Geotechnical Exploration, Inc.

SOIL AND FOUNDATION ENGINEERING ● GROUNDWATER ● ENGINEERING GEOLOGY

22 January 2014

Orange County Planning Commission
300 North Flower
Santa Ana, CA 92702-4048
Attn: Mr. Ron Tippets

Job No. 14-10450

Subject: **Review of Geotechnical and Geologic Concerns**
Draft Environmental Impact Report
Cielo Vista Project EIR No. 615
Yorba Linda, California

Dear Mr. Tippets:

In accordance with the request of Protect Our Homes and Hills represented by KEVIN K. JOHNSON, APLC, ***Geotechnical Exploration, Inc.*** herein provides commentary on the subject draft EIR based upon our review of the reported geotechnical and geologic conditions.

We are a full-service soil engineering firm located in the City of San Diego, established in 1976, with staff possessing the appropriate registrations and certifications in civil engineering, geotechnical engineering, geology and engineering geology. The personnel at ***Geotechnical Exploration, Inc.*** have background experience in soil mechanics, feasibility and design, environmental planning, hazard evaluation, quality control, field supervision and inspection, material testing, and management consultation. This experience has been applied to geotechnical and geologic investigations for residential subdivisions, multi-story commercial complexes, light residential foundations and deep caisson design, street and septic system design, hazard mitigation and litigation, dams, slope stability and settlement analyses. Our work includes predevelopment exploration and grading observation and testing services, hydrogeologic water resource and hazardous

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materials studies, forensic investigations and expert testimony, and geotechnical services related to post damage reconstruction.

We have explored and investigated active California faults and landslides in San Diego County, Orange County, Los Angeles County and northwestern Mexico for the purposes of project development, mitigation and repair. Our experience includes evaluation of reported residential damage to homes following earthquakes that occurred on the Newport-Inglewood and Whittier Fault zones.

Our Scope of Work was limited to review of the referenced DEIR and preparation of this letter with our comments. We have not performed a site investigation or reconnaissance of the site.

BACKGROUND DOCUMENTS

We have reviewed the Draft Environmental Impact Report (DEIR) No. 615 for the planned Cielo Vista project. This document was prepared by PCR Services Corporation and is dated November 2013. The DEIR included the following sections pertinent to the discussion of site geologic and geotechnical conditions:

1. Executive Summary, pages ES-3, ES-21 through ES-23;
2. 2.0 Project Description;
3. 4.5 Geology and Soils;
4. Appendix E Geology Study including:
    a. "Geologic and Geotechnical Evaluation In support of Due Diligence Evaluation "Travis" Property; City of Yorba Linda, County of Orange, California" dated June 8, 2006, prepared by Pacific Soils Engineering, Inc. work order 500674.

b. "Geotechnical Feasibility Study, Proposed Development of Tentative Tract Map No. 17341, County of Orange, California" dated March 1, 2013, prepared by LGC Geotechnical, Inc.; Project No. 10106-01.

Our description of site conditions as provided herein is based solely on review of these pertinent project and geologic/geotechnical references. Our opinions are based on this review and our experience as an active geotechnical consultant in southern California.

PROJECT AND SITE DESCRIPTION

We understand the planned Cielo Vista project includes development of an 84 acre tract located in unincorporated Orange County adjacent to the City of Yorba Linda. The project applicant plans for a maximum of 112 single-family dwellings to be constructed on 47.7 acres in 2 Planning Areas. The remaining 36.3 acres would be preserved as open space. The site is currently primarily vacant land with some operational and abandoned oil wells and appurtenant dirt access roads and trails.

Residential communities exist along the north, south and west sides of the property. The 469-acre undeveloped Esperanza Hills parcel exists to the east. The site and adjacent undeveloped properties are within an area commonly referred to as the Murdock Properties. Chino Hills State Park exists to the north and east of this undeveloped area of Orange County.

The L-shaped site is characterized by moderate to steeply sloping hillsides with over 300 feet of relief, from lower elevations in the south (565 feet above Mean Sea Level, MSL) to 885 feet above MSL in the north. Three relatively deeply incised southerly and westerly draining canyons cross the site. Native vegetation

supporting natural habitats exists across most of the site except where oil operations and associated facilities exist.

