March 16, 2020

Mr. Adam Foster
Senior Planner
City of Orinda Planning Department
22 Orinda Way
Orinda, California 94563

Subject: ***Geotechnical Peer Review***
Proposed New Residence at 2 Charles Hill Circle
Orinda, California 94563
Geosphere Project No. 91-04887-A

Dear Mr. Foster:

As requested by the City of Orinda (City), Geosphere Consultants, Inc. (Geosphere) has reviewed the geotechnical engineering aspects of the submitted documents for the proposed new single family residence to be located at 2 Charles Hill Circle, in Orinda, California. Our review included the following scope of work:

- Review of a report prepared by Romig Engineers (Romig), titled "Geotechnical Investigation, Patel Residence, 2 Charles Hill Circle, Orinda, California" dated September 11, 2018;
- Review of provided Architectural Plans prepared by ODS Architecture, Sheets A0, A1.1 through A1.6, A2.1 through A2.4, A3.1 through A3.6, and A4.1 through A4.4, dated December 9, 2019 (design review set);
- Review of provided Civil Plans prepared by Tamoff Engineering Corp., Sheets C1 and C2, dated September 9, 2019;
- Review of readily available, published relevant geotechnical or geologic information;
- Review of pertinent aerial photographs of the project vicinity;
- Site reconnaissance by a registered geotechnical engineer on March 4, 2020; and
- Preparation of this peer review letter.

PROJECT SUMMARY

Based on our review of the submitted plans and the geotechnical report provided by your office, it is our understanding that the project will consist of the construction of a new three-level, wood-frame, single-family residence with a calculated 5,459 square feet of living space and an upper level, 700 square-foot garage on a currently undeveloped property. The project will also include associated site improvements, including a paved concrete driveway from the street to the garage with retaining walls on each side of the driveway, and rear retaining walls at the lower levels of the new residence. The preliminary grading and drainage plan does not show any calculated cut and fill grading quantities, but the civil and architectural plans suggest moderate cuts will be required for the construction of the lower residential floor levels and the access driveway, and some fill will be required on the downslope side of the driveway as retaining wall backfill.

The project Geotechnical Engineer-of-Record (GEOR) Romig recommended that foundations for the new single family residence consist of drilled pier foundations embedded into competent supporting bedrock with minimum

12-foot embedment length into bedrock or 18-foot length below the bottom of grade beams, whichever is deeper, deriving their support from skin friction between the concrete pier surfaces and surrounding competent bedrock.

SITE RECONNAISSANCE OBSERVATIONS/ REVIEW OF INFORMATION

Our geotechnical engineer conducted a site reconnaissance on March 4, 2020. The surface conditions encountered at the site were generally similar to those indicated in the site plan, geotechnical report, available published data and aerial photographs. The site is a roughly pentagonal, 0.96-acre parcel located east of the intersection of Charles Hill Road and Charles Hill Circle. The site is on the south, downslope side of Charles Hill Circle and is bound on other sides by developed residential properties (i.e., 16 Charles Hill Road on the southwest, 8 Charles Hill Circle on the northeast and southeast).

General Site Description and Details of Proposed Project

The site is located in northern Orinda at the southern edge of a southwest to northeast trending dissected ridge area located between State Highway 24 on the southeast and Lauterwasser Creek on the north and west. The currently undeveloped property is located along the northwestern slope of a steep, narrow, locally southwest-trending creek ravine for an unnamed tributary of Lafayette Creek, which continues downslope of the site along the alignment of present-day State Highway 24. The property descends to the southeast at inclinations of 1.5:1 to 2:1 (horizontal to vertical) becoming flatter and terminating at the ephemeral creek bed near the southeastern property boundary, on the order of 80 feet below street elevation. The property contains numerous native oak and bay trees, with underlying native grasses and other low vegetation.

A new concrete paved driveway will be constructed from Charles Hill Circle near its intersection with Charles Hill Road, and constructed by cut into the existing slope on the upslope side of the driveway, and on a retained fill on a portion of the south, downslope side of the driveway. The driveway will terminate at a new garage on the upper level of the new residence, which will be situated in the northern portion of the property downslope of the street.

Local Geology

Various investigators have mapped the site as underlain by bedrock at shallow depths. Bedrock underlying the property was mapped by Dibblee (2005) as Miocene-aged Briones Sandstone, and by Haydon (1995) as upper-Miocene Orinda Formation sandstone and clay shale. Both maps show the inactive Pinole Fault to be about 1,700 to 2,000 feet southwest of the project site, and on the southwestern limb of a southeastern plunging anticline with an axis to the northeast of the site identified by Haydon as the Miner Ranch Anticline.

