



Kumar & Associates, Inc.
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and Environmental Scientists



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March 9, 2011

TKB Properties
Attn: Mr. Tom Daly
6364 Mighty Flotilla Avenue
Las Vegas, Nevada 89139-6409

Subject: Geotechnical Engineering Study, Proposed Farmhouse Court at Mountain's Edge
Development, El Paso County, Colorado

Project No. 11-2-113

Dear Mr. Daly:

This letter presents the results a geotechnical engineering study for the subject project. This study was conducted in general accordance with the scope of work in our proposal dated January 21, 2011, to provide information on the subsurface conditions and pavement section thickness design recommendations for the proposed aggregate-surfaced roadway. The project site is shown on the attached Fig. 1.

This report has been prepared to summarize the data obtained during this study, and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to the proposed construction are included in the report.

Proposed Construction: We understand the project will consist of constructing approximately 1,100 feet of new aggregate-surfaced roadway. The roadway will begin approximately 2,800 feet north of the intersection of McClelland Road and Scott Road, and extend towards the east. We understand the roadway will be constructed to service approximately 5 residential lots. Based on the plans provided, we anticipate the proposed grading will consist of maximum cuts and fills of approximately 1 foot and 3 feet, respectively. If the proposed construction varies significantly from that described herein or depicted in this report, we should be notified to reevaluate our recommendations.

Site Conditions: The site is bound by McClelland Road to the west, and by sparse rural development to the north, east and south. At the time of our site visit, the land was vacant and appeared to have been used for grazing. In general, the site sloped gently towards the southeast and south. A small ephemeral drainage is located approximately 700 feet east of McClelland Road, and trends towards the south, across the proposed roadway alignment.

Subsurface Conditions: Information on the subsurface conditions was obtained by drilling three borings at the approximate locations shown on Fig. 1. The boring logs are presented on Fig. 2, and the corresponding legend and notes are included on Fig. 3. The results of laboratory testing performed on selected samples from the borings are presented on Figs. 2 and 4, and are summarized on Table I. The testing was conducted in general accordance with applicable ASTM standards.

Below a thin layer of topsoil in each of the borings, native soils encountered consisted of silty sand (SM), with occasional silty-clayey sand (SC-SM), and extended to the maximum 5 to 10-foot depths explored.

Sampler penetration blow counts indicate the native granular soils are medium dense to dense. Ground water was not encountered in the borings at the time of drilling. Fluctuations in the water level may occur with time.

Site Grading: Embankment fill placed for support of pavements should consist of a nonexpansive material. The on-site materials encountered will be suitable for reuse as embankment fill. Imported soils, if required, should contain a maximum 30 percent passing the No. 200 sieve, a maximum liquid limit of 30 and a maximum plasticity index of 10. All proposed fill materials should be approved by the geotechnical engineer prior to placement. Fill should not contain concentrations of organic matter or other deleterious substances. Per El Paso County criteria, we recommend granular fills be placed at a minimum 92% of the maximum modified Proctor density (AASHTO T180). Fills should be placed within two percent of the optimum moisture content.

All pavement subgrade fill should be placed and compacted to the criteria presented in Appendix J and K of the El Paso County Engineering Criteria Manual.

We recommend the following criteria be used when preparing the site grading plans. Permanent cut and fill slopes should not be steeper than 3:1 (horizontal to vertical) and should not exceed 20 feet in height. Cut and fill slopes of greater heights are feasible; however, they should be investigated on an individual basis. The risk of slope instability will be significantly increased if seepage is encountered in cuts. We do not anticipate seepage will be encountered, however, if it is, a stability investigation should be conducted to determine if the seepage will adversely affect the cut. No formal stability analyses were performed to evaluate the recommended slopes; however, published literature and our experience with similar cuts and fills indicate the recommended slopes should have adequate factors of safety. If a detailed stability analysis is required, we should be notified.

Good surface drainage should be provided around all permanent cuts and fills to direct surface runoff away from the slope faces. Fill slopes, cut slopes and other stripped areas should be protected against erosion by revegetation or other methods.

Subgrade Materials: The materials encountered classify as A-1-b and A-2-4 with a group index of 0 in accordance with the American Association of State Highway Transportation Officials (AASHTO) classification. Based on our experience with the AASHTO soil classifications encountered, we assumed a minimum R-value of 20 for pavement design analysis.

Design Traffic: Traffic loading information was not available, and we assumed the roadway would be classified as a "Rural-Local" per the El Paso County Engineering Criteria Manual. Based on the assumed roadway classification, the county default 20-year 18-kip equivalent single axle load (ESAL) of 32,850 was assumed. If it is determined that actual traffic is significantly different from that estimated, we should be contacted to reevaluate the pavement thickness design.