REGIONAL AND LOCAL GEOLOGIC SETTINGS

The site is located in the Puente Hills which are the foothills of the northwestern portion of the Santa Ana Mountains. These form the eastern boundary of the Los Angeles Basin within the Peninsular Ranges Geomorphic Province within California, characterized by northwest trending mountain ranges, intervening valleys and multiple sub-parallel fault systems. The faults in this province are typically right-lateral strike slip faults. Several large active faults exist in the region of the site including the San Joaquin Hills Thrust Fault, Newport-Inglewood Fault, San Andreas Fault and Whittier-Elsinore Fault.

The Tertiary-age Puente Formation forms the site bedrock materials. This Miocene unit consists of thin to massively bedded sandstone, siltstone and shale with minor overlying topsoil and colluvium. Older alluvial materials and abandoned stream terrace deposits are also present on upper portions of the site. Younger alluvium exists within canyon bottoms.

The bedrock materials within the Puente Formation are highly folded due to regional faulting and proximity to the Whittier Fault, with multiple east-west trending synclines and anticlines. Beds dip steeply to both the north and south and include thin weak planes along and across the bedding subject to localized instability. Several large-scale potentially hazardous landslide areas have been indentified on the northwestern portion of the project site. The hazard represented by these landslides has not been evaluated. This hazard could modify or preclude the current planned development on the northwestern portion of the project.

The Whittier Fault forms the dominant structural feature on the site. It crosses the central portion of the site from northwest to southeast and is approximately 1,660 feet long on the site. This fault is considered active by the State of California per the Alquist-Priolo Act of 1972 and is identified as a 1000-foot-wide Fault Rupture Hazard Zone on the fault-rupture hazard zone map. The hazard zone map uses the base USGS Yorba Linda 7.5′ quadrangle. The surface trace of the fault has not been identified within this zone on the map and is dashed to indicate only an approximate location. The Alquist-Priolo Act requires that active fault locations be identified such that habitable structures are not located across the surface fault trace.

GEOLOGIC HAZARDS

Federal, State of California, County of Orange and City of Yorba Linda regulations control the development of the project including the geotechnical and geologic aspects of site development. The geotechnical and geologic consultants for the project have identified several hazards on the site that will require avoidance or mitigation. The degree of project redesign and loss of planned lots resulting from the avoidance or mitigation of these hazards and their impacts cannot be determined until site conditions are investigated and fully addressed. Due to the presence of hazards associated with the Whittier Fault Zone (WFZ) the site is considered a high risk site, which will most likely require significant redesign. The hazards include:

- Significant ground shaking from potential seismic events on the Whittier Fault on site, up to magnitude M_w7.2, and other large active southern California faults;

- Ground surface rupture due to a seismic event on the Whittier Fault on site;
- Ground failure as the result of localized liquefaction on the southern portion of the site during a seismic event on the Whittier Fault on site or other active southern California faults;
- Landsliding/slope instability due to the presence of an ancient landslide complex on the northern portion of the site and in several mapped potential earthquake-induced landslide areas;
- Expansive soils requiring special grading and/or design of proposed foundations, floors and pavements, etc.

The most significant geologic hazards are associated with potential earthquakes on the Whittier Fault on the site. The location of the surface trace and associated additional traces within the 1,000-foot wide Whittier Fault Zone (which may restrict buildable areas) has not yet been determined. State of California Public Resources Code Section 2621 requires this determination prior to project approval and issuance of grading permits by cities and counties.

DISCUSSION

Neither of the geologic/geotechnical consultant reports referenced here provides the subsurface fault investigation to determine the actual (not approximate) location of the Whittier Fault on the planned Cielo Vista project site as required by PRC Section 2621 prior to project approval and permitting by a city and/or county. The fault surface trace is depicted in these reports as being generally along the center of the 1,000-foot-wide zone as approximately shown on the official State of

California Fault Rupture Hazards Zone map. The approach to investigating the site for faulting requires that exploratory trenches and ancillary borings be excavated generally perpendicular to the trend of the faulting such the ground surface fault trace(s) can be identified both within the zone and adjacent to the zone (per current state-of-the-art practice). Trenches of the type required to explore the Whittier Fault Zone could be up to 20 feet or more deep and several hundred feet long. Multiple trenches will be required to fully evaluate the 1,000-foot wide zone. Spoils removed from the trenches would have to be properly stockpiled. Field operations could span months.

