EARTHWORKS ENGINEERING GROUP, L.L.C.
7901 LORRAINE CT NE, ALBUQUERQUE, NM 87113
505-899-4886•505-899-4861(FAX)

GEOTECHNICAL INVESTIGATION

LA CUENTISTA SUBDIVISION UNIT II
ALBUQUERQUE, NEW MEXICO

EEG Project No.: A16-710

Prepared for:

DR SCOTT, LLC

Prepared by

Lee Hopkins, Geologist

December 13, 2016

Reviewed by

Dave Liebelt, P.E.
Earthworks Engineering Group LLC

DAVID K. LIEBELT
NEW MEXICO
14069
REGISTERED PROFESSIONAL ENGINEER

SUMMARY

The information presented in this section is a partial summary intended for reference use only. This information is intended for use only in conjunction with the complete geotechnical investigation report. Significant information contained in the complete geotechnical report may not be present here.

ON-SITE SOILS

The test holes mostly encountered loose to medium dense silty sands. The sands were underlain by hard basalt bedrock at variable depths ranging from zero feet to greater than sixteen feet. The site grading and filling activities to date have left the majority of the site with some pre-existing fill soils that range in thickness from two feet to twelve feet. The fill soils range widely in in-situ density as measured by SPT and contained some debris as recorded at several borehole locations.

GEOTECHNICAL ANALYSIS

This office did not perform engineering oversight and compaction testing during the placement of the existing fill, nor have we been provided with records from another firm documenting the compaction. We cannot certify that the existing fill was placed and compacted properly; in fact the wide range in density and resistance to penetration testing indicates that on average the fill has more loose/poorly compacted zones than dense/well compacted zones. We do not recommend that the uncontrolled fill be relied upon for structural support. We recommend performing remedial earthwork consisting of over-excavation and re-compaction of the majority of the pre-existing uncontrolled fill as well as some of the loose native soils, as further detailed herein. These recommendations are intended to work together so as to allow for the use of conventional shallow foundations and lightly reinforced concrete floor slabs, and reduce the potential for post-construction differential movement and distress of the buildings to acceptable levels.

GRADING, DRAINAGE, AND LANDSCAPING

The implementation of conservative grading, drainage and landscaping designs are imperative in order to reduce the potential for foundation damage. Site grading must comply with the 2009 IRC Sections R401.3 "Drainage" and R403.1.7.3 "Foundation Elevation." General guidelines are for site grading, drainage, and landscaping are included herein. This office must review site grading and drainage plans to evaluate conformance with these recommendations. However these recommendations do not consist of a thorough site-specific evaluation and design; a grading and drainage plan must be designed by a qualified civil engineer.

REMEDIAL EARTHWORK

To create more uniform support, earthen building pads for the residences must be constructed by first excavating the existing soils as directed on the attached Remedial Earthwork Plan, Figure 1B. A handful of lots have hard bedrock essentially at the surface; we recommend importing additional fill dirt to raise grade and provide a minimum of two feet of soil cover over the rock surface. Approximately 2/3 of the lots require excavation of existing soils to depths between three feet and four feet. Approximately 1/3 of the lots require deep excavation of existing soils to depths between five feet and ten feet. Over-excavation may be stopped at shallower depths than directed if rock is encountered in the excavations.

Soil removal must extend a minimum of five feet beyond the outside edges of foundations or to the lateral extent of porches and patios.

The residential building pads must then be constructed with engineered fill. This office must perform inspections during earthwork as detailed in the Earthwork section of this report.

Excavated site soils may be reused as engineered fill provided that they are first thoroughly processed to create a homogenous mixture; any encountered debris must be screened out. Material specifications for engineered fill are detailed in the General Earthwork Procedures section of this report.

FOUNDATIONS AND SLABS

If the recommendations herein are followed particularly those concerning earthwork, grading, drainage and landscaping, the residences may be supported on a monolithic style concrete slab-on-grade with turned-down edges.

The base of turned-down edges and exterior column foundations should be embedded a minimum of eighteen inches below lowest adjacent grade and may be designed for an allowable bearing capacity of 1,500 psf. Interior foundations/thickened slabs should be embedded a minimum of twelve inches below finished floor and may be designed for an allowable bearing capacity of 1,000 psf.

Turned down edges should be a minimum of twelve inches and sixteen inches wide for one and two story structures, respectively. Isolated spread footings and thickened slabs should be a minimum of eighteen inches and twelve inches wide, respectively. Foundations widths may need to be larger than the allowable minimums based on actual structure design loads.

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INTRODUCTION

This report presents the results of our geotechnical investigation and recommendations for design and construction of the La Cuentista Subdivision Unit II which is located at the southwest corner of the intersection of Kimmick Drive NW and Rosa Parks Road NW in Albuquerque, New Mexico.

