April 7, 1999

Mr. Perry Tabor, P.E.
TEAC Consulting Engineers
3160 Crow Canyon Place, Suite 105
San Ramon, CA 94583

RE: Supplemental Recommendations
Slab-on-grade foundations
Subdivision 8123 (Buttner Court)
Pleasant Hill, California

Dear Mr. Tabor:

At the request of Walt McEnerney of Focus Realty Services, Geolith Consultants, Inc. is providing supplemental foundation recommendations to accommodate the use of thickened reinforced concrete slab foundations for the eight single-family homes to be constructed for the subject project. Our firm previously submitted a soils report for this project (to a prior owner) on March 11, 1998. In addition, we have provided ongoing plan review services and design consultations since the issuance of our report. The results of these additional services will be documented separately.

As outlined in the geotechnical investigation, we originally recommended pier-and-grade beam foundations for homes at this site due to the expansive soils and to account for differential fill thickness beneath the building pads. Since the final grading plans indicated relatively level building pads for each lot and public comments expressed concern about height of the completed structures, Mr. McEnerney has requested our opinion regarding the suitability of thickened reinforced concrete slab-on-grade foundations for the proposed homes. It is our opinion that this type of foundation system is appropriate for the proposed construction provided the following supplemental grading and foundation recommendations presented in the following paragraphs are included in the design and construction of the project. The recommendations from the original report remain valid unless specifically modified herein.

Thickened reinforced concrete slab foundations are acceptable for homes located on relatively level building pads with the foundations setback at least 10 feet from any descending slope steeper than 5:1 (horizontal to vertical).

1. Grading

In order to minimize differential fill thickness beneath the building pads, the areas to receive fill should be over-excavated to provide a semi-uniform fill thickness under the building pads. We recommend no more than 15% vertical differential beneath foundations resting on 25 feet or more of compacted fill, as shown in the cross sections contained in Fig. 3 of our March 11, 1998 report. Subdrains may also be placed around the limits of the excavation, as recommended in the field at the time of construction. The more expansive surface soils have been mixed with the sandy subsoils and weathered bedrock materials to reduce the expansion potential of the fill soils.

After the completion of the rough grading, all of the building pads should be periodically soaked to reduce desiccation and promote hydro-compression of the fill and natural soils prior to foundation construction. When foundation construction is ready to proceed, the upper 1-1/2 feet of subgrade in the areas to receive foundations should be moisture-conditioned to at least 4 percent above optimum moisture and compacted to no more than 85% percent relative compaction.

2. Foundations

Due to variable conditions, it has been assumed that moderately expansive soil or bedrock materials may be present at the foundation level in some areas. The following parameters were used in developing appropriate foundation recommendations for thickened reinforced concrete slab-on-grade situated on expansive soils, as recommended in the Chapter 18 - Division III of the 1997 Uniform Building Code (Vol. 2), Sections 1815 through 1818:

Plasticity Index (from laboratory tests) = 27%

Clay Fraction (assumed worst case) = 30%

Depth to Constant Soil Suction (from soil moisture profiles on boring logs) = 7 feet

Thornthwaite Moisture Index (per UBC Fig 18-III-13-2) = -20

It should be noted that the Thornthwaite Moisture Index given above is negative to account for the typically dry summers under natural conditions. However, when year-round or summer landscaping irrigation is anticipated, a positive Thornthwaite Moisture Index of at least 10 is considered appropriate.

Using these values, an edge moisture variation distance of 3 feet should be used for edge lift (controlled by drought or unirrigated conditions), while an edge moisture variation distance of 6 feet should be used for center lift (controlled by irrigated conditions).

Constant soil suction (pF) has been taken as 3.6 for a Thornthwaite Moisture Index of -20 and at 3.4 for a Thornthwaite Moisture Index of 10. The soil type appears to be Interstratified, as defined in UBC Fig. 18-III-15, with an Activity Ratio, A_c = 0.42 and a Cation Exchange Coefficient (CEAC) of

approximately 0.73. We have conservatively estimated that the clay fraction is 66% montmorillonite and 34% kaolinite, according to the results plotted on Fig.18-III-15.

The resulting values for differential movement are 0.832 inches for center lift and 0.319 inches for edge lift.

The slab foundations should be designed for a soil bearing capacity of 1000 pounds per square foot (psf) for dead loads, 1200 psf for dead plus live loads, and 1500 psf for all loads including wind and seismic. A friction coefficient of about 0.35 should be used for the portions of the slab in direct contact with the subgrade.

The slab foundations should have a minimum edge thickness of at least 12 inches and a minimum center thickness of at least 10 inches. The slabs should bear on a prepared subgrade of firmly compacted material at least 6 inches below the lowest adjacent finished grade.

To reduce the likelihood of moisture infiltration through the slab, a water-cement ratio less than 0.45 should be employed (discussed later), and a heavy plastic vapor barrier consisting of 10mil Visqueen (or an approved equivalent) should be placed directly on the prepared subgrade. The plastic should be protected during construction by a layer of at least 2 inches of clean sand. The sand should be thoroughly moistened prior to concrete placement. All appropriate requirements of the 1997 edition of the UBC should be followed in the design and construction of slab-on-grade foundations at this site.

Waterproofing and Dampproofing

Appendix Chapter 18 of the UBC (Vol. 1, pp. 1-343 and 1-344) contains requirements for waterproofing and dampproofing of foundations. These considerations should be acknowledged by the structural engineer designing the slab-on-grade building foundations, since irrigated areas will likely be situated adjacent to the foundations.

Soil Sulfate Testing of Graded Pads

Section 1904.3 of the Uniform Building Code requires that concrete exposed to sulfate-containing solutions or soils shall conform to the requirements of Table 19-A-4, or be constructed of sulfate-resistant concrete, or both. UBC Table 19-A-4 (Vol. 2, p. 2-179) limits the water-cement ratio of various cement mixes. The Martinez formation is locally recognized to include numerous quantities of soluble gypsum ($Ca_2\ SO_4\ 2\ H_2\ O$), as well as Sodium Sulfate, Magnesium Sulfate (Epsom salts) and Halotrychite.

Upon completion of grading the house pads, samples of the near-surface soils should be collected by a representative of our firm and tested for sulfate content, in accordance with Caltrans Test Method

417. Depending on the results of these tests, sulfate-resistant cements might be recommended for the site. Corrosion protection of concrete reinforcement in such situations is addressed in UBC Section 1904.4 and Table 19-A-5. Water-cement ratios of 0.45 or less are required if sulfates are discovered, as has been our experience in this area.

WARRANTY and CLOSURE

We have employed standard geotechnical engineering procedures, and our professional recommendations and opinions are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We hope this letter provides you with the information which you require at this time. If you have any questions regarding the recommendations presented in this letter, please feel free to give us a call at your earliest convenience.

Very truly yours,

GEOLITH CONSULTANTS, INC.

J. David Rogers, Ph.D., R.G., C.E.G., C.H.G.
Principal Engineering Geologist

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Principal Engineer

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