structural or landscaping fill. Alternately, dispose of excavated soils appropriately off-site. If soils exposed at the one-foot depth are soft or disturbed, they should be excavated further to expose more-competent, firm undisturbed native soils.

6.4 Temporary Excavations

Temporary construction slopes are not anticipated for this site. However, if any temporary construction slopes are ever proposed, they should be designed and excavated in strict compliance with applicable safety regulations including the OSHA Excavation and Trench Safety Standards.

All construction equipment, building materials, excavated soil, vehicular traffic, and other similar loads should never be allowed near the top of any unshored or unbraced excavations. Where the stability of adjoining buildings, walls, pavements, or any other similar improvements may be endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be necessary and should be provided to provide structural stability and to protect any personnel working in the excavation.

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 can assume 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 an experienced licensed professional engineer.

6.5 Cut and Fill Slopes

No cut or fill slopes taller than 3 to 4 feet are currently anticipated on this site. If cuts or fill slopes may be proposed, for example for a berm around the proposed rainwater catchment, limit slopes to two to one, horizontal to vertical (2:1). In general, structural fill on sloping ground should be placed on a suitably prepared "benched" subgrade surface with a slope of no greater than 5:1, and should be compacted in accordance with our recommendations to reduce the potential for excessive settlement.

6.6 Fill Materials

Aggregate Base

Compacted aggregate base material may be used for pavement subgrade, placed beneath footings or floor slabs on grade, or used as trench backfill. This material should meet the requirements in the Caltrans Standard Specifications for Class 2 Aggregate Base (1-inch maximum particle size).

Select Fill

In the case of new construction requiring select fill, that select fill should consist of granular material that may be used as non-expansive fill beneath floor slabs and for the upper portion of pavement subgrade. Select fill should be a well-graded rock and soil mixture free of organic material and other deleterious material; on-site native soils below the topsoil may be suitable for select fill if cobbles larger than 3-inches are removed.

Select fill material should contain low plasticity clay, well-graded sand and/or gravel. The material should contain no more than three percent by weight of rocks larger than 3-inches in greatest dimension, or more than 15 percent larger than 2-inches. Additionally, the material should meet the following specifications:

- Plasticity Index: <12
- Liquid Limit: <30
- Percent Passing No. 200 sieve: 50 maximum, 5 minimum

6.7 Compaction Standard

We are not aware of any fill planned that will require compaction. If or when compacted fill is required, that structural fill and backfill material shall be compacted in accordance with the specifications listed in the table below. Material should be placed at optimum moisture content, in horizontal lifts that do not exceed 8-inches in uncompacted thickness. Fill should be compacted mechanically. A qualified field technician, or other qualified professional, should be present to observe fill placement and to perform field density tests at random locations throughout each lift to verify that the specified compaction is being achieved.

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

TABLE 3 – STRUCTURAL FILL PLACEMENT SPECIFICATIONS		
Fill Placement Location	**Compaction Recommendation (ASTM D 1557 – Mod. Proctor)**	**Moisture Content (Percent Optimum)**
Granular cushion beneath Floor Slab	90%	-1 to +3 percent
Structural fill supporting Footings	90%	-1 to +3 percent
Structural fill placed within 5-feet of the perimeter of the building pad	90%	-1 to +3 percent
Utility trenches within building and pavement areas	90%	-1 to +3 percent
Utility trenches beneath Landscape Areas	90%	-1 to +3 percent

6.8 Allowable Soil Bearing Pressures

Per Section 1806.2 of the 2019 CBC, for undisturbed native subsoils, or a documented engineered fill resting on such material, the following may be used for design: an allowable soil bearing value of 1,500 psf; a lateral bearing pressure of 100 psf per foot below natural grade; and a lateral sliding resistance cohesion of 130 psf multiplied by the contact area as limited by CBC Section 1806.3.2. An increase of one-third may be allowed where used with the alternate basic load combinations in CBC Section 1605.3.2 which includes wind or earthquake loads.

7.0 FOUNDATION DESIGN

Foundation design recommendations presented here assume that the structure will be supported on a typical new reinforced concrete foundation system. In our opinion, a typical wood-, or metal-framed, structures may be supported on continuous concrete perimeter foundations, in combination with isolated interior spread footings where necessary or appropriate. A thickened-edge, reinforced concrete slab-on-grade foundation system is also acceptable. Foundations of these types appear suitable for this site provided that they are constructed in accordance with our recommendations and specifications; and designed to meet the standards of the 2019 edition of the CBC, and the county of Humboldt.

