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GEOTECHNICAL ENGINEERING SERVICES
JOB NO. 1-60607
TRACT 1A -17, MARIPOSA RANCH
RIO RANCHO, NEW MEXICO

PREPARED FOR

DEVELOPMENT MANAGING CONSULTANTS

GEO-TEST

August 3, 2006
Job No.1-60607

Development Managing Consultants
9320 Menaul Boulevard NE, Suite D
Albuquerque, New Mexico 87112

ATTN: **Mr. Steven Hernandez, President**

RE: **Geotechnical Engineering Services**
Tract A-17, Mariposa Ranch
Rio Rancho, New Mexico

Dear Mr. Hernandez:

Submitted herein is the Geotechnical Engineering Services Report for the above referenced project. The report contains the results of our field investigation and laboratory testing, and recommendations for foundation and slab on grade floor design, as well as criteria for site grading.

It has been a pleasure to serve you on this project. If you should have any questions, please contact this office.

Respectfully submitted:

GEO-TEST, INC.

Patrick J. Byres, P.E.

Reviewed by:

PATRICK J. BYRES NEW MEXICO 8126 LICENSED PROFESSIONAL ENGINEER

Robert D. Booth, P.E

cc: Addressee (3)

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INTRODUCTION

This report presents the results of the geotechnical engineering services investigation performed by this firm for the proposed subdivision located on Tract 1A-17, Mariposa Ranch, located in Rio Rancho, New Mexico.

The objectives of this investigation were to:

1) Evaluate the nature and engineering properties of the subsurface soils underlying the site.

2) Provide recommendations for foundation and slab-on-grade design, and site grading.

The investigation includes subsurface exploration, selected soil sampling, laboratory testing of the samples, performing an engineering analysis and preparation of this report.

PROPOSED CONSTRUCTION

It is understood that the project consists of an approximate 172 lot residential subdivision. It is assumed that the residential structures will be of masonry or wood frame construction and single or two stories in height. No basements are proposed and slab on-grade construction will be utilized. Structural loads are assumed to be light. For purposes of this report, it is assumed that wall and column loads will not exceed 2 kips per linear foot and 20 kips, respectively.

Should structural details vary significantly from those outlined above, this firm should be notified for review and possible revision of recommendations contained herein.

FIELD EXPLORATION

Twenty-seven exploratory borings were drilled to depths ranging from approximately 14½ to 16 feet below existing site grades. Locations of the borings are shown on the attached Boring Location Map, Figure 1. The soils encountered in the borings were continuously examined, visually classified and logged during the drilling operation. The boring logs are presented in a following section of this report. Drilling was accomplished using a truck mounted drill rig equipped with 5-inch diameter continuous flight hollow stem auger. Subsurface materials were sampled at five-foot intervals or less utilizing an open tube split barrel sampler or brass ring lined sampler driven

by a standard penetration test hammer.

LABORATORY TESTING

Selected soil samples were tested in the laboratory to determine certain engineering properties of the soils. Moisture contents were determined to evaluate the various soil deposits with depth. The results of these tests are shown on the boring logs.

Sieve analysis and Atterberg limits tests were performed to aid in soil classification. The results of these laboratory tests are presented in the Summary of Laboratory Results included in a following section of this report.

SUBSURFACE SOIL CONDITIONS

As indicated by the exploratory borings, the soils underlying the site consist predominately of silty sands with lesser amounts of clayey sands throughout the depth of the borings. These soils ranged from non-plastic to medium in plasticity and were generally dense to very dense. However, medium to high plasticity clays and sandy clays were encountered at boring location Nos. 6, 7 and 17 and extended to depths of between 8 and 14 feet.

Soil moisture contents were generally low to moderate throughout the extent of the borings and no groundwater was encountered.

CONCLUSIONS AND RECOMMENDATIONS

Analyses of Results

The silty and clayey sand native soils encountered in the borings were generally dense to very dense and are considered suitable for support of the lightly loaded residential structures as planned. However, the primary geotechnical condition affecting the proposed site development is the medium to high plasticity clays and sandy clays encountered in borings nos. 6, 7 and 17, and may underlie other isolated areas of the site. These soils possess a low to medium expansive potential and could cause excessive upward movement of foundations and floor slabs upon significant moisture increase. Foundations which bear directly on these soils would be susceptible to undesirable total movements under the anticipated light loads. This potential can be minimized by overexcavation of these clayey soils, where present in the area of the structures, and replacing them with properly compacted, non-expansive structural fill during the site preparation phase of the project.

