Farmington City Planning Commission
Special Meeting

March 10, 2016

FARMINGTON CITY

H. JAMES TALBOT
MAYOR

BRETT ANDERSON
DOUG ANDERSON
JOHN BILTON
BRIGHAM MELLOR
CORY RITZ
CITY COUNCIL

DAVE MILLHEIM
CITY MANAGER

SPECIAL MEETING

AGENDA
PLANNING COMMISSION MEETING
March 10, 2016

Public Meeting at the Farmington City Hall, 160 S. Main Street, Farmington, Utah
Study Session: 6:30 p.m. – Conference Room 3 (2nd Floor)
Regular Session: 7:00 p.m. – City Council Chambers (2nd Floor)

(Please note: In order to be considerate of everyone attending the meeting and to more closely follow the published agenda times, public comments will be limited to 3 minutes per person per item. A spokesperson who has been asked by a group to summarize their concerns will be allowed 5 minutes to speak. Comments which cannot be made within these limits should be submitted in writing to the Planning Department prior to noon the day before the meeting.)

1. Minutes

2. City Council Report

SUBDIVISION

3. Jerry Preston – Applicant is requesting preliminary plat approval for the Residences at Farmington Hills (P.U.D) Subdivision consisting of 23 lots on 44.3 acres located at approximately 300 East between 100 and 400 North in an LR-F (Large Residential - Foothill) zone. (S-8-15)

4. Miscellaneous, correspondence, etc.
    a. Other

5. Motion to Adjourn

Please Note: Planning Commission applications may be tabled by the Commission if: 1. Additional information is needed in order to take action on the item; OR 2. if the Planning Commission feels there are unresolved issues that may need additional attention before the Commission is ready to make a motion. No agenda item will begin after 10:00 p.m. without a unanimous vote of the Commissioners. The Commission may carry over Agenda items, scheduled late in the evening and not heard to the next regularly scheduled meeting.

Posted March 4, 2016

Eric Anderson
Associate City Planner

160 S MAIN • P.O. BOX 160 • FARMINGTON, UT 84025
PHONE (801) 451-2383 • FAX (801) 451-2747
www.farmington.utah.gov

Planning Commission Staff Report
March 10, 2016

Item 3: Preliminary Plat for the Residences at Farmington Hills Subdivision

Public Hearing:	Yes
Application No.:	S-8-15
Property Address:	Approx. 300 East between 100 and 400 North
General Plan Designation:	LDR (Low Density Residential)
Zoning Designation:	LR-F (Large Residential - Foothill)
Area:	44.3 Acres
Number of Lots:	23
Property Owner:	Jerry Preston, et. Al.
Agent:	Jerry Preston

Request: *Applicant is requesting preliminary plat approval for the Residences at Farmington Hills (P.U.D) Subdivision.*

Background Information

The applicant desires to develop 44+ acres east of 200 E. Access to the site will be via a looped residential street connecting the east end of 100 North Street to the east end of 400 North Street. Two points of access are required if the street is more than a 1,000 feet in length. A steep hillside band separates the buildable area of this site from the relatively flat topography of downtown. The major challenge for the developer is to engineer a road across this steep band to and from the site. The City Engineer is aware of the cuts and fills necessary to construct this street, but it is more typical that the Planning Commission consider aesthetics issues related to these cuts and fills during the next stage of the subdivision process.

The applicant's 20,000 s.f. lot yield plan shows that at least 23 lots are possible on site. He is seeking no lot bonuses as per the conservation subdivision standards set forth in Chapter 12 of the Zoning Ordinance. Nor is he seeking TDR lots because the number of lots set forth on the preliminary plat does not exceed the total lot count on the above referenced yield plan and, for the most part, the lots are well over 20,000 s.f. in size. Nevertheless, Lots 3, 4, and 5 on the preliminary plat are less than 20,000 square feet in size (17,190 s.f., 14,563 s.f., 15,008 s.f. respectively) and each of these is served by a common drive. Therefore, the developer is requesting a PUD overlay (limited to said lots) enabling him to deviate from the standards of the underlying zone, and the City Council approved the preliminary PUD master plan for these 3 lots as part of their schematic plan consideration on June 30th. In order to meet his open space requirement for this small PUD, the applicant is proposing to dedicate trail

easements over and across the flag rock trail on the south side of the project, and the lower firebreak road trail on the north side of the development.