7.1 Footings

- Foundation systems for this site should be reinforced to help limit potential settlement
- If necessary to mitigate undocumented fill soils, excavate and replace with suitable engineered fill, placed and compacted as recommended.
- Foundations should be embedded a minimum of 12 inches into suitably dense, undisturbed native bearing soils, below the loose topsoil, or on compacted and tested engineered fill. Based on the soil profile observed on-site, the base of footings will therefore be approximately 18 inches below existing grade, at minimum.

7.2 Floor Slab Design

- We recommend a reinforced concrete floor slab-on-grade foundation with a minimum thickness sufficient to bear the loads generated by the anticipated use, as specified by the

design engineer. Floor slabs should be underlain by 10 inches, minimum, of compacted select fill consisting of at least 8 inches of Class 1, Type A permeable material (per Caltrans), or an approved equivalent, to act as a capillary moisture break, and two inches of sand as described below.

- To reduce the possibility of moisture migration through any floor slab-on-grade, a minimum 6 mil plastic membrane (vapor retarder) should be placed on the prepared Class 1, Type A gravel subgrade.
- Joints between the sheets and utility piping openings should be lapped and taped.
- Care should be taken during construction to protect the plastic membrane against punctures. To protect the membrane during steel and concrete placement, and to provide for a better concrete finish, underlay and cover the membrane with one inch of sand.

Any difference between the 10 inches of select fill and sand under the slab and the depth to firm undisturbed native soil, at approximately one foot below existing ground surface, may be made up with additional select fill, or engineered fill that is placed as specified in the Structural Fill section of this report.

7.3 Grading and Drainage

Existing grading appeared sufficient for positive drainage by sheet flow. Finished ground surfaces around the residence appear to slope away from the foundations sufficiently for positive drainage under normal circumstances. Proposed new structures should also have the surrounding ground surface sloped to provide positive drainage away from foundations.

Roof storm runoff should be controlled by the gutters and downspouts. Downspouts should be connected to tightlines to convey roof runoff to an appropriate discharge point where no erosion or sedimentation can occur.

7.4 Erosion, Sediment Control Recommendations

Adhere to the recommendations on the anticipated Grading, Drainage and Erosion Control Plan prepared by the project architect or engineer. Except in an emergency, avoid wet-season earthwork and grading. Wet weather conditions can occur any time but may be expected predominantly from November through April. Storm water erosion and pollution prevention measures should be taken as soon as possible prior to the onset of the winter rains. To the extent feasible for this project, Humboldt County Erosion Control Standards should be incorporated into the project design and adhered to strictly during construction. We specifically recommend the following erosion and sedimentation control measures:

- Replace topsoil (if any) and revegetate disturbed areas immediately following earthwork.
- Heavily mulch exposed soil areas with straw and grass seed to protect against erosion.
- Cover stockpiles with 6 mil plastic sheeting, anchored to prevent wind disturbance.
- Drive no vehicles on the site soils when wet; use six inches of crushed rock or gravel to protect areas accessed by vehicles.

- To the extents feasible, the owner or his agent should monitor site conditions before and after runoff-generating rainfall events to verify proper functioning of erosion control measures, and to repair them promptly as necessary.

7.5 Pavement Design Recommendations

Although this proposed project includes no new pavement areas. Pavement design will require site-specific assessment of the area to be paved.

8.0 ADDITIONAL SERVICES

8.1 Review of Grading and Drainage Plans

The conclusions and recommendations provided in this report are based on the assumption that soil conditions encountered during future foundation repair work will be essentially as exposed during our explorations. If grading or new construction is proposed it will necessitate an additional site-specific assessment of the proposed grading.

8.2 Observation and Testing

To assure conformance with the specific recommendations contained within this report, and to assure that the assumptions made in the preparation of this 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 any structural fill, foundation forms, reinforcing steel, or concrete.

9.0 REFERENCES

CBC [California Building Code], 2019, California Code of Regulations, Title 24, Part 2, Volume 2. California Building Standards Commission.

CDMG, 1995, Planning Scenario in Humboldt and Del Norte Counties, California, for a Great Earthquake on the Cascadia Subduction Zone, Special Publication 115.

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USGS, 1973, Lord-Ellis Summit, Calif. 7.5' Quadrangle Map, Humboldt County, California.