Pavement Section: Using criteria presented in the El Paso County Engineering Criteria Manual and based on our experience, we recommend the roadway be surfaced with a minimum 6 inches of aggregate meeting the gradation requirements presented in Appendix D, Table D-11 of the El Paso County Engineering Criteria Manual. Aggregate should be compacted to a minimum of 95 % of the maximum modified Proctor density (AASHTO T180), per Appendix K of the Criteria Manual.

Expansive Soil Considerations: Based on the subsurface conditions encountered in the borings and our experience, the subgrade soils are estimated to be nonexpansive. Therefore, we anticipate special mitigation of expansive soils will not be required.

Subgrade Preparation: Topsoil and excessive organic matter present below the proposed pavement grade should be removed in its entirety prior to placement of embankment fill or pavement materials. Prior to placing the pavement section, the entire subgrade area should be scarified to a depth of 8 inches, adjusted to within two percent of the optimum moisture content and compacted to the minimum criteria presented in the "Site Grading" section of the report. The pavement subgrade should be proofrolled with a heavily loaded pneumatic-tired vehicle. Pavement design procedures assume a stable subgrade. Areas which deform under heavy wheel loads are not stable and should be corrected. We anticipate these areas may be stabilized by scarifying/ripping the subgrade and allowing for moisture adjustment, or by overexcavation and replacement of the subgrade with materials having suitable moisture. Other alternatives include the use of geogrid reinforcement (Tensar Type II geogrid or equivalent) in combination with suitable fill. Specific stabilization requirements should be evaluated at the time of construction.

Drainage: The collection and diversion of surface drainage away from roadway prism is extremely important to the satisfactory performance of the roadway. Drainage design should provide for the removal of water from the roadway surface and prevent the wetting of the subgrade soils.

Design and Construction Support Services: Kumar & Associates, Inc., should be retained to review the project plans and specifications for conformance with the recommendations provided in this report. We are also available to assist the design team in preparing specifications for geotechnical aspects of the project and, if necessary, perform additional studies to accommodate possible changes in the proposed construction.

We recommend that Kumar & Associates, Inc., be retained to provide observation and testing services to document that the requirements of the plans and specifications are being followed during construction, and to identify possible variations in subsurface conditions from those encountered in this study.

Limitations: This study has been conducted in accordance with generally accepted geotechnical engineering practices in this area for use by the client for design purposes. The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory borings drilled at the locations indicated on Fig. 1 and the proposed type of construction. The nature and extent of subsurface variations across the site may not become evident until excavation is performed. If during construction, fill, soil, rock or water conditions appear to be different from those described herein, this office should be advised at once so reevaluation of the recommendations may be made. We recommend on-site observation of excavations by a representative of the geotechnical engineer.

If you have any questions or require any additional information, please do not hesitate to call.

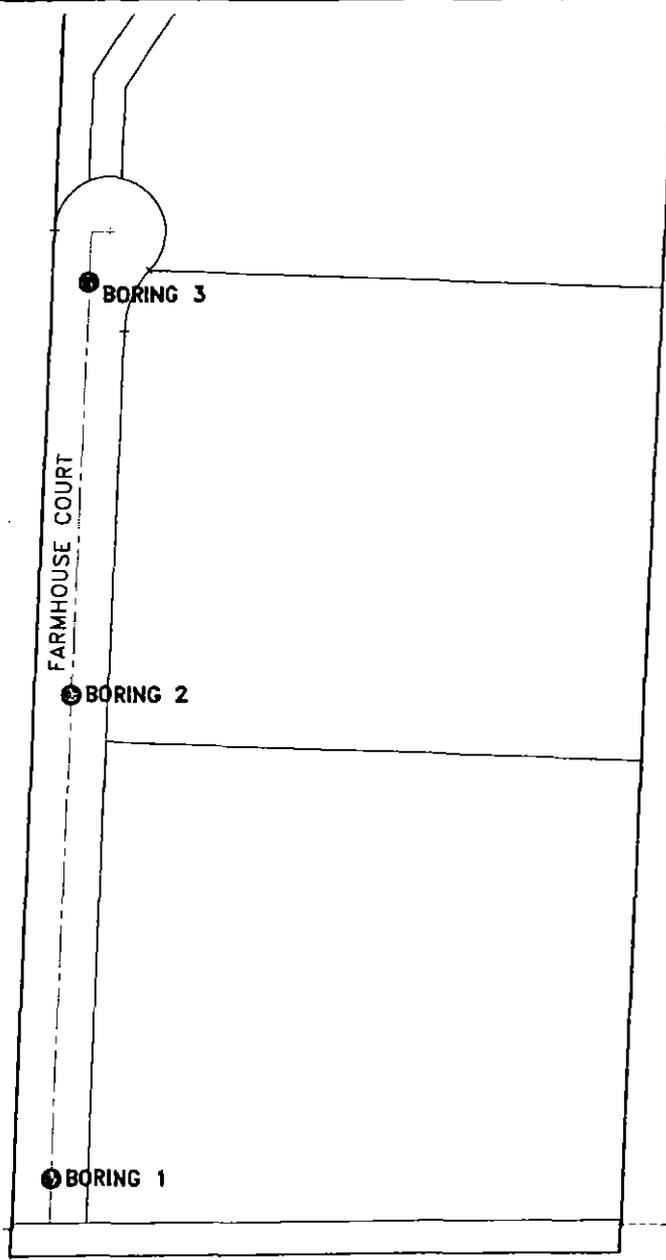
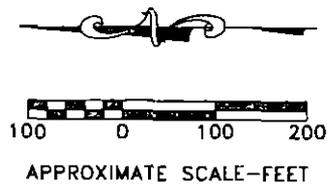
KUMAR & ASSOCIATES, INC.

