GEOTECHNICAL FEASIBILITY STUDY
for

Rincon del Rio

Nevada County, California

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JN: 7122.000

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Project Description

Proposed is "Rincon del Rio," a Continuing Care Retirement Community (CCRC), which is located on approximately 235 acres in an unincorporated area of southern Nevada County, California, west of California State Highway 49 and north of the Bear River. Unimproved roads emanating from Rincon Way in the northeast corner and Rodeo Flat Road in the northwest corner afford site access. A site vicinity map is provided as Plate 1.

At this time, anticipated uses in the CCRC include single-family detached cottages, attached residential units, walking paths, and a small park. While a general use for the property has been established, specific site plans, layout, and density have not yet been determined.

The preliminary findings of this report have been prepared on our understanding of the proposed development as outlined above. A final geotechnical study and report should be conducted after a tentative map or other appropriate permit/entitlement has been approved. This final geotechnical report should include logs of exploratory test pits, excavation characteristics of onsite material, laboratory test data, discussion of soil bearing capacities, foundation recommendations, slope stability analysis, and general grading requirements.

Site Conditions

The site is mostly undeveloped. Currently the property owners private residence occupies the southeast portion, a golf driving range exists in the northwestern corner of the property. An approximate 3.25-acre pond is located in the south central area, fed by a south flowing drainage and is retained by an approximate 30-foot tall earthen dam. A Nevada Irrigation District (NID) canal snakes through the eastern portion of the site, flowing from south to north. The

remainder of the land is undeveloped and primarily used for agricultural and range land purposes.

Elevations of the site range from 1278 feet above sea level in the southwest corner to 1683 feet above sea level in the northeast corner. Natural slopes range from gently rolling hills, less than 5:1 horizontal to vertical, to 1.25:1 horizontal to vertical.

Site vegetation consists namely of moderately dense annual grasses and deciduous trees, such as live oaks and blue oaks. North facing slopes support moderate to heavy under brush and some evergreens. Riparian vegetation such as tall green grasses, reeds, blackberries, trees, and other bushes delineate the main south flowing drainage and pond.

Regional Geology

The site is located in the central eastern area of the Sierra Nevada Geomorphic Province of northern California. This province is characterized by a 40 to 100 mile wide and nearly 400 mile long west dipping fault block with a long gentle dipping slope to the west and a steep eastern slope. Its elevations vary from 400 feet at the Great Valley boundary in the west to summits of more than 14,000 feet adjacent to the Basin and Range Province in the east.

This area is rather complex geologically, containing a wide variety of igneous, metamorphic, and sedimentary rocks, as well as active or potentially active faults. The metamorphic rocks of the Sierra Nevada Province have been subjected to intense folding and faulting associated with the Foothills Fault Zone, which has produced an area of steeply east dipping, northwesterly striking bedrock series through the center of the province.

Site Geology

Our review of geologic maps and site reconnaissance indicates the site is situated between the Wolf Creek Fault Zone and the Weimar Fault Zone, which are components of the Foothills Fault System. Onsite material is dominated by Paleozoic to Mesozoic age mafic metavolcanic rocks (G.J. Saucedo, 1992). A local geology map is provided as Plate 2.

The Foothills Fault system is a large fault system, and is a dominant structural feature of the western Sierra Nevada. The steeply east dipping to vertical component faults trend northwestward through an area about 200 miles long and 30 miles wide. Younger rocks overlap the faulted Paleozoic and Mesozoic rocks, and the total extent of the fault system is unknown. It is probably not limited to the western Sierra Nevada, but may extend north where it is buried by material of the Cascade Ranges. Faults are marked by belts as much as 4 miles wide, of cataclysmically deformed and recrystallized rocks and by truncated folds. Net displacement on some of the component faults exceeds 3,000 feet and may be measurable in miles. Major faults cut beds of Late Jurassic age material and are in turn cut by plutonic rocks of Late Jurassic to Middle Cretaceous age. Faults that controlled deposition of quartz veins and Gold ore bodies of the Mother Lode belt are apparently younger and structurally less important features superimposed on the fault zones of the larger system (Clark, 1960). GSA Bulletin.