10.0 LIST OF FIGURES

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Figure 2: Humboldt County Assessor's Parcel Map
Figure 3: Satellite Image of Subject Property
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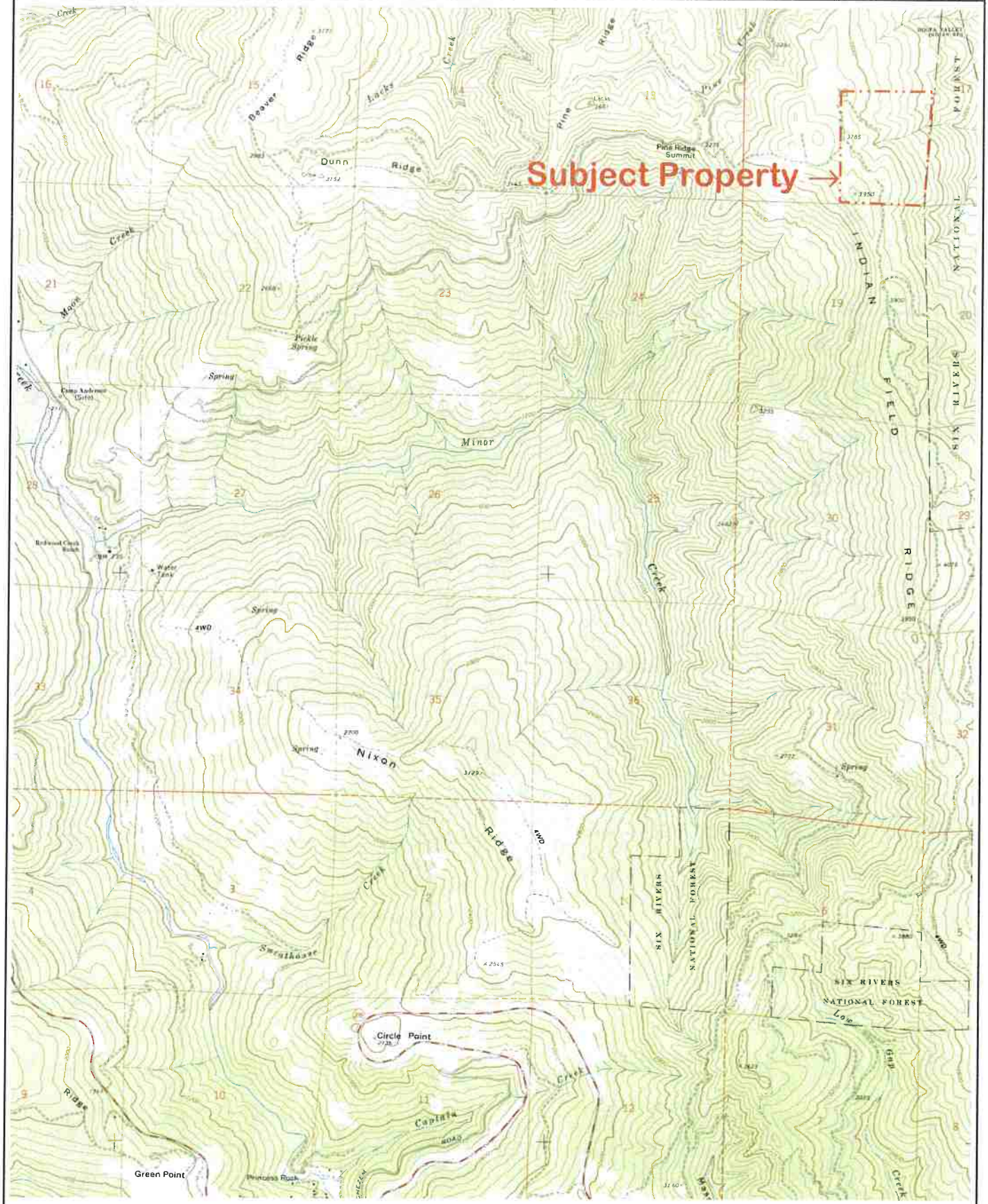
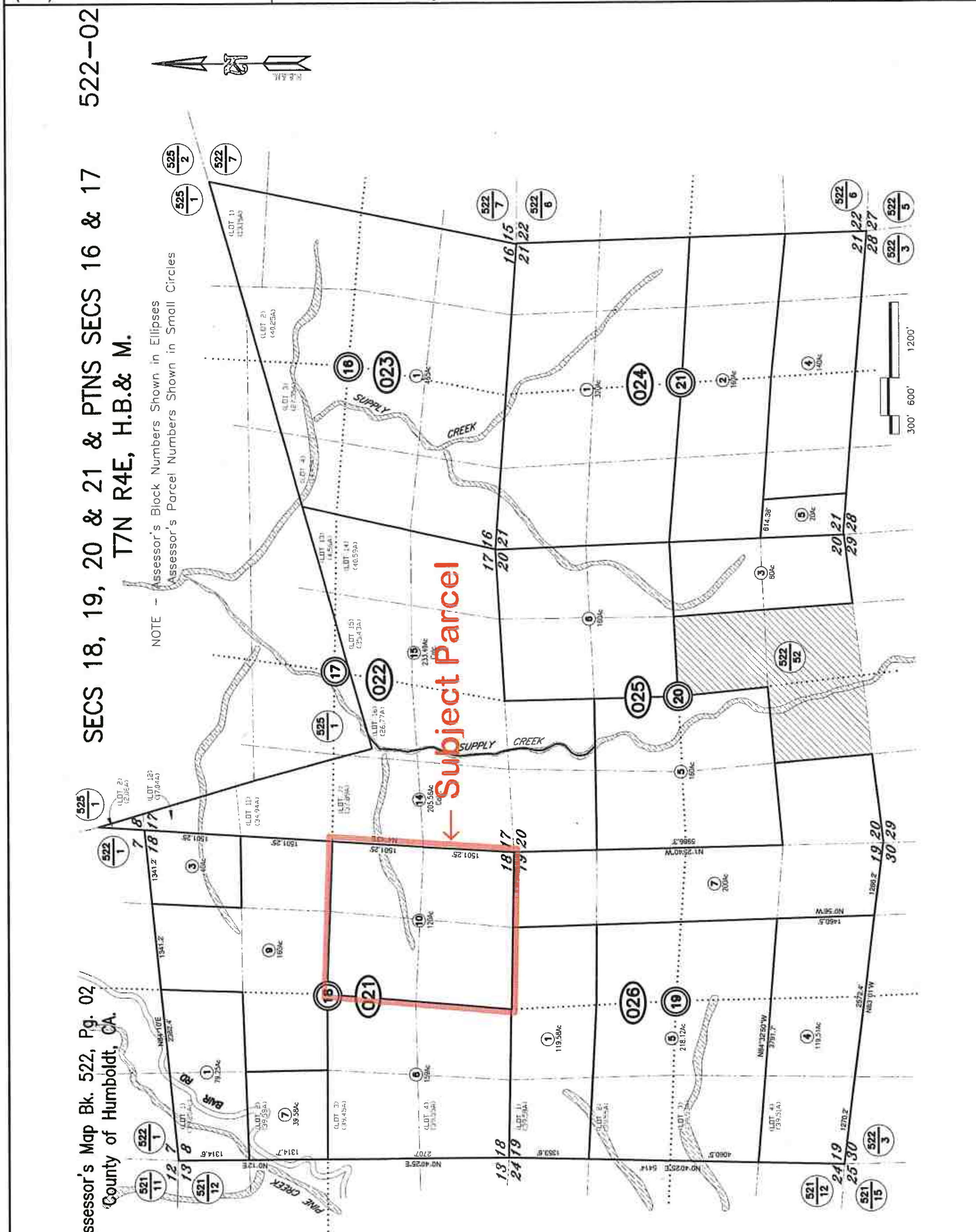
Lindberg Geologic Consulting	Engineering Geologic R-2 Soils Report	Figure 1
Post Office Box 306	Indian Field Ridge, Old Three Creeks Road, Humboldt County	January 29, 2020
Cutten, CA 95534	APN 522-021-010, Stay Humboldt LLC, Mr. Kevin Dobosh, Client	Project 0349.00
(707) 442-6000	Topographic Project Location Map (locations approximate)	1" ≅ 1,850'