The easterly 20 acres of the development is presently located in the unincorporated area of the County. As part of the process, the applicant submitted a petition to annex the acreage into Farmington City and requested the zone designation (LR-F) similar to the rest of his property and adjacent properties in the area that are already located within the city limits. The City Council accepted the petition for annexation study by resolution on May 5, 2015. The Planning Commission voted 6-0 on January 21, 2016 to recommend that the City Council approve the annexation, but recommended denial of the zoning designation of LR-F, which, if the City Council follows the Planning Commission recommendation, the default zone designation would be A-F.

Since the time that the schematic plan was approved by the City Council on June 30, 2015, the applicant has been preparing the studies required to address Section 11-30-105 of the Zoning Ordinance related to the Foothill Development Standards. The most important component of this has been the geotechnical (soils) report and the geo-hazards report. While many of the requirements of the foothill development standards have been met, there are some that will not be required until either the final improvement drawings or building plans have been submitted; these include a drainage and erosion control plan or SWPPP, grading plan, revegetation plan, and streets; all of these outstanding design requirements will be part of the improvement package required at the next step. Excerpts from the geo-hazards and geotech (soils) report have been included as part of this staff report. Both reports state that the property is developable as long as the mitigation methods and engineering guidelines detailed in these reports are followed.

Some concerned residents have acquired a professor of geology from the University of Utah to give her opinion on the applicant's reports. At the City Council meeting held on December 15th, the Planning Commission was invited to hear what Dr. Nicoll said; while Dr. Nicoll had many relevant points, the focus of her discussion was on hillside development in general and how the best practice is to not develop on hillsides. Unfortunately, as valid as that input may be, the City currently has an application for a subdivision to review, and this application is what is under consideration, not an application for a nature preserve. Dr. Nicoll did not really address the two GeoStrata reports directly, nor did she address the site specifically; it was a high-level, broad-brushed, and overall look at hillside development in general.

Staff has had a third party geotech engineer (that is a consultant for the City) review the reports, he added a few mitigation requirements, but found the report to be fundamentally sound, however, this review was focused on the structural integrity of the future homes and how to mitigate those risks. At the December 17, 2015 Planning Commission, staff was instructed to get a more thorough and comprehensive review of the geo-studies, which has occurred. Staff contracted with AGEC to get an objective, third-party review of the reports, the findings of this report are attached. The applicant and his geotech engineers, and the city's consultant have met several times and the applicant has performed all of the recommendations made by AGEC that are required at this point in the subdivision application review; the biggest of which were deeper borings (40-50' instead of the 15' done in the original geotech report) at a few more locations throughout the site. At question is whether there is clay between the surface and bedrock, and if so, how much; the initial geotech reports showed that there was sandy gravel, but they did not go deep enough.

GeoStrata has since performed the requested borings and found that the site is comprised of "fine-grained sediments with low to no plasticity," excerpts of this revised report have been attached for your

review. In the Executive Summary, GeoStrata states: "Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are complied with." The City had our third-party consultant, Doug Hawkes of AGEC, review the Revised GeoTech Report and he stated: "Based on the borings, the subsurface conditions at this site are not similar to the North Salt Lake landslide subsurface conditions where a low strength weathered bedrock was encountered at depth. The subsurface conditions at this site are not as good as GeoStrata had originally assumed, but are still fairly good. GeoStrata has modified the setback from the crest of the slope to account for the improved understanding of the subsurface conditions." Additionally, there is a memo from Doug that goes into more detail regarding the revised report, which is attached.

At the March 3, 2016 Planning Commission, it was discovered that the Planning Commission had requested the item to be held as a public hearing and staff had neglected to do so. Because the item was not properly noticed as a public hearing, the Planning Commission determined that a special meeting held tonight would be the best solution for the City, affected residents, and the applicant; the commissioners felt that a public hearing would be the most transparent way to handle this situation.

