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February 21, 2019

Mr. Kenneth Wu
Providence Development Corporation
1055 Craddock Court
Walnut Creek, CA 994597

Supplement to Geotechnical Investigation Report
Four New Homes Off McKissick Street,
Pleasant Hill, California

Dear Mr. Wu:

In accordance with our discussions earlier today, we provide recommendations for design and construction of retaining walls on the perimeter of the subject property. We also provide a recommendation for earthwork construction under wet weather conditions.

Add to report as Section 4.7 on page 18:

4.7 Retaining Walls

Retaining walls for the north and east property boundaries are planned to be mechanically stabilized earth. These walls will be segmental block walls supported by geogrid-reinforced soil (engineered fill). Basement walls will be of conventional reinforced concrete or CMU masonry.

4.7.1 Segmental Block Retaining Walls

Segmental block type retaining walls, whether geogrid-reinforced or not, and mechanically-stabilized earth (MSE) fills, if used, should be designed, detailed and constructed on a turnkey, design-build basis. All aspects of the wall design should be under the direction of a single, California-licensed civil (or civil/geotechnical) engineer who is solely responsible for all aspects of the wall design, and provides oversight and appropriate testing during the construction phase. Contact us if you would like us to design the wall(s) or to further explain this recommendation, if necessary.

All walls should be founded on competent soil. Embed the blocks a minimum 12" below adjacent final grade for level ground, or at a depth such that there is a minimum 5 feet width of native soil or engineered fill, measured horizontally between the face of the first block and the face of the slope, per Figure C-1. Use an allowable bearing pressure of 2,000 psf for design. For lateral resistance, use a passive resistance of 255 pounds per square foot per foot of depth, pcf. Design the wall in accordance with the pressures in the following table.

4.7.2 Wall Design Pressures

Walls structurally with straight alignment so the stem can rotate about the base may be designed for the active pressure condition, provided that a deformation of about 1-inch at the top of wall is acceptable. If walls are rigid or constrained, they should be designed for the "at rest" condition. As indicated in the table, earth pressure on the walls can be reduced by using granular backfill. Add appropriate surcharge loads, including seismic loads where required by the building code to the backfill pressure in wall structural design as discussed below. The values in the table below are for retaining walls that have been supplied with a proper backdrain and subdrain system.

Design Earth Pressures for Retaining Walls

Add surcharge to these loads as discussed in the text. Creep pressures are included.

Backfill Material / Backfill Inclination	Earth Pressure (EFP)			
	Active		At Rest	
	Level to 4:1	4:1 to 2:1	Level to 4:1	4:1 to 2:1
Site clays	55	70	80	95
Sand with SE ≥ 30	30	45	55	70
Clean crushed rock or aggregate base	28	42	45	60

4.7.3 Surcharge and Transient Loads

Retaining walls must be back-drained to preclude buildup of hydrostatic pressures, otherwise water pressure (62.4 psf/ft) must be added to the design earth pressures presented herein.

All walls should be designed to additionally support any transient or permanent surcharge loads imposed by stockpiled soil, vehicles, other nearby walls or footings in addition to the active and at-rest earth pressures in the table above. If "ride-on" compaction equipment is to be operated within 5 feet of retaining walls, an equivalent fluid pressure of at least 100 pcf should be added in wall design.

Do not site foundations for car ports or other structures on the wall backfill unless the backfill has been placed and compacted as Engineered Fill under our observation and testing, and the walls designed for such loadings.

4.7.4 Wall Drainage

Retaining walls should include a freeboard height of at least 6-inches to prevent surface stormwater from overtopping the wall. A swale or sloped ground surface should be included at the top of wall to direct runoff to a drain inlet and prevent ponding of water.

The wall backdrain should consist of clean drain rock, such as Caltrans Class 1 Permeable Material. The drain gravel should be placed behind the wall at least 1-foot wide and

drained with either by weep holes, at least 2-inch diameter on maximum 8-foot spacing, or a 4 inch, perforated, rigid-walled PVC pipe, (Class SDR 35 or stronger), with cleanout risers at 100-foot maximum spacing. Wrap the back ends of weep hole pipes to contain the drain rock. Use separate pipe systems for conveying surface/roof drain water. Do not connect area drains into the perforated backdrain pipes. Extend the drain outlet to an engineer-designed outlet for erosion management. See the recommendations regarding area drainage and infiltration.

Add to report as Section 5.1.5 on page 20 of report:

5.1.4 Wet-weather Construction

Earthwork is more difficult when clayey soils are overly moist because the fills become unstable. Soil that is too wet compared with its optimum moisture content will not respond to compactive effort. This is more significant in the wet season (officially September 15 to April 15) because of reduced sunlight available to dry back soil if it becomes overly moist. So, all excavations and soil stockpiles should be tarped whenever work is not physically in progress.

Overly wet soils can be stabilized by mixing in lime, cement or other chemicals, which boil off the excess moisture by creating an exothermic reaction. Obviously, this is hazardous work, which should only be done by experienced crews using specialized mixing machinery under the Geotechnical Engineer's oversight. This is an expensive operation and the residual lime makes the soil caustic, and difficult to grow plants in the treated soil.

The project Geotechnical Engineer should be consulted if any of these options will be required to correct unstable site conditions or when wet weather conditions prevail during earthwork operations.

Limitations and Responsibilities

The limitations and responsibilities (Section 8) of our Geotechnical Investigation Report dated September 18, 2016 apply to this supplement.