Modified from: USGS "Lord-Ellis Summit, Calif." 7.5' Quadrangle Map. 1973. N ≅

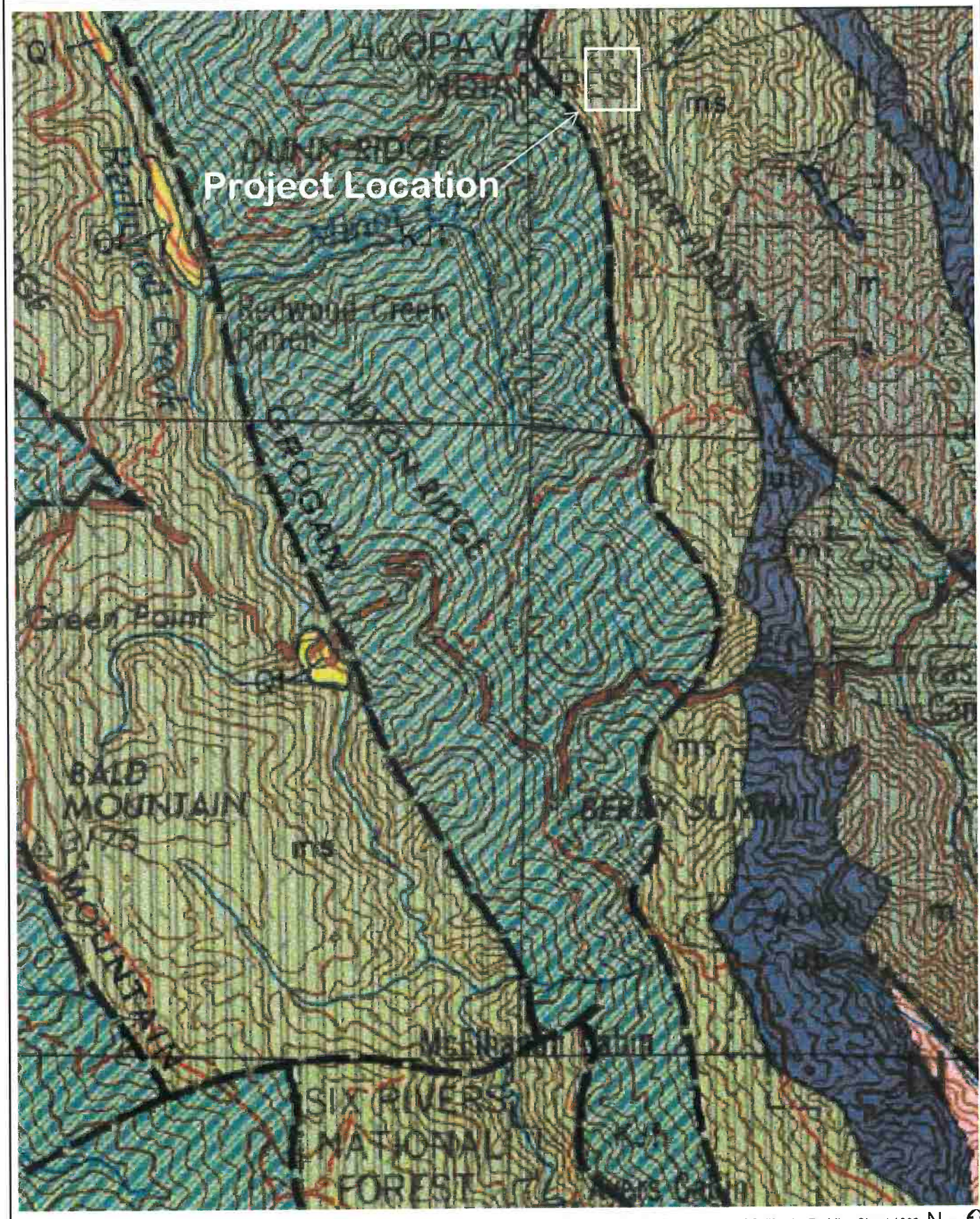
Lindberg Geologic Consulting	Engineering Geologic R-2 Soils Report	Figure 2
Post Office Box 306	Indian Field Ridge, Old Three Creeks Road,	January 29, 2020
Cutten, CA 95534	APN 522-021-010, Stay Humboldt LLC, Mr. Kevin Dobosh, Client	Project 0349.00
(707) 442-6000	Humboldt County Assessor's Parcel Map (locations approximate)	Scale as Shown



Lindberg Geologic Consulting	Engineering Geologic R-2 Soils Report	Figure 3
Post Office Box 306	Indian Field Ridge, Old Three Creeks Road, Humboldt County	January 29, 2020
Cutten, CA 95534	APN 522-021-010, Stay Humboldt LLC, Mr. Kevin Dobosh, Client	Project 0349.00
(707) 442-6000	Satellite Image of Subject Property (locations approximate)	1" ≅ 350'

Modified from: USGS "Lord-Ellis Summit, Calif." 7.5' Quadrangle Map, 1973. N ≅

Lindberg Geologic Consulting	Engineering Geologic R-2 Soils Report	Figure 4
Post Office Box 306	Indian Field Ridge, Old Three Creeks Road, Humboldt County	January 29, 2020
Cutten, CA 95534	APN 522-021-010, Stay Humboldt LLC, Mr. Kevin Dobosh, Client	Project 0349.00
(707) 442-6000	Project Geologic Map (locations approximate)	1" ≅ 1.3 miles



Modified from: CDMG Geologic Map of California, Redding Sheet 1962. N ≅