Duane P. Craft, P.E.

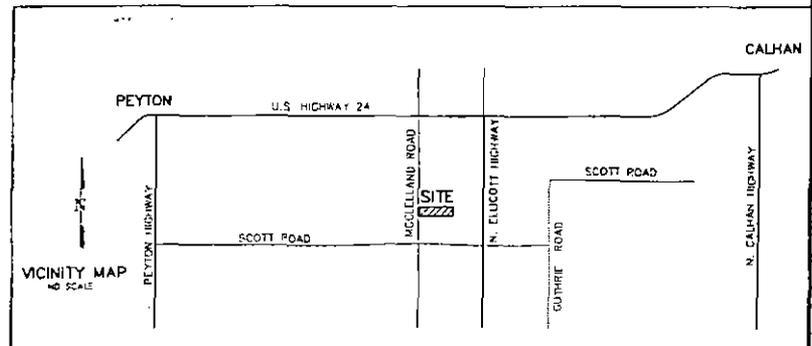


DPC:lm
Reviewed by: RLB
Attachments

cc: LDC Inc, Attn: Ms. Anna Sparks, P.E.



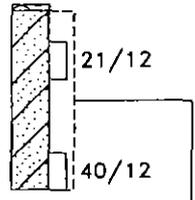
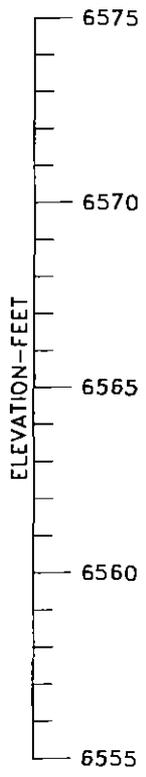
APPROX. 2,800 FT
TO SCOTT ROAD →



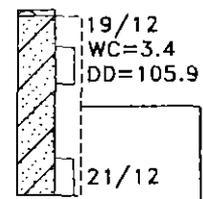
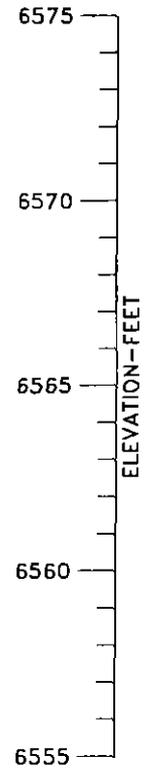
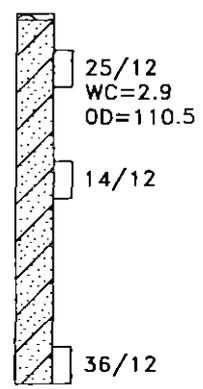
BORING 1
EL. 6572.5
gd @ +1'

BORING 2
EL. 6566
gd @ +1'

BORING 3
EL. 6563.5
gd @ +4'



+4=10
-200=15
LL=22
PI=5
A-1-b (0)



+4=0
-200=30
NP
A-2-4 (0)

LEGEND



TOPSOIL.



SILTY SAND (SM) WITH OCCASIONAL SILTY-CLAYEY SAND (SC-SM), MEDIUM DENSE TO DENSE, SLIGHTLY MOIST, TAN TO BROWN.



DRIVE SAMPLE, 2-INCH I.D. CALIFORNIA LINER SAMPLE.