The investigation was performed to determine the site subsurface conditions, and based on the conditions encountered, develop geotechnical recommendations for:

- Site Grading, Drainage, and Landscaping
- Earthwork Construction
- Foundation Design
- Slabs-on-Grade
- Retaining Walls
- On-Site Pavements

The conclusions and recommendations presented are based on information provided by the client regarding the proposed construction, subsurface conditions disclosed by the test holes, laboratory testing, and the local standards of our profession at the time this report was prepared. It is assumed that all recommendations herein will be followed.

PROJECT DESCRIPTION

The project will consist of construction of approximately 122 detached single-family residences and associated subdivision infrastructure consisting of streets, sidewalks, retaining walls, etc. The property was mass-graded in 2009 but development was stopped.

We anticipate the new residences will be constructed of conventional wood framing and have concrete slab-on-grade ground floors. The residences will be a maximum of two stories in height. No basements or below-grade structures are anticipated.

For the purposes of this report, column and strip loads (dead + live) were estimated as not exceeding 20 kips and 2 kips per linear foot. If actual loads are significantly different than those assumed, this office must be contacted to verify the recommendations presented herein remain applicable.

If structure loads or configuration differ from those indicated in this report, this office must be notified.

SOIL CONDITIONS

To explore the site subsurface conditions 122 test holes were excavated on the property with either a truck-mounted CME Model 75 or CME Model 55 drill rig using hollow stem auger drilling techniques. The approximate test hole locations are presented on the attached Site Plan, Figure 1A.

Standard penetration testing was performed with either a cathead-assisted safety hammer or a hydraulic-automatic SPT hammer both of which consist of a 140 lb. weight with a 30 inch free-fall. Sampling consisted of bulk/grab samples of disturbed auger cuttings and hammer-driven 2-inch O.D. unlined, and 3-inch O.D. brass ring-lined, split barrel samplers. The N-values presented on the attached logs of test holes for the oversize/3-inch samplers were normalized to SPT using the correlations presented by Tim Davis in "Geotechnical Testing, Observation, and Documentation", ASCE Press, 2001.

The test holes mostly encountered silty sands. The soils were generally loose to medium dense as measured by SPT. The soils were slightly moist to moist. The sands were underlain by hard basalt bedrock at variable depths ranging from zero feet (rock outcrop at the surface) to greater than sixteen feet. The site grading and filling activities to date have left the majority of the site with some pre-existing fill soils. The fill soils range in thickness from two feet to twelve feet. The fill soils range widely in in-situ density as measured by SPT and contained some debris as recorded at several borehole locations. Detailed logs of the test holes are presented on Figures 2 through 70. A summary of test hole data is presented on Table 4. Soil laboratory test results are summarized on Table 5.

Groundwater was not encountered in the test holes to the maximum depth of exploration, approximately 17 feet. Groundwater is not anticipated to impact project design/construction.

Our assessment of the site subsurface conditions is based on the test holes which allow observation of a very small portion of the soils below the site. Significant variation in subsurface conditions may occur across the site that was not disclosed by the test holes.

GEOTECHNICAL ANALYSIS

The site was historically mass graded in conjunction with the earthwork construction phase of the adjacent residential subdivision (La Cuentista Subdivision Unit I). This office did not perform engineering oversight and compaction testing during the placement of the fill, nor have we been provided with records from another firm documenting the compaction. In these situations, the fill soils are generally referred to as "uncontrolled" because there is a wide range in fill material type, existing moisture content, and relative compaction. The potential for substantial differential settlements to occur within uncontrolled fill is considered to be high, as is the corresponding risk of post-construction distress of buildings constructed atop uncontrolled fill.

We cannot certify that the existing fill was placed and compacted properly; in fact the wide range in density and resistance to penetration testing indicates that on average the fill has more loose/poorly compacted zones than dense/well compacted zones. We do not recommend that the uncontrolled fill be relied upon for structural support.

We recommend remedial earthwork consisting of over-excavation and re-compaction of the majority of the pre-existing uncontrolled fill as well as some of the loose surficial native soils, as further detailed in following sections of this report. We also recommend the installation of strict moisture control measures around the buildings as detailed further herein.

These recommendations are intended to work together so as to allow for the use of conventional shallow foundations and lightly reinforced concrete floor slabs, and reduce the potential for post-construction differential movement and distress of the buildings to acceptable levels.

DRAINAGE, GRADING, AND LANDSCAPING

The implementation of conservative grading, drainage and landscaping designs are imperative in order to reduce the potential for foundation damage. Site grading must comply with the 2009 IRC Sections R401.3 "Drainage" and R403.1.7.3 "Foundation Elevation." A grading and drainage plan must be designed by a qualified civil engineer.

To reduce the risk of moisture induced soil movement, the site must be graded to rapidly drain away from structures on all sides. We suggest a minimum five percent gradient within at least the first ten feet away from structures in unpaved areas and a minimum one and one-half percent gradient of paved surfaces. Planters and sidewalks must not "dam" water adjacent to structures.

Roof gutters and downspouts must be utilized on the buildings. Down spouts must discharge towards the front/street side of the residences, down slope and well away from buildings, a minimum of ten feet. Surface water must run off rapidly.