The geologic map of the Chico Quadrangle, California also indicates an approximately located, north trending fault on the property. To the south of the site, this fault juxtaposes Mesozoic age plutonic rocks against Paleozoic to Mesozoic age metavolcanic rocks. This fault is most likely associated with the Wolf Creek Fault Zone to the west.

The closest fault to the site is the Wolf Creek Fault, anticipated ground shaking and intensities should be governed by a design earthquake occurring within 60 miles of the site. Ground shaking intensities may be on the order of a maximum credible earthquake of 6.5 in moment magnitude and a maximum ground acceleration of 0.29g, which corresponds to a ten percent (10%) probability of exceedance in fifty (50) yeas.

Soils

As part of our investigation, Lumos reviewed the web based USDA-NRCS soil survey. The soil survey indicates the project site is underlain by: Boomer series and Sobrante series soils, more specifically: Boomer Loam, Boomer Rock Outcrop and Sobrante Loam. A soils map is provided as Plate 3.

The official soil series descriptions indicate the Boomer series consists of deep and very deep, well drained soils that formed in material weathered from metavolcanic rock. These soils are on uplands and slopes range from 2 to 75 percent. These soils are well drained with slow to very rapid runoff and moderately slow permeability.

The Sobrante series consists of moderately deep, well drained soils that formed in material weathered from igneous and metamorphic rocks. These soils are on foothills and have slopes of 2 to 75 percent.

Grading

It is expected that cut and fill grading operations will be required to achieve desired grades. Much of the site is composed of shallow soils underlain by hard fractured bedrock. It is expected that cuts exceeding 2 feet will require heavy ripping and/or blasting. Oversize material (greater than 8 inches) will be generated; disposal or reduction of this material will be required.

Foundation Recommendations

Foundation systems could be either slab-on-grade with appropriate moisture barriers or perimeter footings with interior piers.

The most economical method of foundation support lies in spread footings bearing on only structural fill, only native granular soil, or only bedrock. In no case should a combination of these materials (structural fill, native granular soil, or bedrock) be used under a structure foundation(s). We anticipate low to moderate bearing capacities for conventional spread footings.

Conclusions

Based on the results of our recent site visit, literature, and map research, it is Lumos' opinion that the subject site is generally suitable for the proposed development. However, detailed site investigation(s) and field report(s) will be required for the design and construction of any proposed improvements.

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Location Principal

Chad Borean
Project Designer

References

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Saucedo, G. J., Wagner D. L., 1992, *Geology Map of the Chico Quadrangle*, Division of Mines and Geology, CA

Wagner D.L., Jennings C.W., 1987 *Geology Map of the Sacramento Quadrangle,* California Department of Conservation, Division of Mines and Geology

Wood and Newman, 1931, *Modified Mercalli Intensity Scale*, United States Geologic Survey, 1974, Earthquake Information Bulletin, v. 6, no. 5, p. 281

USGS, 2002, *Interpolated Probabilistic Ground Motion for the Conterminous 48 State, 2002 Data,* United States Geological Survey.

USGS, 2002, National Seismic Hazards Map, United States Geologic Survey

Appendix A

From: Google Maps.