21/12 DRIVE SAMPLE BLOW COUNT. INDICATES THAT 21 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE THE SAMPLER 12 INCHES.

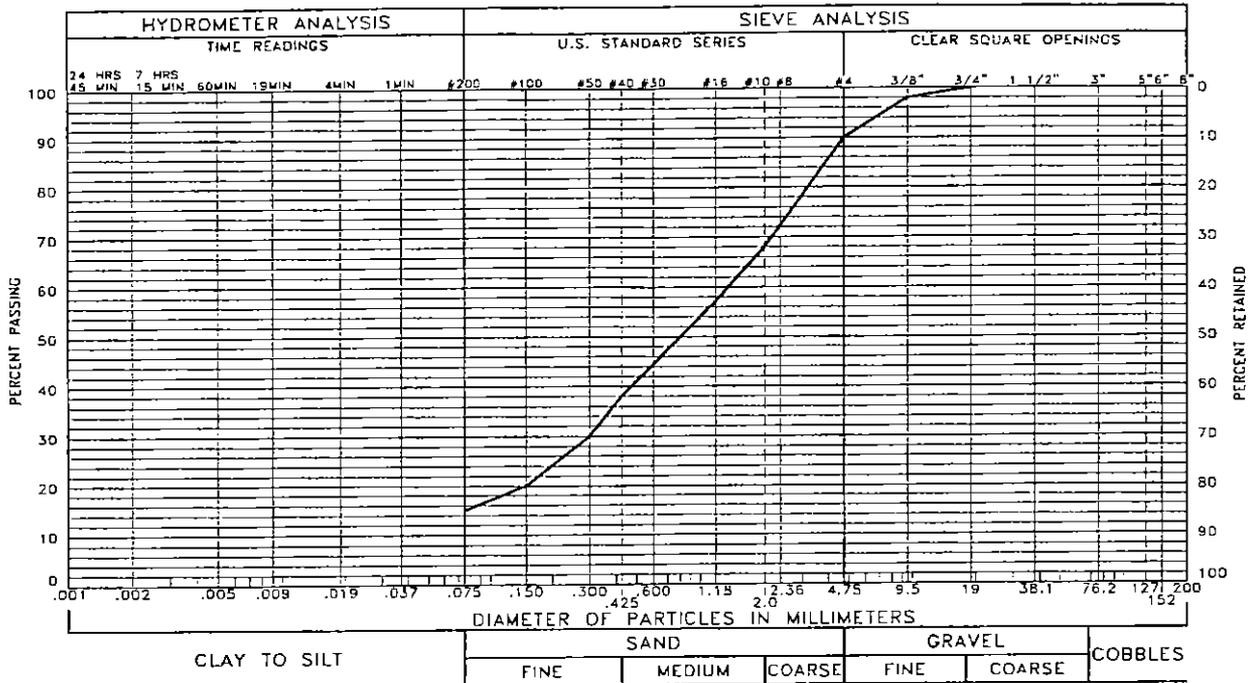


DISTURBED BULK SAMPLE.

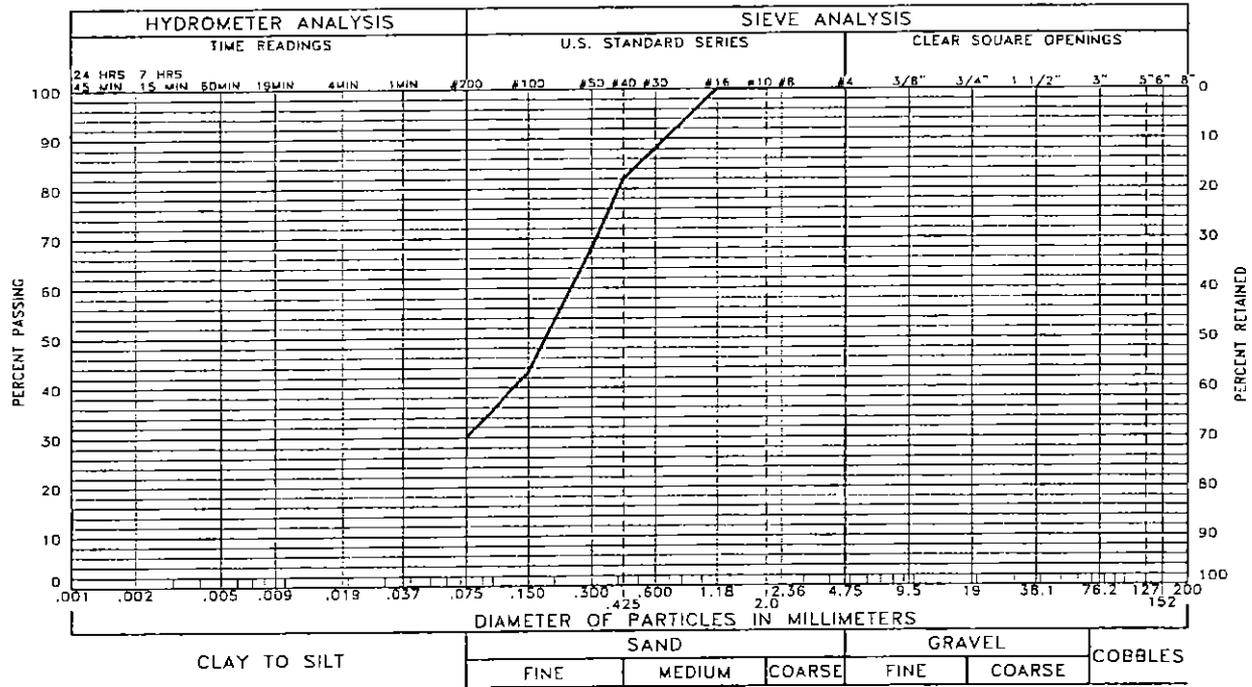
gd@+1 INDICATES PROPOSED GRADE IS APPROXIMATELY 1 FOOT ABOVE BORING ELEVATION.