The Alquist-Priolo Act requires that habitable structures not be located astride or over these offsets. Therefore, the investigations required to accurately locate the faults have to be performed before project approval, issuance of grading permits and development. Setbacks from the fault trace(s) would also be required. Both geotechnical/geologic consultant reports recommend further investigation of the fault.

The locations of these surface fault traces are significant with respect to the location of the planned project residential structures and appurtenant improvements. A Geologic Map of the site is provided in the referenced LGC Geotechnical, Inc. report. It provides an overlay of the planned project configuration within (and adjacent to) the mapped Whittier Fault Zone (WFZ). Based on review of this project overlay, 56 planned residential lots are within the WFZ. Additionally, 10 planned lots are within 100 to 200 feet of the WFZ. These 66 lots represent 59 percent of the planned project. Should active faulting be discovered beneath the location of planned lots significant re-siting of these lots, associated project utilities and roads would be required to comply with the Alquist-Priolo requirements.

In effect, any approval of a housing site plan before these geologic investigations are completed could be subject to major revisions and possible significant down-sizing of the project as currently planned.

In addition to the hazards associated with the WFZ, the planned project site has ancient landslide features and steep slopes that pose potential hazards to the planned residential lots. These features have not been investigated. A landslide complex is mapped above and abutting the eastern side of Planning Area 2 (PA2). All 17 planned residential units within PA2 could be affected by this hazard. Additionally, steep slopes with adverse geologic bedding may pose significant potential slope failure hazards. All potential landslide, steep slope and adverse geologic bedding hazards require thorough subsurface investigation before project approval.

The normal approach to investigating these features would be to drill large-diameter borings that would allow downhole inspection and logging by the project geologists of the ancient landslide features and bedding within steep slope areas. The borings, advanced by large truck-mounted or track-mounted drill rigs, would be 2½ to 3 feet in diameter and up to 150 feet deep. Spoils excavated from the borings would have to be stockpiled and the borings appropriately sealed after backfilling.

Following subsurface investigation and soil strength testing cross sections through the hillsides and landslide features and slope stability/engineering analyses would be performed to assess the stability of these features both in the short term and long term. Planned project development would likely include stabilization of potential landsliding hazards, either by buttress grading or excavation, etc. of unstable features. Setbacks from the hazards would likley be required. Depending

on the details of the field investigation findings, significant re-siting or redesign of planned project lots, streets, utilities, etc. would likely be required. Both referenced geotechnical consultant reports recommend further investigation of these features.

The subsurface investigations to address both the WFZ and landsliding/steep slope hazards require the mobilization of exploratory equipment across the site. Large exploratory trenches will have to be excavated by four-wheel drive or track-mounted excavators in all planned project areas. We understand from review of available photographs that similar fault trenching studies were performed on the adjacent Esperanza site.

Trenches will have to be open for the time required for detailed logging by project geologists and therefore commonly require shoring. Multiple overlapping or long trenches may be required. Access to certain site areas may have to be created by temporary road building. The large-diameter borings will require that drill rigs access higher landslide and slope areas such that the exploratory borings drill down through the areas of concern. Temporary access roads may also have to be created. Multiple borings will be required. The detailed exploration and updated investigation, as described, could take several months to complete. Significant environmental impacts due to trenching and drilling should be anticipated including soil and ground disturbance, noise, dust, effects to sensitive biological resources, potential effects on ground water, potential disturbance to archaeological and/or paleontological resources, habitat destruction or disturbance, etc.

LIMITATIONS

Our discussion and opinions have been based upon the provided materials as described in this report, as well as our experience with the soils and native

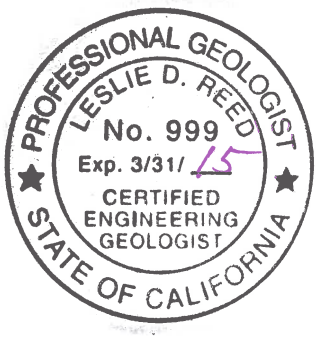
materials located in this area of Orange County. We have not performed a geotechnical or geologic investigation of the site.

Should you have any questions, please feel free to contact our office. Reference to our **Job No. 14-10450** will help expedite a reply to your inquiries.

Respectfully submitted,

GEOTECHNICAL EXPLORATION, INC.

Leslie D. Reed, President
C.E.G. 999/P.G. 3391



Cc: Kevin K. Johnson, KEVIN K. JOHNSON, APLC