Based upon the above, it is recommended that the proposed structures be supported on shallow spread-type footings bearing directly on the native silty or clayey sands or on properly compacted structural fill. Detailed recommendations concerning the required site preparation and foundation design are presented in the following sections of this report.

FOUNDATIONS

Shallow spread-type footings bearing directly on the silty and clayey sand native soils or on structural fill are recommended for the support of the structures provided the site grading recommendations are followed. An allowable soil bearing pressure of 2,000 pounds per square foot is recommended for the design of shallow spread-type footings. This bearing value applies to full dead load plus realistic live loads, and can be safely increased by one-third for loading of short durations such as due to the effect of wind or seismic forces.

Exterior footings should be established a minimum of 2.0 feet below the lowest adjacent finished grade, while interior footings should be at least 12 inches below finished floor grade. Two feet and 1.33 feet are the minimum recommended width of square and continuous footings, respectively.

Maximum settlements of foundations designed and constructed as recommended herein are estimated not to exceed ¾ inch for the soil moisture contents encountered during this investigation or moisture contents introduced during construction. Differential movements should be less than 75 percent of total movements. Significant post-construction moisture increases of the supporting soils would create additional movements and, thus, the moisture protection procedures recommended in a following section of this report are considered important for the satisfactory performance of the structures.

LATERAL LOADS

Resistance to lateral forces will be provided by soil friction between the base of the floor slabs and footings and passive earth resistance. A coefficient of friction of 0.40 should be used for computing the lateral resistance between bases of footings and slabs with the soil. With backfill placed as recommended in the site grading section of this report, a passive soil resistance equivalent to a fluid weighing 325 pounds per cubic foot should be used for analysis.

SITE SEISMISITY

In accordance with RBC 2006, Site Class C should be used for structural design.

SLABS ON GRADE

Provided the grading requirements are complied with, concrete slabs may be supported on grade. However, if desired as a working surface, a 4-inch course of granular base should be placed on properly prepared subgrade. The granular base should consist of 1-inch maximum size aggregate with less than 15 percent passing the No. 200 sieve.

The granular base will act as a capillary barrier, but will not totally eliminate the rise of moisture to the slabs. If this is critical, an impervious membrane barrier should be placed beneath the slabs with 2 inches of clean non-plastic sand overlying the barrier to minimize differential cracking and curling of floor slabs.

SITE-GRADING

The following general guidelines should be included in the project construction specifications to provide a basis for quality control during site grading. It is recommended that all structural fill and backfill be placed and compacted under continuous engineering observation and testing and in accordance with the following:

1) After any required excavation and site stripping, the exposed native soils should be densified prior to placement of structural fill.

2) Densification of the native soils should consist of scarifying, moisture conditioning to optimum moisture content or slightly above, and compacting the area to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D-1557.

3) Contingent on careful blending, most on site soils are suitable to meet the criteria for structural fill. All backfill material shall be non-expansive, free of vegetation and debris and contain no rocks larger than 3 inches. The gradation of the backfill material, as determined in accordance with ASTM D-422, should be as follows:

Size	Percent Passing
3 inch	90 - 100
No. 4	60 - 100
No. 200	15-45

4) The plasticity index should be no greater than 15 when tested in accordance with ASTM D-4318.

5) Fill or backfill, consisting of soil approved by the Geotechnical Engineer, should be placed in controlled compacted layers with approved compaction equipment.

6) All compaction of fill or backfill should be accomplished to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D-1557. The moisture content of the material during compaction should be within 2 percent of the optimum moisture content.

7) Tests for degree of compaction should be determined by the ASTM D-1556 method or ASTM D-2922. Observation and field tests should be carried on during fill and backfill placement by the geotechnical engineer to assist the contractor in obtaining the required degree of compaction. If less than 95 percent is indicated, additional compaction effort should be made with adjustment of the moisture content as necessary until 95 percent compaction is obtained.