Landscaping adjacent to structures must be designed and constructed to minimize the potential for wetting of soils supporting the proposed facilities. We suggest utilizing a xeriscape design. Watering must be carefully controlled to prevent over watering. All lawns, plantings, drip irrigation, and sprinkler lines must be located a minimum of five feet away from foundations.

If onsite leach fields or stormwater ponding areas are required, they must be located downhill from and as far away from structures as possible, a minimum of twenty feet.

Permanent, non-retained slopes must be graded to a maximum slope of 3:1 horizontal to vertical for gross slope stability.

All earth slopes will require protection from erosion.

This office must review site grading and drainage plans to evaluate conformance with the recommendations presented herein.

REMEDIAL EARTHWORK

To create more uniform support, earthen building pads for the residences must be constructed by first excavating the existing soils as directed on the attached Remedial Earthwork Plan, Figure 1B.

As shown on the Remedial Earthwork Plan, Figure 1B, a handful of lots have hard bedrock essentially at the surface; we recommend importing additional fill dirt to raise grade and provide a minimum of two feet of soil cover over the rock surface.

Approximately 2/3 of the lots require excavation of existing soils to depths between three feet and four feet as directed on the Remedial Earthwork Plan, Figure 1B. Based on the single borehole per lot, the depth to hard basalt bedrock is shallower in these areas. Over-excavation may be stopped at shallower depths if rock is encountered in the excavation.

Approximately 1/3 of the lots require deep excavation of existing soils to depths between five feet and ten feet as directed on the Remedial Earthwork Plan, Figure 1B.

Soil removal must extend a minimum of five feet beyond the outside edges of foundations or to the lateral extent of porches and patios.

The building pads must then be constructed with engineered fill and raised to design finished pad grade. This office must perform inspections during earthwork as detailed in the Earthwork section of this report.

Excavated site soils may be reused as engineered fill provided that they are first thoroughly processed to create a homogenous mixture; any encountered debris must be screened out. Material specifications for engineered fill are detailed in the General Earthwork Procedures section of this report.

FOUNDATION RECOMMENDATIONS

A seismic site soils classification of **C** may be utilized for design purposes.

If the recommendations herein are followed particularly those concerning earthwork, grading, drainage and landscaping, the residences may be supported on a monolithic style concrete slabs-on-grade with turned-down edges.

The base of turned-down edges and exterior column foundations should be embedded a minimum of eighteen inches below lowest adjacent grade and may be designed for an allowable bearing capacity of 1,500 psf. Interior foundations/thickened slabs should be embedded a minimum of twelve inches below finished floor and may be designed for an allowable bearing capacity of 1,000 psf.

Turned down edges should be a minimum of twelve inches and sixteen inches wide for one and two story structures, respectively. Isolated spread footings and thickened slabs should be a minimum of eighteen inches and twelve inches wide, respectively.

Lateral foundation loads will be resisted by a combination of passive soil pressure against the sides of foundations and friction along the base. A passive soil resistance of 300 pounds per cubic foot may be utilized for design. Frictional resistance may be determined by multiplying foundation dead load by a coefficient of friction of 0.40.

These allowable bearing capacities are based on the assumption that the remedial earthwork recommendations herein are followed. The allowable bearing capacity values presented herein may be increased by one-third for short term loading conditions due to wind and earthquakes. Foundation widths may need to be larger than the minimum widths stated herein based on actual structure design loads. Foundations must be designed by a qualified structural engineer.

Foundations designed and constructed as described herein are not anticipated to experience differential movement of more than one inch. This estimate is implicit in the method used to calculate the allowable bearing capacities and also relies on the assumption the site soils will not be allowed to increase in moisture content and that all recommendations presented in this report will be fully implemented, particularly those regarding earthwork, drainage, grading, and landscaping. Additional movement on the order of ¼ inch per foot of wetted soil and significant distress to the building may occur if the soils are allowed to increase in moisture content.

CONCRETE SLABS-ON-GRADE

We anticipate the residences will have concrete slab-on-grade ground floors. Concrete floor slabs may either be isolated from foundations or monolithic. Concrete floor slabs must be supported by properly compacted non-expansive engineered fill as detailed in previous sections of this report.

Concrete slabs-on-grade must be designed by a qualified structural engineer. Concrete floors must be designed, constructed and jointed as discussed in the ACI Committee Report 302.1R-04 "Guide for Concrete Floor and Slab Construction" and/or 302.2R-06 "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials."

If moisture-sensitive floorings are planned, the slab must be underlain by an impermeable moisture vapor barrier. Vapor barriers must have a minimum 15-mil thickness and must consist of extruded polyolefin plastic (no recycled content or woven materials permitted) that conforms in every way to an ASTM E 1745 Class A material. Vapor barriers must be installed in accordance with ASTM E 1643, including perimeter seal. Care must be taken during construction to minimize damage to the vapor barrier.

If a moisture barrier is utilized, the slab reinforcement must be designed to resist shrinkage and curling.

Concrete slabs-on-grade and exterior flatwork must be isolated from all utility lines.

