Real-World Geotechnical Solutions
Investigation • Design • Construction Support

September 2, 2015
Project No. 15-3719

Grand Peaks Properties
c/o Mr. Paul S. Herskowitz
4582 S Ulster Street, Ste. 1200
Denver, Colorado 80237
Phone: (720) 889-9209
Email: pherskowitz@granpeaks.com

SUBJECT: GEOTECHNICAL RESPONSE
Oregon City, Community Development - Planning
Site Development Checksheet Response, dated August 3, 2015
The Cove Garden Apartments
Oregon City, Oregon

References: GeoPacific Engineering, Inc., *Preliminary Geotechnical Engineering Report The Cove Garden Apartments, Oregon City, Oregon,* dated July 14, 2015.

At your request, GeoPacific Engineering, Inc. (GeoPacific) prepared the following response to the geotechnical issues noted in the Oregon City, Oregon, Community Development – Planning, Site Development Checksheet, dated August 3, 2015.

Checksheet Item #19 – Geotechnical Review of Preliminary Plans

Provide documentation of the geotechnical engineer's review of the preliminary development plans and stormwater plans for conformance with their recommendations, specifically referencing the application plan sheets reviewed.

GeoPacific Engineering, Inc. (GeoPacific) has reviewed preliminary civil engineer plans for the Cove – Garden Apartments, Oregon City, Oregon, produced by Cardo, dated June 26, 2015. Generally the proposed project appears to be geotechnically feasible provided that the recommendations of our preliminary geotechnical engineering report are incorporated into the design and construction phases of the project.

The primary geotechnical concern associated with development at the subject site is the presence of large quantities of highly variable undocumented fill at the site which may be susceptible to settlement in areas proposed for structures and roadways. Undocumented fill was observed to extend to greater depths than our test pit explorations, and as a result, the subsurface stratum across the site is not thoroughly understood at this time. Several additional subsurface explorations consisting of deep soils borings and cone penetrometer explorations are recommended for the site in order to gain a better understanding of the extent, and depth of the undocumented fill soils. Once the consistency and extent of the undocumented fill at the site is understood and quantified, detailed settlement analysis should be conducted for each proposed structure, and appropriate recommendations should be developed to limit static and differential settlement to acceptable levels

for each structure. The installation of settlement plates during site grading and placement of engineered fill will likely be required during engineered fill placement. Removal of some undocumented fill at the site may be conducted to depths necessary to limit potential settlement of engineered fill and structures. Deep foundation systems may be appropriate for the structures. Each structure appears to be underlain by a unique soil condition. Recommendations to mitigate settlement should be developed on a building by building basis.

In addition to the preliminary project plans produced for the site, we have reviewed Oregon City GIS hazard mapping which indicates the presence of potential landslide hazard areas at the site. Based upon our review of the mapping, the areas indicated as potential landslide hazard areas consist of man-made stockpiles and fill areas. The site development plan indicates a significant amount of grading will be conducted, resulting in removal of the stockpiles, and creating a relatively level elevation across the site (approximately 52 feet above mean sea level). The grading plan indicates that the margins of the site will be graded to no steeper than 2H:1V slopes, and several retaining walls will be constructed. Based upon our review it appears that the proposed grading will remove features currently identified as potential landslide hazard areas. No landslides have been identified at the site by the Oregon Department of Geology and Mineral Industries (DOGAMI). During our subsurface site investigation we did not observe features which would be considered potential landslide hazard areas. We consider the current, and post-construction risk of landsliding at the site to be very low.

We have reviewed the preliminary stormwater plan for the project. As shown on page C3.1 of the preliminary plan, and based upon communication with the civil engineer, we understand that stormwater collected from the buildings, parking and drive areas, and all impervious area created as part of the development plan, will be collected and directed to a vegetated swale along the western margin of the site, where it will ultimately discharge to Clackamette Cove located on the north side of the project. The swale along the western margin of the site is currently heavily vegetated. During our preliminary subsurface investigation at the site we encountered undocumented fill and debris in the swale. We understand that site development will include removal of the fill material from the existing swale, and construction of a new swale system which will incorporate geotextile filter fabric, drain rock, growing medium, and new plants. It appears that the proposed stormwater disposal swale is geotechnically feasible, and that outfall of the storwmwater to Clackamette Cove will not present a geologic hazard at the site.

Checksheet Item #20 – Retaining Walls

Provide engineering design for retaining walls in accordance with the Oregon Structural Specialty Code. Note the design should include global stability and walls with heights greater than 7-feet should be terraced.

GeoPacific understands that several retaining walls will be constructed at the site. Based upon review of the preliminary grading plans we anticipate construction of retaining walls along the western margin of the site with a maximum height of approximately 17 feet, which will be subjected to surcharge loads from the adjacent parking areas, drive aisles, and garage buildings. We anticipate retaining walls with maximum heights along the northern and eastern portions of the site with maximum heights of approximately 4 to 5 feet, which will be subjected to surcharge loads from

structures and engineered fill slopes. Based upon communication with the civil engineer, we anticipate that retaining walls along the western margin of the site may consist of soldier-pile walls, Ultrablock walls, or MSE walls. We anticipate that the walls along the northern and eastern margins of the site will consist of Keystone or Allan Block retaining walls. GeoPacific will conduct detailed retaining wall design, in accordance with the Oregon Structural Specialty Code, IBC, and ASCE-7 for the site once additional subsurface investigation has been conducted, and the extent, density, and consistency of the undocumented fill soils present at the site are understood in greater detail. In general the proposed retaining wall locations appear to be geotechnical feasible.

UNCERTAINTY AND LIMITATIONS

We have prepared this report for the client, for use on this project only. The report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, express or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

REGISTERED OREGON BENJAMIN L COOK 2245 GEOLOGIST

EXP 12-31-15

Benjamin L. Cook, R.G.
Senior Geologist

REGISTERED PROFESSIONAL ENGINEER 14743PE OREGON JAN. 23, 1990 JAMES D. IMBRIE

EXPIRES: 06/30/2017

James D. Imbrie, P.E., C.E.G.
Principal Geotechnical Engineer