The photointerpretation maps by Nilsen (1975) and Haydon (1995) did not show any photointerpreted landslides in the immediate vicinity of the site. The Rogers/Pacific (1993) map, based on more detailed topographic mapping than the Nilsen and Haydon maps, shows no photointerpreted slides in the vicinity of the site, but shows the drainage ravine passing through the site to be colluvium-filled swales, with two smaller colluvial swales passing through the property, one of which passes through the western portion of the property adjacent to the existing residence at 16 Charles Hill Road, and the second swale located to the east, within which the proposed new residence is to be located. The project geotechnical engineer, Romig, did not opine on evidence of significant current or historic slope instability on the project site, but did reference a previous geologic study performed in 2007 by David Hoexter, CEG, who indicated no indications of active landsliding or slope failures within the proposed development area of the site. During our March 4, 2020 site reconnaissance, we noted a black-plastic covered area on the cut slope on the upslope side of Charles Hill Circle just upslope and opposite of the proposed development area below the street. This covered area of slope may indicate past, recent surficial sloughing of

exposed surficial soils in or above this cut slope, although the slope surface below the sheeting could not be observed.

Aerial Photograph Review

We reviewed 1:12,000 scale photographs taken in 1957 and 1969, as well as historical aerial photography available in Google Earth. Aerial photography taken in 1939 as provided by Google Earth shows Charles Hill Road and Charles Hill Circle to have been graded, but with no surrounding development. The adjacent drainage ravine was filled with trees (likely oak), and on the subject property, a few oak trees were present on the slope area between the two colluvial swales. No evidence of slope instability was noted in the vicinity of the site. Stereographic May 1957 photographs showed the roads to have been developed and some residences to be present along Charles Hill Road. The project site appeared to be similar in condition to the 1939 photograph, with the onsite trees noted to be larger. No evidence of slope instability at the project site was observed. The 1969 stereographic photographs showed more development of the site vicinity, as well as a denser oak canopy over the project site, and the neighboring residence to the southwest (16 Charles Hill Road) to have been constructed.

Subsurface Exploration

Onsite subsurface exploration performed by the project geotechnical engineer, Romig, on August 26 2018, consisted of five test borings drilled using a portable Minuteman drill rig equipped with a power-driven, solid auger. The borings were drilled to maximum depths of about 4.3 to 8.9 feet. These borings were intended to supplement six additional exploratory borings drilled in 2007 by Wayne Ting & Associates (WTA) for a previously proposed residence at the site. The WTA borings were drilled to depths of 3.5 to 12 feet. Six of the Romig and WTA borings were drilled in the vicinity of the proposed residence, and three additional borings were drilled along the presently proposed driveway alignment.

The borings essentially encountered surficial undocumented fills in most of the borings, underlain by either weathered siltstone or sandstone bedrock at shallow depth. In the eastern drainage swale where the residence is to be located, a layer of clayey colluvium was encountered between the surficial fills and underlying weathered bedrock. The surficial fills tended to be composed of silty sands and sandy clays grading to fat clays, with varying plasticity and expansion potential, and native soils where encountered consisting primarily of fat clays with high expansion potential. Sandstone or siltstone bedrock was generally encountered at depths of less than three feet in the spine areas between the colluvial swale. Within the eastern colluvial swale where the new residence is to be located, bedrock was encountered at depths ranging from 5 to 10 feet, overlain by surficial fills and underlying colluvium, with the thicker fills present at the top of the swale at the downslope edge of the Charles Hill Circle road alignment.

Native surficial topsoils as well as the identified fills were identified as moderately to highly expansive, with laboratory measured Plasticity Indices of 25 and 29 percent per Atterberg Limit tests performed by Romig and WTA. Groundwater was not encountered in any of the relatively shallow borings.

SIGNIFICANT GEOTECHNICAL CONSIDERATIONS

Based on our review of the geotechnical report, available literature, project plans, air-photo review, and site reconnaissance, it is our opinion the following significant geotechnical considerations exist at the site:

- Undocumented surficial fills of varying thickness within the swales and along the outer edge of the Charles Hill Circle road alignment within and upslope of the proposed residential footprint.

- Highly expansive, creep-susceptible, near-surface soils prone to potential surficial instability.
- Relatively steep slopes underlying the proposed construction.
- Variable bedrock depth underlying the proposed construction.
- Seismic shaking structural design considerations.
- Site surface, subsurface, and area drainage.