Some movement should be expected to occur between the building and adjacent exterior concrete flatwork. Joints and cracks in concrete flatwork must be sealed as discussed in the Maintenance section of this report.

All exterior concrete (exposed to weather) must conform to an approved air entrained mix design having between 4.5% and 7.5% air. This also applies to interior slabs, if it is anticipated that they will be placed or left unprotected during winter months.

This office must be allowed the opportunity to review project plans and material submittals prior to the start of construction.

RETAINING WALLS

Retaining walls constructed in association with this project are not anticipated to exceed eight feet in height. The values presented below do not include surcharge loads or hydrostatic pressures. If taller walls, surcharge loads, or unusual conditions such as sloping backfill are anticipated, this office must be contacted for additional recommendations.

Retaining wall foundations must be designed as detailed in the Foundations section of this report. The base of retaining wall foundations must be embedded a minimum of eighteen inches below lowest adjacent grade. Soil cover over the foundation toe must be protected from erosion.

Walls must be designed to resist an Active Earth Pressure calculated as an equivalent fluid pressure from a fluid having a unit weight of 35 pounds per cubic foot. If the wall is restrained against rotating the wall must be designed for an At-Rest Earth Pressure calculated as an equivalent fluid pressure from a fluid having a unit weight of 55 pounds per cubic foot.

Wall movement will be resisted by Passive Earth Pressure at the toe calculated as an equivalent fluid pressure from a fluid having a unit weight of 300 pounds per cubic foot. Friction along the base can be calculated as the normal force multiplied by a friction factor of 0.40.

The backside of retaining walls must be waterproofed to prevent moisture infiltration. A french drain or gravel-packed weep holes must be installed behind the wall to help prevent hydrostatic forces from developing. Water must drain rapidly.

Retaining walls must be backfilled with an approved granular material such as aggregate base course. Retaining wall backfill must be treated as engineered fill with compaction testing performed by this office on every vertical foot. Care must be taken during compaction of retaining wall backfill to avoid stressing and deflecting the walls.

ON-SITE PAVEMENTS

We understand that the subdivision streets are classified as Local-Residential per the City of Albuquerque. The following design values were utilized:

Design Life	20-Years
Serviceability Index	2.5
Regional Factor	2.0
Asphalt Structural Coefficient	0.42
Estimated R-Value of Subgrade	≥50

Table 1: Assumed Asphalt Pavement Design Coefficients

Based on the City of Albuquerque Standard Drawing 2405A the standard pavement design for local-residential streets are as follows:

COA Street Class	Standard Pavement Section	SN	Daily ESALS
Local-Residential	1.5 in. A.C. Surface Course over 1.5 in. A.C. Pavement Course	1.26	≤ 2.0

Table 2: Standard COA Local-Residential Asphalt Pavement Section

The COA standard pavement section will carry a maximum of 2.0 daily 18-kip Equivalent Single Axle Loads (ESALs) over the design life of 20 years. The anticipated neighborhood traffic volume should be reviewed by the developer and project civil engineer to determine if the standard minimum pavement section is sufficient. Greater than anticipated traffic volume will reduce pavement life and increase maintenance cost.

During grading of the subdivision streets, the surface soils should be tested to confirm that they have an R-Value of 50 or greater. Where subgrade soils with any plasticity are encountered they should be undercut to allow for the placement of a minimum of 12-inches of non-plastic granular fill having an R-Value of 50 or greater.

Prior to constructing pavements, the upper 12-inches of road subgrade should be prepared and compacted to a minimum of 95% of maximum density as determined by ASTM D-1557. If utilized, Aggregate Base course and Sub-Base/Select Fill should be compacted to a minimum of 95% of maximum density as determined by ASTM D-1557. Additional earthwork recommendations are further detailed in the General Earthwork Procedures section of this report.

Asphaltic Concrete should exhibit a minimum Marshall stability of 1800 pounds and should be compacted to between 93% and 97% of maximum theoretical density.

The site should be graded to prevent saturation of pavement subgrade soils. The soils ability to support pavement will be significantly reduced should they become wetted.

Periodic pavement maintenance will be required over the design life. Crack cleaning and sealing should be performed to extend pavement life. Seal coating may also be desired after the pavement has been in service for several years to improve appearances and increase pavement life.

GENERAL EARTHWORK PROCEDURES

STRIPPING AND GRUBBING

Prior to performing earthwork, all borrow and fill areas should be stripped of vegetation and deleterious materials. All strippings should be hauled offsite or utilized in landscaped areas. Any existing fill and disturbed soil should be removed from below structures.

EXCAVATION DIFFICULTY

We anticipate the site soils and fractured/weathered basalt bedrock can be excavated with conventional equipment. Hard/competent basalt rock may require hoe ram or blasting.

NATURAL GROUND PREP

Following all cut earthwork, the natural soils should be scarified to a depth of eight inches and moisture conditioned to optimum moisture content (+/- 3%). The surface of the natural soils should then be compacted to a minimum of 95% of maximum dry density as determined by ASTM D-1557. It is not necessary to scarify, moisten, and compact bedrock surfaces. Only visual inspection of bedrock surfaces will be required.