Suggested Motion:

Move that the Planning Commission approve the preliminary plat for the Residences at Farmington Hills PUD Subdivision, subject to all applicable Farmington City ordinances and development standards and the following conditions:

1. The 20 acres must be annexed prior to the City accepting any application for final plat and/or final (PUD) master plan;
2. All cut and fills shall meet the requirements of Chapter 30 of the Zoning Ordinance;
3. The City Engineer must approve any exception to the maximum street slope of 12%, but in no event shall any exception exceed 14% slope as per the ordinance;
4. The developer must work with the City Manager/City Council to acquire property now owned by the City within the proposed development;
5. The applicant must deed trail rights-of-way, for public access to the City for the Flag Rock Trail and the lower firebreak road trail, and these easements shall be shown on final plat;
6. The applicant shall meet all requirements as set forth in Section 11-30-105 of the Zoning Ordinance, that have not been addressed yet;
7. The applicant shall provide any additional information to the geotech and geohazards reports as recommended by the attached *Review of Geologic and Geotechnical Investigation Reports – Farmington Hills Development* in the form of an addendum to the GeoStrata reports;
8. The applicant shall follow all recommended conditions outlined in the attached *Review of Geologic and Geotechnical Investigation Reports – Farmington Hills Development*.
9. GeoStrata shall conduct periodic inspections of development activity on-site to ensure the infrastructure improvements, single-family homes, and other structures are installed and/or constructed consistent with the standards set forth in their studies. All such work must receive approval from GeoStrata in writing, including engineer stamps;
10. The applicant shall set aside necessary land to accommodate the City's water tank and provide all easements necessary to make sure no portion of the City water facilities are outside of said easements including but not limited to off-site water lines connecting to 200 East;
11. The building envelopes on Lots 1-5 are dependent on the results of final trenching, and Lot 13 is not buildable, and the envelopes on all lots must be consistent with Plate A-3 of the Revised

Geotechnical Study, unless presented otherwise by the geotech with a recommendation from the City's consultants.

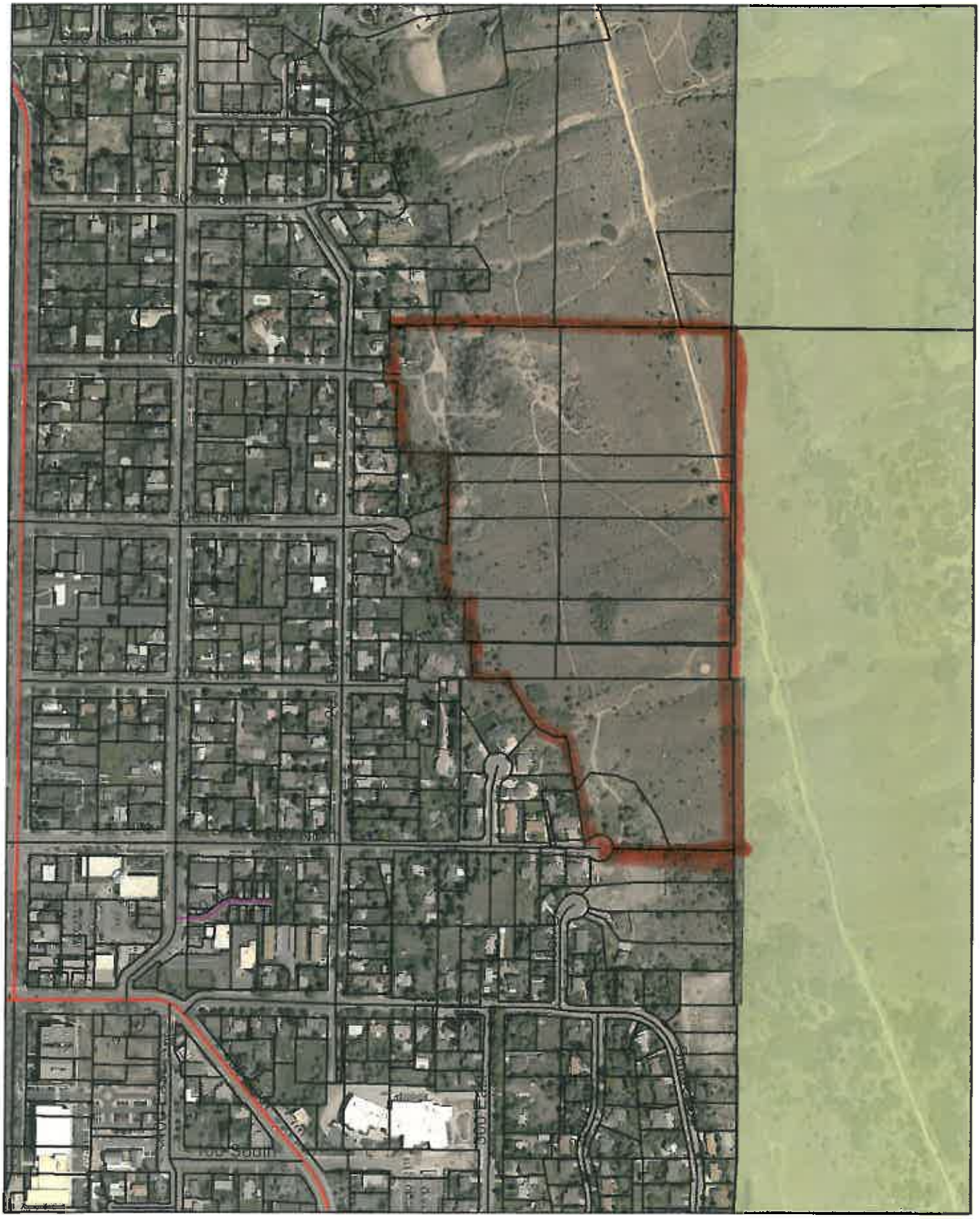
Findings for Approval:

1. The proposed preliminary plat meets the requirements of the subdivision and zoning ordinance.
2. Thus far the developer has demonstrated that the roads providing access to and from the site meet the City's slope standards for such roads.
3. The anticipated trail rights-of-way meet the 10% open space requirement for the PUD, in that only a small area of the project near 100 North will have the PUD overlay, and the developer is not seeking a bonus of lots over and above the lots allowed by the yield plan.
4. The primary responsibility of this small PUD is to maintain the common drive for lots near what is now the east end of 400 North Street.
5. The applicant has provided all of the requirements of Section 11-30-105 that are normally required up to this point in the subdivision process, and will provide the final development standard requirements as part of final plat and improvement drawings.
6. The applicant has provided and will provide additional geotechnical and geohazards studies than what is normally required for foothill development.

Supplemental Information

1. Vicinity Map
2. Yield Plan
3. Preliminary Plat
4. Excerpt from GeoTech Report
5. Excerpt from Geological Hazards Report
6. *The Review of Geologic and Geotechnical Investigation Reports – Farmington Hills Development* Performed by AGEC on behalf of the City
7. Excerpt from Revised Geotechnical Report
8. AGEC memo of review of Revised Geotechnical Report

Farmington City



Tuesday, February 24, 2009 10:44:54 AM
M:\Projects\Current\BaseMap.mxd

0 220 440 880 1,320
Feet

CALL BLUESTAKES @ 1-800-662-4111 AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION.

BOUNDARY DESCRIPTION

Beginning at the Southwest Corner of Lot 7, Sunset Hills No. 4 Subdivision, said point being North 89°49'10" East 561.66 feet along the quarter section line and North 0°25'28" West 719.93 feet to the north line of 100 North Street and South 89°39'30" East 166.29 feet along the north line of 100 North Street from the Center of Section 19, Township 3 North, Range 1 East, Salt Lake Base and Meridian (not found), said point of beginning also being South 89°39'30" East 921.91 feet along the centerline of 100 North Street and North 0°20'30" East 30.00 feet from a Farmington City Street Monument in the intersection of 100 North Street and 300 East Street, (the Basis of Bearing being North 0°17'15" East 1785.51 feet record, 1786.04 feet measured, along the monument line in 300 East Street from a monument in 100 North Street to a monument in 400 North Street as shown on the Farmington Townsite Re-Survey, and running;

Thence North 10°06'30" West 189.00 feet along the west line to the Northwest Corner of Lot 7, Sunset Hills No. 4 Subdivision, also being the Southeast Corner of Lot 6, Deer Hollow Run Planned Unit Development;

Thence North 10°06'30" West 207.87 feet along the east line of Lot 6 and Lot 5 to the Northeast Corner of Lot 5, Deer Hollow Run Planned Unit Development;

Thence South 89°38'39" West 46.24 feet along the northerly line of Lot 5, Deer Hollow Run Planned Unit Development;

Thence North 64°17'26" West 67.84 feet along the northerly line of Lot 5, Deer Hollow Run Planned Unit Development;

Thence North 38°51'53" West 63.90 feet along the easterly line of Lot 5 and easterly line of Lot 4, Deer Hollow Run Planned Unit Development;

Thence North 30°11'21" West 157.34 feet along the easterly line to the Northeast Corner of Lot 4, Deer Hollow Run Planned Unit Development;

Thence South 89°56'06" West 142.92 feet along the north line of Lot 4, Deer Hollow Run Planned Unit Development;