We appreciate the opportunity to be of continuing service to you on this interesting project. Please call or email the undersigned should you have any questions, need clarification, or if you need additional information.

Very truly yours,
THE SUTTON GROUP

John R. Sutton, P.E./GE, D.GE
Principal Engineer

Measure	Description	Page Number in Report (Appendix Sutton)
Earthwork		
Clearing and Site Preparation	Site preparation should comprise clearing and grubbing to remove vegetation, debris, and organic-rich root zones including tree roots over ¼" diameter from the entire area to be re-developed. As this site was formerly a walnut grove, we recommend digging more deeply to search for, and remove decayed root mass. Any zones of organics or otherwise unsuitable fill, including any manmade fill encountered should be removed from the site.	Page 19 of 26 – section 5.1.1
Existing Soil and Fill Recompaction	Existing soil is suitable for site grading and backfilling. Rock or concrete chunks should be culled with no more than 20% by weight exceeding 1 ½" size.	Page 19 of 26 – section 5.1.2
Building Pads and Retaining Walls	The pads should be cross-scarified, moisture conditioned, and re-compacted as an engineered fill to provide uniform bearing.	Page 13 of 26 – section 4.3.2
Subgrade Preparation	Prior to placing fill, the soils in areas to be filled should be thoroughly scarified, then moistened, and compacted.	Page 20 of 26 – section 5.1.4
Fill Material	The on-site or similar clay soils may be used for general site grading and backfilling. When placed and tested under the oversight of the Geotechnical Engineer's representative, in accordance with the recommendations, it constitutes Engineered Fill.	Page 19 of 26 – section 5.1.2
Compaction	Compact the engineered fill to no less than 88% and no greater than 92% of maximum dry density, at between +2% and +5% over the optimum moisture content.	Page 19 of 26 – section 5.1.2
Utility Trench Backfill	Utility trenches should be backfilled with native site soils, except that trenches through non-expansive fill should be backfilled with like materials and compaction.	Page 21 of 26 – section 5.2
Exterior Flatwork	Driveways, turnarounds and parking areas should be underlain by non-expansive fill uniform in consistency and degree of compaction to provide uniform support.	Page 22 of 26 – section 5.5, 5.6
Construction During Wet Weather Conditions	Earthwork is more difficult when clayey soils are overly moist because the fills become unstable. Soil that is too wet compared with its optimum moisture content will not respond to compactive effort. This is more significant in the wet season (officially September 15 to April 15) because of reduced sunlight available to dry back soil if it becomes overly moist. So, all excavations and soil stockpiles should be tarped whenever work is not physically in progress. Overly wet soils can be stabilized by mixing in lime, cement or other chemicals, which boil off the excess moisture by creating an exothermic reaction. Obviously, this is hazardous work, which should only be done by experienced crews using specialized mixing machinery under the Geotechnical Engineer's oversight. This is an expensive operation and the	Supplement letter dated Feb. 21, 2019 – section 5.1.4

	residual lime makes the soil caustic, and difficult to grow plants in the treated soil. The project Geotechnical Engineer should be consulted if any of these options will be required to correct unstable site conditions or when wet weather conditions prevail during earthwork operations.	
Surface Drainage, Irrigation, and Landscaping	Wetting of foundation soils should be prevented during and after construction. Dry-climate plantings and irrigation systems, such as drip irrigation significantly reduce the potential for wetting of foundation soils.	Page 24 of 26 – section 6
Stormwater Runoff Structures	Preventions of wetting of foundation soils include compaction of impervious fill around structures, installing water proof membranes, providing adequate grades for rapid runoff of surface waters, and collecting roof discharge water in non-perforated pipes diverting the flow to a subsurface piping system, or directing the flow well beyond the limits of the construction.	Page 24 of 26 – section 6
Setbacks	Trenches that must parallel the sides of buildings should be more than 2' away from foundations, and above a down-sloping, 1.5H:1V plane, drawn from a line 9" above the foundation bearing level.	Page 21 of 26 – section 5.2
Future Maintenance	Periodically look for overly wet soil, heaved or depressed paving, distressed plants and presence of moss as problem indicators. Observe the system periodically, minimize watering time and observe that spray heads are properly directed, and not directed against building walls. Check for dislodged drip irrigation system.	Page 24 of 26 – section 6
Foundation Support		
Post-Tensioned Slabs	Post-tensioned slab should be at least 12" thick. The pads should be cross-scarified, moisture conditioned, and re-compacted as an engineered fill to provide uniform bearing.	Page 13 of 26 – section 4.3.2
Retaining Walls	All walls should be founded on competent soil. Embed the blocks a minimum 12" below adjacent final grad. Use an allowable bearing pressure of 2,000 psf for design. For lateral resistance, use a passive resistance of 255 pounds per square foot per foot of depth, pcf. The wall back drain should consist of clean drain rock, such as Caltrans Class 1 Permeable Material and drained with either by weep holes or perforated, rigid-walled PVC pipe with cleanout risers.	Supplement letter dated Feb. 21, 2019 – section 4.7
Seismic Design Criteria	For seismic design using the 2013 California Building Code (CBC), it is recommended that seismic design criteria Site Classification "D" in accordance with section 1613 be used.	Page 12 of 26 – section 4.2
Pavements	Asphalt pavement should use a Traffic Index of 4, a subgrade R-value of 40, and Caltrans minimum section of 2" HMA on 6" AB	Page 23 of 26 – section 5.6.2