ENGINEERED FILL SPECIFICATIONS

Excavated site soils may be reused as engineered fill provided that they are first thoroughly processed to create a homogenous mixture; any encountered debris must be screened out. Sieve analysis, Atterberg Limits, and possibly remolded swell tests performed by this office will be required prior to acceptance of imported fill. Engineered fill soil must not contain any cobbles, boulders, or rock fragments; or frozen, organic, or decomposable material. Engineered fill must meet the following gradation:

U.S. SIEVE SIZE	%-PASSING
3 -INCH	100
NO. 4	70-100
NO. 200	15-40
PLASTICITY INDEX	≤10

Table 3: Engineered Fill Specifications

In addition the engineered fill must exhibit less than 1% swell when remolded to 95% of the maximum dry density and 3% below the optimum moisture as determined by ASTM D1557, loaded to 100 psf, and inundated.

FILL PLACEMENT AND COMPACTION

Engineered fill must be stockpiled on site, moisture conditioned, and blended to a homogeneous mixture prior to use.

Engineered fill must be placed in horizontal lifts a maximum of eight inches in loose thickness, moisture conditioned to optimum moisture content (+/- 3%), and mechanically compacted. Lift thickness may need to be reduced based on the size of the compaction equipment utilized. All engineered fill must be compacted to a minimum of 95% of maximum dry density as determined by ASTM D-1557.

UTILITIES

Care must be taken when installing utilities that the prepared building pad is not overly disturbed. Trenches must be no wider than is necessary for proper installation of utilities. Utility line trenches must not be located parallel and below/immediately adjacent to foundations.

If water or sewer line leaks occur, differential movement of the structure may result. Prior to backfilling utility line trenches, all water and sewer lines must be pressure checked for leaks. Any leaks found must be repaired.

Per the APWA Manual of Standard Specifications 2007 Edition, Section 33-05-20-3.3, the maximum particle size allowable within the pipe zone is ¾-inches for plastic pipes. If the onsite soils cannot be milled or screened to these specifications then we recommend that buried utilities be surrounded by approximately one cubic foot of nominal 3/8-inch "pea gravel" in the pipe zone.

The excavation spoils may be reused as trench backfill provided that the minimum pipe bedding and cover requirements are fulfilled as described above. Cobbles, boulders and rock fragments must not be placed within pipe bedding or pipe backfills.

To reduce the possibility of breaking utility lines, compaction of pipe backfill must be performed with light, hand-operated equipment. In order to achieve compaction, it will be necessary to place backfill in thinner lifts than would normally be necessary. The fill soils in trenches must be compacted to a minimum of 95% of maximum dry density as determined by ASTM D-1557, except where applying this compactive effort may damage pipes or insulation, in which case the backfill must be compacted to a minimum 90%.

FOUNDATION EXCAVATIONS

Caving and raveling of excavation sidewalls should be expected. Prior to pouring concrete, foundation excavations must be cleaned of any slough, loose soil, or debris. Footing excavations must be scarified and moisture conditioned to optimum moisture content (+/- 3%). Foundation excavations must be compacted to a minimum of 95% of maximum dry density as determined by ASTM D-1557. It is not necessary to scarify, moisten, and compact bedrock surfaces. Only visual inspection of bedrock is required.

OBSERVATION AND TESTING

Compaction testing must be performed by this office during earthwork construction to verify the compaction requirements outlined in this report have been met.

Modified Proctor testing (ASTM D-1557) will be necessary to determine the maximum dry density and optimum moisture content of the natural soils at the base of excavations. The surface of natural soils must be tested for compaction prior to placing engineered fill. Bedrock surfaces will require visual inspection instead of density/compaction testing.

Engineered fill material must be approved by this office prior to use. Following acceptance of the fill material, Modified Proctor testing (ASTM D-1557) will be necessary to determine the maximum dry density and optimum moisture content. Compaction testing must be performed on engineered fill at a minimum of every other lift until finished grade is reached. Testing of utility line trenches for compaction must be performed at a minimum of every foot of compacted backfill thickness.

The base of footing excavations and finished pad grade must be tested prior to placing reinforcement and pouring concrete. Compaction testing cannot be performed if reinforcement has been installed and will need to be removed to perform testing. Bedrock surfaces will require visual inspection instead of density/compaction testing.

SHORING

All trenches greater than five feet in depth must be sloped, shored or braced, or otherwise supported according to OSHA Construction and Safety Standards. Site soils should be considered OSHA Class "C" soils. Temporary construction excavations less than eight feet deep must be sloped no steeper than 1½:1 (horizontal: vertical). If deeper excavations are required, this office must be contacted for supplemental recommendations.

Limited raveling of slopes will occur particularly as the exposed soils dry out. Material excavated from the trench or spoil must be placed away from the edge of the excavation. The spoil must be retained in an effective manner such that no loose material can fall into the excavation. Heavy equipment and material stockpiles must be located a minimum of five feet from the top of slope.