8) All cut areas throughout the project, especially near boring nos. 6, 7 and 17, should be carefully observed during the earthwork operations by a representative of the geotechnical engineer for the presence of potentially expansive clay soils. Where identified, these soils should be overexcavated in their entirety, or to a depth of 6 feet beneath the bases of all footings and floor slabs, whichever is the lesser depth, from throughout each building area and replaced with properly compacted structural fill meeting the requirements recommended above. Overexcavation should extend laterally beyond the perimeter of the structures equal to the depth of overexcavation. The overexcavated clay soils should either be wasted or carefully blended with the native silty sand soils as necessary to meet the requirements for structural fill.

MOISTURE PROTECTION

Precautions should be taken during and after construction to minimize moisture increases of foundation soils. Positive drainage should be established away from the exterior walls of the structures. Backfill should be well compacted and should meet the specifications outlined in the site grading section of this report. Irrigation within 5 feet of foundations should be carefully controlled. All utility trenches leading into the structures should be backfilled with compacted fill. Special care should be taken during installation of the subfloor sewers and water lines to reduce the possibility of post-construction soil moisture increases beneath the structures.

Proper landscaping and drainage maintenance is required to preclude accumulation of excessive moisture in the soils below the structures. Accumulations of excessive moisture could be harmful to some types of interior flooring, to HVAC ductwork beneath the slabs, and can weaken or cause other changes in the soils supporting the foundations. This can cause differential movement of foundations and can result in cosmetic or structural damage to structures.

1. Landscaping should not be allowed to change the overall drainage patterns established for development.

2. The ground surface should slope adequately away from all portions of the structures. A typical adequate slope is 6 inches in the first 5 feet.

3. Shrubbery planted within 10 feet of foundation walls should be hand irrigated or irrigated with a carefully controlled drip irrigation system.

4. Grass installed within 10 feet of foundation walls should be hand watered or, if irrigated by sprinklers, should be very carefully controlled. Sprinkler heads should always point away from foundation walls.

5. Decorative bark or gravel should be underlain by a geo-textile fabric (weed fabric) to allow evaporation of soil moisture. Polyethylene or other plastic underlayments are discouraged.

6. If the structures have gutters and downspouts, the downspouts should discharge a minimum of 5 feet away from foundation walls. If the structures drain by roof canales, the canales should discharge to splash blocks that carry water rapidly away from the foundation. It is also advisable to locate sprinkler

valve boxes well away from foundations.

7. Sidewalks placed close to foundations should not impede flow of water away from the foundations. The ground surface between the sidewalks and the foundations should be graded so that water flows over the sidewalks.

8. If mowing strips are installed to separate decorative gravel or bark from grass, the mowing strips should be perforated to allow drainage and preclude ponding of water, or the ground surface grade should be carefully controlled to allow drainage or water over the mowing strips.

If any water line leaks or if irrigation system leaks are detected, they should be promptly repaired. In addition, if any depressions develop from settlement of soils in utility trenches or other areas, they should be backfilled to maintain the grade so that surface water drains rapidly away from the structures.

FOUNDATION REVIEW AND INSPECTION

This report has been prepared to aid in the evaluation of this site and to assist in the design of this project. It is recommended that the geotechnical engineer be provided the opportunity to review the final design drawings and specifications in order to determine whether the recommendations in this report are applicable to the final design. Review of the final design drawings and specifications should be noted in writing by the geotechnical engineer.

Variations from soil conditions presented herein may be encountered during construction of this project. In order to permit correlation between the conditions encountered during construction and to confirm recommendations presented herein, it is recommended that the geotechnical engineer be retained to perform sufficient review during construction of this project. Observation and testing should be performed during construction to confirm that suitable fill soils are placed upon competent materials and properly compacted and foundation elements penetrate the recommended soils.

CLOSURE

Our conclusions, recommendations and opinions presented herein are:

1) Based upon our evaluation and interpretation of the findings of the field and laboratory program.

2) Based upon an interpolation of soil conditions between and beyond the explorations.

3) Subject to confirmation of the conditions encountered during construction.

4) Based upon the assumption that sufficient observation will be provided during construction.