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Rincon del Rio

LOCATION MAP

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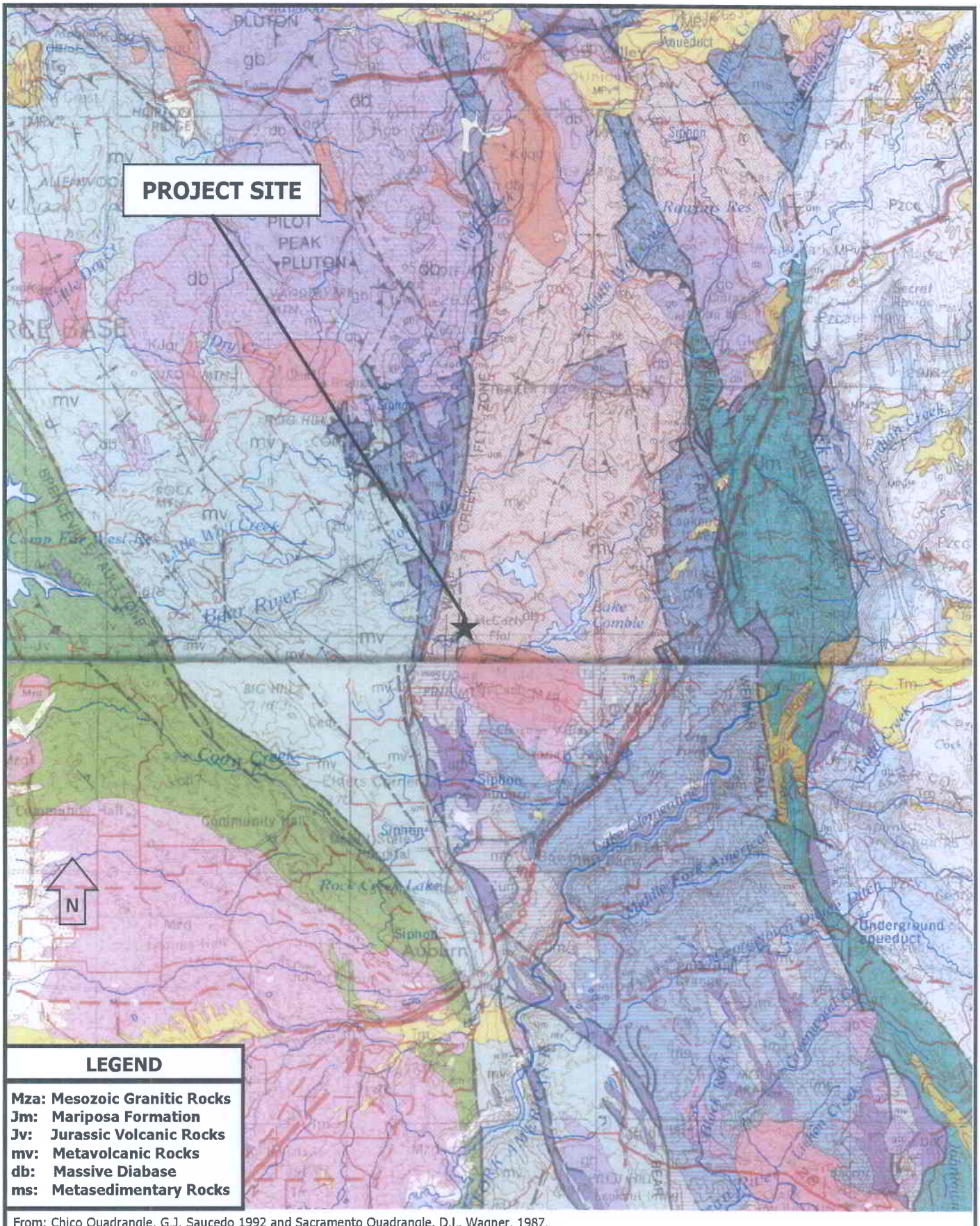
PLATE

1



LEGEND

Mza: Mesozoic Granitic Rocks
Jm: Mariposa Formation
Jv: Jurassic Volcanic Rocks
mv: Metavolcanic Rocks
db: Massive Diabase
ms: Metasedimentary Rocks

From: Chico Quadrangle, G.J. Saucedo 1992 and Sacramento Quadrangle, D.L. Wagner, 1987.