The above information is intended to provide only general guidelines. This office is not responsible for excavation safety. Temporary construction excavations must be evaluated by the contractor's competent person. Design of safe excavations must conform to the regulations set forth in 29 CFR 1926 Subpart P by the contractor or their designated engineer of record.

MAINTENANCE

Performance of structures depends not only on proper design and construction, but also on an ongoing foundation maintenance program. A properly designed foundation may still experience distress from incorrectly controlled water sources, improper drainage, and landscaping. The owner must perform a yearly inspection to observe for necessary maintenance and repair.

Positive drainage must be provided away from the structure over the life of the building. A minimum slope of five percent within the first ten feet of the structure must be maintained. Flowerbeds and landscaping that requires irrigation must not be installed adjacent to structures. Walkways and borders that dam water adjacent to foundations must be eliminated.

Depressions and excavations must be backfilled with compacted, non-swelling, relatively-impervious soils such as clayey sands.

Gutters and downspouts must be installed to control roof drainage. Downspouts must discharge a minimum of ten feet away from structures. Area drains may be installed around structures to improve drainage. Discharge pipes must slope a minimum of 1/8th inch vertical per foot of horizontal pipe. Drainage sewers and discharge channels must be kept free of debris.

Water bills must be monitored for unexplained increases in usage. Higher than normal water usage may indicate a leaking utility line. If a leaking line is suspected, utility lines must be pressure checked for leaks.

Expansion joints within exterior concrete flatwork must be filled with a flexible joint sealer to minimize water infiltration.

Some minor cracking of new concrete foundations, concrete flatwork, and interior dry wall is normal. This is a result of concrete shrinkage as it cures, "settling in" of the new structure, drying of timbers used in construction, etc. Normally the majority of this movement should cease within the first year following construction. However, depending on the structure and site conditions, movement may continue at a slow rate for several years. If cracks tend to open and close, increase significantly within a short period of time, or resume after a period of relative inactivity, it is recommended that this office be contacted to review the situation.

CLOSURE

The recommendations presented in this report are based upon the subsurface conditions disclosed by the test holes. Soil and groundwater conditions may vary between test holes and with time. This office may change the recommendations presented herein based on the conditions encountered during construction.

Prior to performing earthwork, a meeting between the client, this office, and the earthwork contractor must be arranged to discuss the earthwork and foundation recommendations and testing requirements of this project. The purpose of this meeting is to assure that recommendations and requirements are implemented and to minimize delays and expenses during construction.

In order to verify the recommendations presented herein are followed this office must perform field inspections and earthwork Proctor and compaction testing. If this office is not utilized to perform these services, the client agrees to assume all risk for post-construction movement and distress.

This report reflects our interpretation of the site subsurface conditions. We strongly recommend that prior to bidding all contractors perform their own subsurface investigation to form their own opinion of the site soil, rock and groundwater conditions. Should contractors elect to use this report for construction, bidding or estimating purposes, they do so at their own risk.

As this report makes recommendations concerning prudent landscaping and site maintenance, the individual property owners must be given access to this report and the recommendations herein.

The staff of Earthworks Engineering Group, LLC is available for supplemental consultation as necessary at (505) 899-4886.