NOTES

1. THE EXPLORATORY BORINGS WERE DRILLED ON MARCH 1, 2011 WITH A 4-INCH DIAMETER CONTINUOUS FLIGHT POWER AUGER.
2. THE LOCATIONS OF THE EXPLORATORY BORINGS WERE MEASURED APPROXIMATELY BY TAPING FROM FEATURES SHOWN ON THE SITE PLAN PROVIDED.
3. THE ELEVATIONS OF THE EXPLORATORY BORINGS WERE OBTAINED BY INTERPOLATION BETWEEN CONTOURS ON THE SITE PLAN PROVIDED.
4. THE EXPLORATORY BORING LOCATIONS AND ELEVATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. THE LINES BETWEEN MATERIALS SHOWN ON THE EXPLORATORY BORING LOGS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.
6. GROUND WATER WAS NOT ENCOUNTERED IN THE BORINGS AT THE TIME OF DRILLING. FLUCTUATIONS IN THE WATER LEVEL MAY OCCUR WITH TIME.
7. LABORATORY TEST RESULTS:
WC = WATER CONTENT (%) (ASTM D 2216);
DD = DRY DENSITY (pcf) (ASTM D 2216);
+4 = PERCENTAGE RETAINED ON NO. 4 SIEVE (ASTM D 422);
-200 = PERCENTAGE PASSING NO. 200 SIEVE (ASTM D 1140);
LL = LIQUID LIMIT (ASTM D 4318);
PI = PLASTICITY INDEX (ASTM D 4318);
NP = NON-PLASTIC (ASTM D 4318);
A-1-b (0) = AASHTO CLASSIFICATION (GROUP INDEX) (AASHTO M 145).



GRAVEL 10 % SAND 75 % SILT AND CLAY 15 %
 LIQUID LIMIT 22 PLASTICITY INDEX 5
 SAMPLE OF: Silty Clayey Sand (SC-SM) FROM: Boring 1 @ 2"-5'



GRAVEL 0 % SAND 70 % SILT AND CLAY 30 %
 LIQUID LIMIT NP PLASTICITY INDEX NP
 SAMPLE OF: Silty Sand (SM) FROM: Boring 3 @ 2"-5'

These test results apply only to the samples which were tested. The testing report shall not be reproduced, except in full, without the written approval of Kumar & Associates, Inc. Sieve analysis testing is performed in accordance with ASTM D422, ASTM C136 and/or ASTM D1140.

Kumar & Associates, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

Project No.: 11-2-113
 Project Name: Farmhouse Court
 Date Sampled: 3/1/11
 Date Received: 3/1/11

SAMPLE LOCATION		DATE TESTED	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		AASHTO CLASSIFICATION (group index)	SOIL OR BEDROCK TYPE (Unified Soil Classification)
BORING	DEPTH (ft)				GRAVEL (%)	SAND (%)		LIQUID LIMIT	PLASTICITY INDEX		
B1	0.2-5	3/1/11			10	75	15	22	5	A-1-b (0)	Silty clayey sand (SC-SM)
B2	1	3/1/11	2.9	110.5							Silty sand (SM)
B3	0.2-5	3/1/11			0	70	30		NP	A-2-4 (0)	Silty sand (SM)
B3	2	3/1/11	3.4	105.9							Silty sand (SM)