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GEOLOGIC MAP

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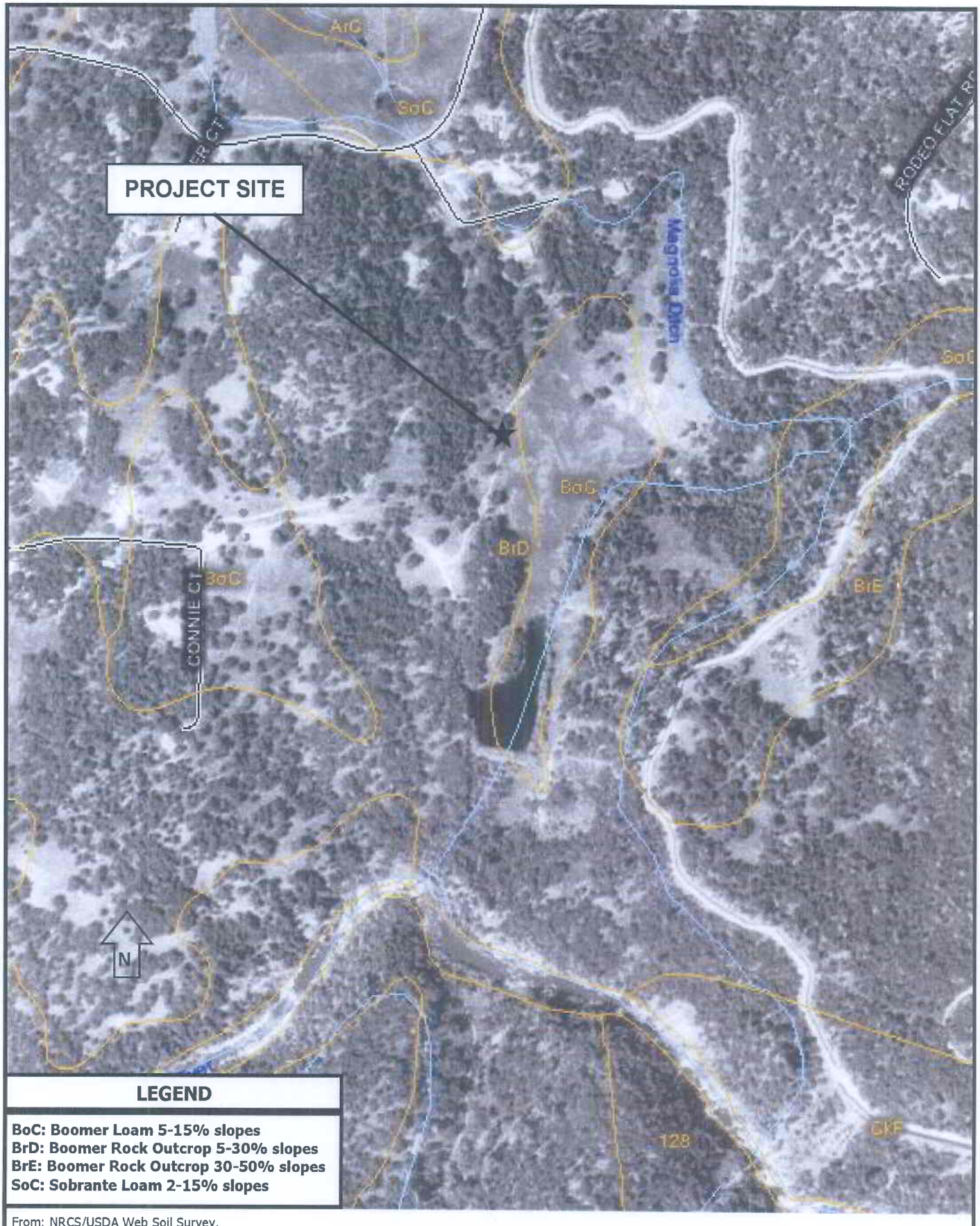
PLATE

2



From: NRCS/USDA Web Soil Survey.

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Rincon del Rio

SOILS MAP

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PLATE

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