La Cuentista Subdivision Unit II, Albuquerque, NM

Site Plan

***Not To Scale**

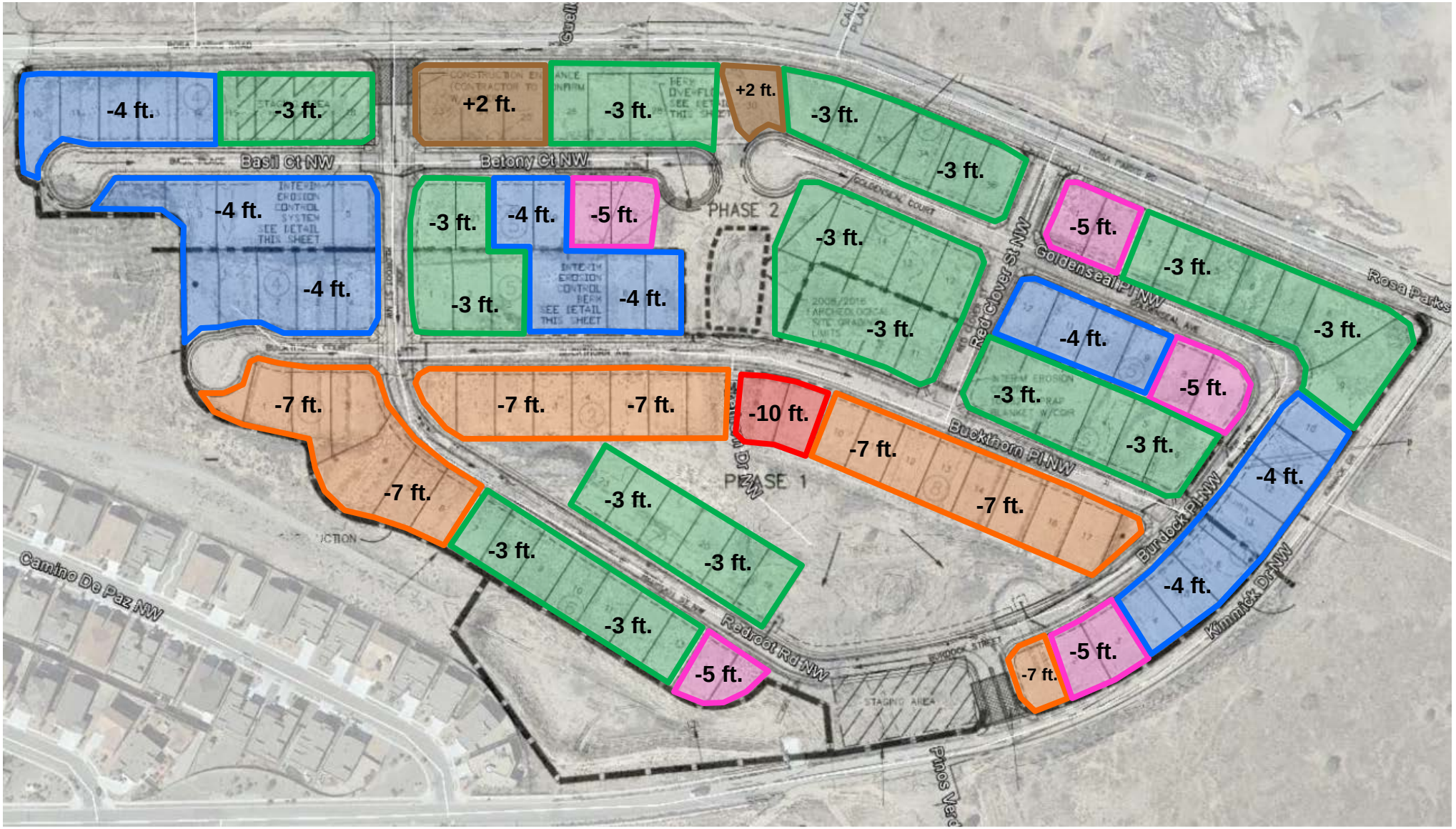
◆**Test Hole Locations**

La Cuentista Subdivision Unit II, Albuquerque, NM

*Remedial Earthwork Plan

*Where:
(+) indicates importing/adding engineered fill to raise grade a minimum of 2 feet above existing elevations due to hard basalt bedrock at the surface.
(-) indicates over-excavation to specified depth below existing elevations to remove pre-existing uncontrolled fill/loose soils and re-compacting under the direction of this office.
Over-excavation may be stopped at shallower depths if hard basalt bedrock is encountered;
The likelihood of shallow rock is increased in the -3 ft. (green) and -4 ft. (blue) shaded areas.

*Not To Scale



Project No.: A16-710

Earthworks Engineering Group, LLC

Figure 1B

Test Hole No.:	GPS Coordinates		Thickness of Existing Fill (ft)	Depth to Hard Basalt Bedrock (ft)	Notes
	Lat. (deg)	Long. (deg)			
1	35.17542	-106.71456	2	6	
2	35.17543	-106.71434	2	5	
3	35.17551	-106.71416	2	9	clay lenses 7-10 ft
4	35.1755	-106.71398	3	11	clay lenses 3-5 ft
5	35.17565	-106.71379	3	6	
6	35.17573	-106.7136	3	5	
7	35.17578	-106.71344	--	2	
8	35.17583	-106.71323	2.5	5.5	
9	35.1759	-106.71304	--	1.5	
10	35.17533	-106.71356	3	8	clay lens at 5 ft
11	35.17538	-106.71336	2	6	
12	35.17544	-106.7132	3	8	
13	35.17545	-106.71308	3	8.5	
14	35.1755	-106.71289	5	7	
15	35.17503	-106.71327	3	6	
16	35.17509	-106.71307	3.5	6	
17	35.17511	-106.71287	3	6	
18	35.17521	-106.71264	--	4.5	
19	35.17473	-106.71292	7	>15	weathered basalt 10-15 ft
20	35.17471	-106.71267	7	13	
21	35.17481	-106.71252	4	>15	weathered basalt 11-15 ft
22	35.17456	-106.7122	3.5	11	clay lenses 5-7 ft
23	35.1746	-106.71204	3	>15	weathered basalt 13-15 ft
24	35.17447	-106.7118	3	>15	clay lenses 3-5 ft
25	35.17447	-106.71162	2	7	clay lenses 2-3 ft
26	35.17447	-106.71142	2	3.5	
27	35.17441	-106.71121	3	6	
28	35.1744	-106.71102	3	7	
29	35.17426	-106.710828	3	>16.5	
30	35.17434	-106.71063	--	1.5	

