ENGINEERING & TESTING CONSULTANTS, INC.

May 14, 2007

Mr. William Heyer
Texona Investments
3205 Greenlee Drive
Austin, TX 78703-1622

SUBJECT: GEOTECHNICAL OBSERVATION FOR CANYON VISTA, SEDONA, AZ

Dear Mr. Heyer:

As requested, Engineering & Testing Consultants, Inc., (ETC) has completed the geotechnical observation for the subject project referenced above. The purpose of this exploration is to determine the general subgrade soil conditions for pavement thickness design, constructed slopes, and soil design factors.

This report discusses the general site conditions, laboratory test results, and provides pavement structure recommendations, recommended cut slope angles, and suggested construction procedures and design parameters. These services were provided following accepted soil mechanics and engineering practices. We make no other warranty, either implied or expressed. If soil conditions are encountered during construction that differ from those presented herein, this firm should be notified for evaluation.

PROJECT AND SITE CONDITIONS

The subject project is generally located on the west side of Brewer Road, between Juniper Lane and Procnow Road. ETC understands that the development will include 8 custom residential lots. A "hammer head" entrance road will be constructed, approximately 170 feet in length. One private drive will begin at the "hammer head" for access to interior lots. A second private drive will come off Brewer Road, just north of the main access road.

The proposed roadway alignments have been rough graded. We were informed that this occurred in the 1970's.

There is a significant cut slope exposed along the northeast side of Lot 3, up to approximately 10 feet in height. The cut exposes firm soils and highly weathered/fractured to decomposed rock material. The other existing cut slopes are much smaller, and exposed moderately fractured rock with relatively horizontal and vertical fracture planes.

The subgrade soils are generally comprised of low-plasticity, silty sand with gravel (Unified Soil Classification SM).

LABORATORY

Atterberg limits and gradation laboratory tests were performed for representative samples collected of the subgrade soils during the field operation. A summary of the laboratory test results are presented below in Table 1. Laboratory testing was performed in accordance with applicable ASTM standards.

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Location	Liquid Limit (%)	Plasticity Index	Fines Content (%)	Gravel Content (%)	Unified Soil Classification
Southern Subgrade Soils	23	3	35	34	SM
Northern Subgrade Soils	---	Non-plastic	32	24	SM

PAVEMENT DESIGN

Site grading for pavement areas should be as outlined herein, to provide subgrade support of flexible pavements. The native materials will provide good support for pavement structure. The pavement sections presented in Table 2 are recommended for the proposed development. Due to the potential steep roadway grades, Portland cement concrete should be considered for roadway pavement.

TABLE 2
PAVEMENT STRUCTURAL SECTION

Roadway	Alternative	Portland Cement Concrete* Thickness (inches)	Asphaltic Concrete Thickness (inches)	Aggregate Base Thickness (inches)	Prepared Subgrade Thickness (inches)
Canyon Vista Drive	1	---	3	6	8
Private Drives	1	---	2.5	6	8
	2	5	---	4	8

*Note: Air-entrained concrete with a minimum 28-day compressive strength of 3,500 psi.

The recommended pavement sections are expected to function with periodic maintenance or overlays when the subgrade, base, and pavement are constructed in accordance with YAG construction standards with City of Sedona modifications.

Efficient surface and subsurface drainage should be established prior to and maintained during and after construction to prevent water from ponding and/or saturating the soils within or adjacent to roadway areas.

In design and construction, adequate setback should be provided between the back of curb and/or sidewalk to ensure efficient drainage is maintained in areas adjacent to the toe of a rock cut slope.

EARTHWORK

The areas where fill is required must be stripped of all vegetation, debris, or unstable soils and such material should be removed. Depressions and sloped ground should be widened or benched as necessary to accommodate compaction equipment and provide a level base for placing fill.

Existing fill soils were encountered at various locations along the roadway alignment. The existing fill material in the area of culvert crossings shall be removed and replaced in compacted lifts. In addition, loose fill soils were observed along the existing fill slopes, which shall be removed and benched back into firm soils prior to placement of any additional fill. Loose or otherwise inadequate fill material, if encountered during construction, shall be removed and replaced in compacted lifts, as determined by the engineer.

Prior to fill placement, the exposed ground surface should be scarified; moisture conditioned, and compacted to a minimum depth of 8 inches, except on exposed rock. Special attention shall be given to insure adequate moisture is present throughout the entire 8-inch depth.

All subbase fill required to bring the structured areas up to subgrade elevation should be placed in horizontal lifts not exceeding 8 inches compacted thickness. Fill soils in roadway areas, and backfill in utility trenches shall be compacted to a minimum relative density of 95% of maximum dry density at –2% to +2% of optimum moisture content, ASTM D698.

Many cobbles and boulders will likely be generated during the earthwork phases of the construction. During fill placement "nesting" of large cobbles or boulders should be avoided. An adequate amount of finer material should be mixed in with the coarser material to create a dense fill without the creation of voids. Fill material with a large amount of rock pieces will still need to be adequately moisture conditioned to provide for long term stability and a dense fill section.

ETC recommends the observation of the site grading operation with sufficient tests to verify proper compaction.

CONSTRUCTED SLOPES

ETC recommends that fill slopes be constructed at a maximum slope angle of 2H:1V. If boulder revetment will be placed on the slope face, fill slopes may be constructed up to 1.5H:1V.

Cut slopes in the firm soil and highly weathered to decomposed rock material, as encountered in the northeast portion of Lot 3, shall be constructed at a maximum slope angle of 1.25H:1V up to 12 feet in height.

The relatively intact, moderately fractured rock encountered elsewhere may be cut at a maximum slope angle of 0.6H:1V, up to 10 feet in height. The rock strata may be excavated in stepped method along relatively horizontal and vertical fractures, provided the overall slope angle conforms to the maximum recommended slope angle.

Natural fractures within the rock mass may dictate that portions of some cut slopes be constructed along natural fracture planes, which may be at steeper angles. Steeper cut slopes shall be observed and approved by the engineer for adequate stability. Cut slopes should be constructed with careful rock excavation.

Zones of softer/decomposed/highly-fractured rock may not be apparent until a cut slope is exposed. Such strata, if encountered during construction, may require local slope angles to be adjusted.

Unstable cobbles, boulders, or loose material on the face of the slopes, and near the top of the slopes shall be removed, to help prevent future dislodgment due to weathering.

Soil in the top of cut slopes should be rounded back from the slope face to create a gradual transition to natural grade. Surface water runoff may erode slope faces, causing portions of a slope to become unstable, or dislodging larger rocks. Therefore, surface drainage should be prevented from flowing down slope faces without adequate revetment material.

LIMITATIONS

The recommendations in this report were prepared in accordance with accepted professional engineering principles and soil mechanics practices. We make no other warranty, either implied or expressed. If during subsequent planning and construction, conditions are different than as indicated, this firm should be notified for evaluation.

This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction techniques to be used on this project.

For your use. If you have any questions, please contact us at (928) 778-9001.

Sincerely,

ENGINEERING & TESTING CONSULTANTS, INC.

Richard G. Kelley, P.E.
Project Manager

cc: Mr. Jim Sullivan, SEC, Inc.
Mr. Steven Garrett, ETC-Cottonwood
ETC File No. 6438