The project GEOR, Romig, concluded that development of the site was feasible from a geotechnical standpoint and noted the aforementioned significant considerations. Romig recommended supporting the new residential structure as well as the site retaining walls (where not bearing directly on bedrock) on drilled pier and grade beam foundations extending into and supported by bedrock, based on minimum embedment requirements, and presented design recommendations for such foundations. Romig also presented recommendations for removal and recompaction of undocumented fills (where not removed by grading) in the proposed development areas, as well as design of foundations and flatwork accounting for the highly expansive soils. Romig also presented recommendations for addressing potential near-surface erosion, soil slumping, and creep of the remaining near-surface soils where such potential instability may affect the proposed improvements.

CONCLUSIONS

Based on our review and reconnaissance, it is our opinion the geotechnical information and recommendations for the project, as submitted, essentially address the aforementioned geotechnical considerations as applicable to the project, and is in general conformance with accepted local and current geotechnical engineering principles and practices, and as well as the Orinda Soils Report Standards. We have the following comment which should be addressed if appropriate:

- CBC Seismic Design Criteria: The Romig report, due to its age, presents California Building Code (CBC) seismic design criteria based on the 2016 CBC. Depending on the submittal stage of this project, if 2019 CBC requirements are deemed to apply, the GEOR should submit 2019 CBC parameters for structural design.

FUTURE DOCUMENTATION

The project geotechnical engineer should review the completed project civil and architectural drawings, and provide a professional certification letter to the City to that effect. The project geotechnical engineer should also be consulted by the project structural engineer during the design process, and should review the completed structural plans and calculations for conformance to his geotechnical recommendations, provide supplemental recommendations as necessary, and also provide a professional certification letter to the City to that effect.

The project geotechnical engineer should be retained to observe the geotechnical aspects of the construction. Upon completion of construction, we recommend the geotechnical engineer provide written documentation to the City for the following activities:

- Earthwork operations, including subgrade preparation, earthwork construction, and site drainage installations, as applicable;
- Recording of test locations and results of field and laboratory compaction tests where testing is determined to be appropriate by the project geotechnical engineer;

- Building foundations, including observation of foundation excavations, and confirmation of individual foundation embedment and supporting materials with respect to the geotechnical engineer's recommendations; and
- Site drainage, including finish grading around and below the new residential structure, and discharge of collected surface and subsurface water to appropriate discharge facilities.

LIMITATIONS

Our role as a third-party reviewer has been solely to provide technical advice to assist the City of Orinda in its discretionary permit decisions, and we are afforded the same protection under law. Our services are limited to the review of the documents described; a visual review of the property; and developing an opinion as to the project geotechnical engineer's conformance to local and current geotechnical engineering standard of practice, and the intent of the City's Soil Report Standards. We cannot confirm the accuracy of the information provided by others, nor can we confirm their conclusions and design recommendations. In addition, we have no control over the design or construction on this property and make no representations regarding its future condition(s).

Geosphere appreciates this opportunity to be of continuing service to the City of Orinda. The opinions presented in this letter were developed in accordance with generally accepted, local and current geotechnical engineering and engineering geology principles and practices.

Should you have any questions or require additional information, please contact the undersigned either by e-mail at cdare@geosphereinc.net or directly at (925) 314-7123.

Sincerely,
GEOSPHERE CONSULTANTS, INC.

Corey T. Dare, PE, GE
Principal Geotechnical Engineer

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CTD:pmf

REFERENCES

MAPS AND REPORTS

Dibblee, T.W., Jr., 2005, *Geologic map of the Briones Valley Quadrangle, Contra Costa and Alameda Counties, California*: Santa Barbara Museum of Natural History, Dibblee Geology Center Map No. DF-148.

Haydon, Wayne D., 1995, *Landslide Hazards in the Martinez - Orinda - Walnut Creek Area, Contra* Costa *County, California*: California Division of Mines and Geology Open File Report 95-12, Landslide Hazard Identification Map No. 32.

Nilsen, T.H., 1975, *Preliminary photointerpretation map of landslide and other surficial deposits of the Briones Valley 7½" Quadrangle, Contra Costa and Alameda Counties, California*: U.S. Geological Survey Open-File Map 75-277-8.

Rogers/Pacific, 1993, *Photointerpretive Landslide Features Map*: Consultant's Map prepared for the City of Orinda.

AERIAL PHOTOGRAPHS

Pacific Aerial Surveys, May 4, 1957, AV-253-12-15 and 16, 1:12,000 scale.

Pacific Aerial Surveys, May 28, 1969, AV-905-12-16 and 17, 1:12,000 scale.

Google Earth, December 31, 1938 (historical imagery); download application.