Test Hole No.:	GPS Coordinates		Thickness of Existing Fill (ft)	Depth to Hard Basalt Bedrock (ft)	Notes
	Lat. (deg)	Long. (deg)			
31	35.174324	-106.7104	--	>16.5	
32	35.17432	-106.71025	3	>16.5	
33	35.17483	-106.71111	--	2	
34	35.17477	-106.71089	--	5.5	
35	35.17474	-106.71072	--	3.5	
36	35.174721	-106.71053	--	4	
37	35.1747	-106.71033	--	4	
38	35.17468	-106.71013	--	2	
39	35.17569	-106.71243	3	3	
40	35.17575	-106.71223	3	4.5	
41	35.17607	-106.71263	--	1	
42	35.17619	-106.71245	--	0.5	
43	35.17615	-106.7122	--	0.5	
44	35.17625	-106.71201	--	5	
45	35.17632	-106.71181	--	2	
46	35.1764	-106.71158	--	2	
47	35.17645	-106.71139	--	7.5	
48	35.17657	-106.71115	--	0	
49	35.17665	-106.71083	--	5	
50	35.17664	-106.71063	--	7.5	
51	35.17664	-106.71042	--	2	
52	35.17665	-106.71022	--	6.5	
53	35.17667	-106.71004	--	1	
54	35.17667	-106.70984	--	2	
55	35.1767	-106.70938	3	11	
56	35.17669	-106.70919	3	7.5	
57	35.17666	-106.70895	3	5	
58	35.17667	-106.70872	--	2.5	
59	35.17669	-106.70855	--	2	
60	35.1767	-106.70834	--	4	weathered basalt 2-4 ft

Test Hole No.:	GPS Coordinates		Thickness of Existing Fill (ft)	Depth to Hard Basalt Bedrock (ft)	Notes
	Lat. (deg)	Long. (deg)			
61	35.17672	-106.70814	--	2.5	
62	35.176627	-106.707816	--	1	
63	35.17643	-106.7078	--	2.5	clay lens at 1.5 ft
64	35.17627	-106.70785	5.5	8	clay lenses 6-7 ft
65	35.17606	-106.7079	3.5	8.5	clay lenses 4-5 ft
66	35.17591	-106.70789	3.5	6	
67	35.17574	-106.70798	2	9	clay lenses 2-3 ft, 5-9 ft
68	35.17556	-106.70811	3	6	clay lenses 4-5 ft
69	35.17541	-106.70816	3.5	5	clay lenses 3.5-5 ft
70	35.17522	-106.70827	3.5	6	
71	35.17506	-106.70834	4	9	
72	35.17498	-106.70853	4	13.5	clay lens at 5 ft
73	35.17474	-106.70855	8	11.5	clay lens at 8 ft
74	35.17584	-106.71207	4	7.5	
75	35.17585	-106.71188	4	7	
76	35.17595	-106.71169	6	8.5	
77	35.17597	-106.71142	6	13.5	
78	35.17628	-106.71069	--	7	
79	35.17636	-106.71044	--	3	
80	35.17637	-106.71022	--	3	
81	35.17638	-106.71002	--	4.5	
82	35.17635	-106.70982	--	4	
83	35.17627	-106.70943	4	6	
84	35.17627	-106.70919	3	4	
85	35.17626	-106.70896	3	6	
86	35.17628	-106.70874	4	6	clay lenses 4-6 ft
87	35.17631	-106.70853	5	7.5	
88	35.17622	-106.70828	7	9	
89	35.17524	-106.71227	--	6.5	
90	35.17542	-106.71216	--	1.5	
91	35.17533	-106.71199	--	1.5	

Test Hole No.:	GPS Coordinates		Thickness of Existing Fill (ft)	Depth to Hard Basalt Bedrock (ft)	Notes
	Lat. (deg)	Long. (deg)			
92	35.1755	-106.71179	--	6	
93	35.17558	-106.71151	--	11	
94	35.17569	-106.71133	--	9	
95	35.17575	-106.71119	--	4	
96	35.17588	-106.71043	--	5.5	clay lenses 3.5-5.5 ft
97	35.17592	-106.71021	--	1.5	
98	35.175894	-106.709924	--	6	clay lens 3.5 ft
99	35.17587	-106.70972	--	2	
100	35.175873	-106.709445	--	1	
101	35.17592	-106.70914	3	4.5	
102	35.17599	-106.70896	--	3	
103	35.17592	-106.70879	--	3.5	
104	35.1759	-106.7086	--	1.5	
105	35.17587	-106.70833	--	3	
106	35.1758	-106.71193	10	13	
107	35.17508	-106.71162	6	8.5	
108	35.17511	-106.71152	6	8	
109	35.17519	-106.71138	7	11	
110	35.17527	-106.71123	10	14	
111	35.1753	-106.71096	7	11	
112	35.17542	-106.71073	6	13	
113	35.17544	-106.71042	12	>16.5	
114	35.17548	-106.71032	8	11	
115	35.1755	-106.71007	8	11.5	
116	35.1755	-106.70986	6	9	
117	35.175462	-106.709665	4	6	
118	35.175433	-106.709427	6	9	
119	35.175449	-106.709237	6	8	
120	35.175447	-106.70903	6.5	9	
121	35.175477	-106.708829	6	9	
122	35.175449	-106.708633	6.5	8.5	