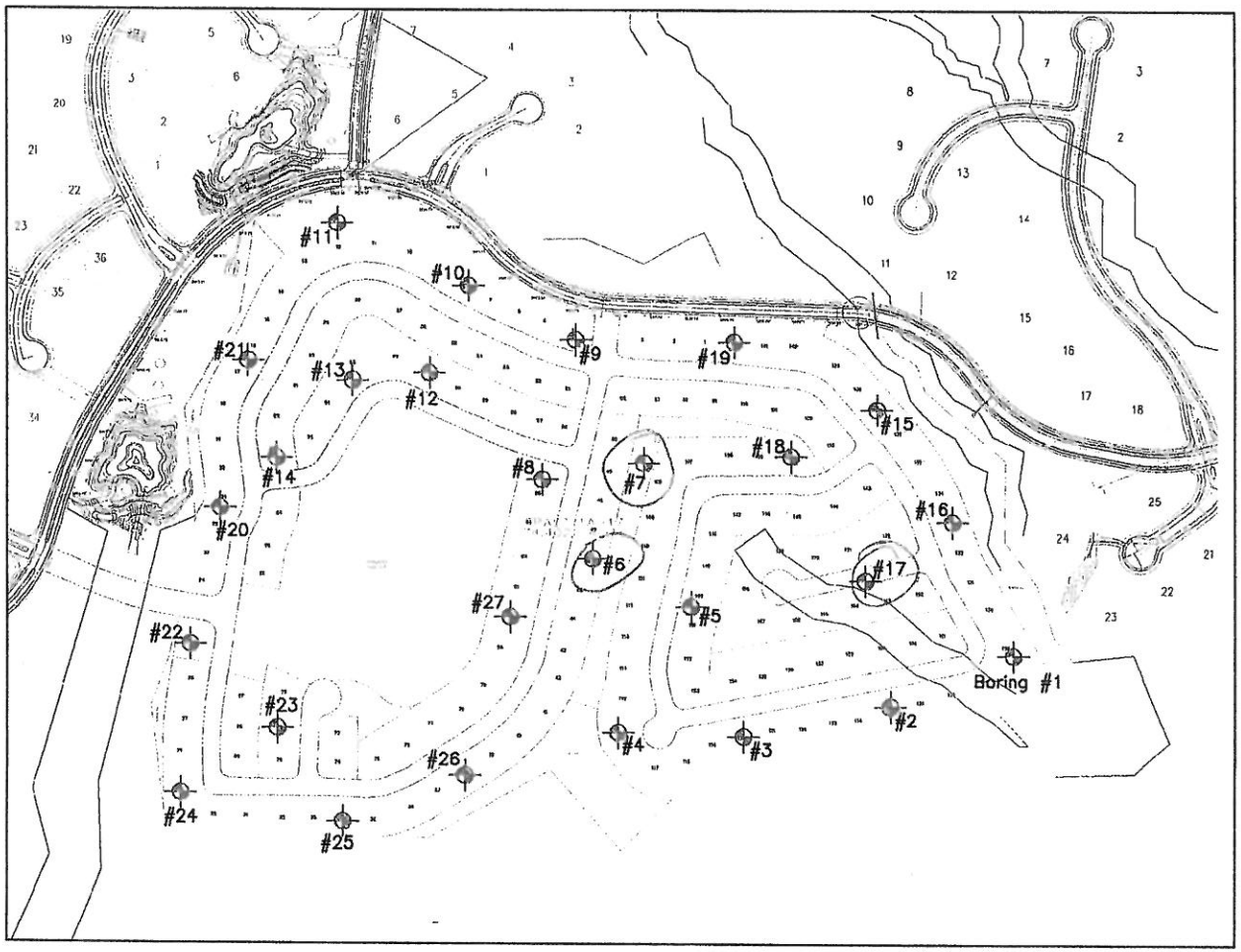
5) Prepared in accordance with generally accepted professional geotechnical engineering principles and practice.

We make no other warranty, either express or implied. Any person using this report for bidding or construction purposes should perform such independent investigation as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project. If conditions are encountered during construction that appears to be different than indicated by this report, this office should be notified.

All soil samples will be discarded 60 days after the date of this report unless we receive a specific request to retain the samples for a longer period of time.

BORING LOCATION MAP

(Not to Scale)



Tract 1A–17, Mariposa Ranch
Rio Rancho, New Mexico
Job No. 1–60607

Figure 1

GEO-TEST
GEOTECHNICAL ENGINEERING, ENVIRONMENTAL
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