Thence North 0°19'14" East 139.45 feet;
Thence North 89°59'05" West 23.54 feet;
Thence North 0°17'15" East 164.31 feet;
Thence North 52°36'45" East 219.78 feet;
Thence North 24°44'40" West 125.23 feet;
Thence North 89°59'05" West 150.22 feet;
Thence North 0°22'40" East 239.00 feet;
Thence North 89°59'05" West 167.15 feet;

Thence North 10.02 feet;
Thence North 89°40'58" West 7.86 feet;
Thence North 0°17'15" East 247.54 feet;
Thence North 89°42'52" West 67.52 feet;
Thence North 1°09'15" West 99.03 feet;
Thence South 89°42'52" East 32.51 feet;
Thence North 0°17'15" East 187.72 feet;
Thence South 89°59'05" East 1112.71 feet to a Bureau of Land Management 3.5"Brass Disk Monument at a 1/16th Corner in Section 19, Township 3 North, Range 1 East;

Thence South 0°44'21" East 1965.05 feet along the 1/16th line to the Northeast Corner of Lot 3, Sunset Hills No. 4 Subdivision;

Thence South 89°39'30" West 446.31 feet along the north line of Sunset Hills No. 4 Subdivision;

Thence southwesterly 8.37 feet along the arc of a 125.00 foot radius curve to the right, (center bears North West and long chord bears South 55°24'30" West 8.37 feet, with a central angle of 3°50'13");

Thence southwesterly 10.07 feet along the arc of a 15.00 foot radius curve to the left, (center bears South 32°40'23" East and long chord bears South 38°05'57" West 9.88 feet, with a central angle of 38°27'19") to the right of way line of 100 North Street;

Thence northwesterly 133.85 feet along the arc of a 50.00 foot radius curve to the left, (center bears North 71°07'42" West and long chord bears North 57°49'00" West 97.31 feet, with a central angle of 153°22'35") along the easterly and northerly right of way line of 100 North Street;

Thence southwesterly 23.48 feet along the arc of a 30.0.0 foot radius curve to the right, (center bears North West and long chord bears South 67°55'06" West 22.89 feet, with a central angle of 44°50'47") along the northerly right of way line of 100 North Street;

Thence North 89°39'30" West 2.45 feet along the north line of 100 North Street to the point of beginning.

Contains 1,874,711 square feet, 43.037 acres, 23 lots.

11-19-15
Date

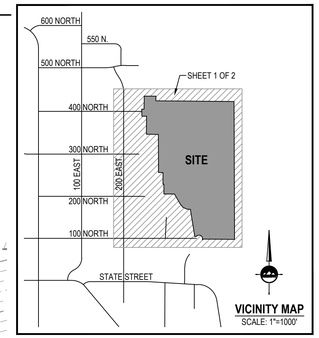
Keith R. Russell
License no. 164386

NOTES

1. BOOSTER PUMPS WITH VAULT PER FARMINGTON CITY STANDARDS WILL BE PROVIDED FOR EACH INDIVIDUAL LOT ON EAST SIDE OF 350 EAST STREET ON THE CULINARY WATERLINE. (POWER PROVIDED BY INDIVIDUAL LOTS)
2. ALL LOTS UNABLE TO DRAIN TO CITY RIGHT-OF-WAY WILL PROVIDE ONSITE RETENTION. NO STORM WATER WILL BE ALLOWED TO DRAIN ACROSS PROPERTY LINES.
3. ALL AREAS (INCLUDING PROPERTY TO BE ANNEXED) IS PROPOSED TO BE LR ZONE.
4. DETENTION POND @ TOP OF 100 NORTH TO PROVIDE ENOUGH STORAGE TO MAINTAIN HISTORICAL RELEASE RATE ONTO 100 NORTH STREET.
5. ALL DRIVEWAYS TO INDIVIDUAL PROPERTIES ARE TO 14% SLOPE OR LESS.

KEYED NOTES

1. INSTALL 1" CULINARY WATER SERVICE
2. INSTALL 4" SANITARY SEWER SERVICE
3. INSTALL 1-1/2" DUAL TURNOUT SECONDARY WATER SERVICE
4. INSTALL 1" SINGLE LOT SECONDARY WATER SERVICE
5. INSTALL FIRE HYDRANT AND VALVE
6. INSTALL SANITARY SEWER MANHOLE
7. INSTALL STORM DRAIN MANHOLE
8. INSTALL STORM DRAIN COMBO BOX
9. INSTALL STORM DRAIN INLET BOX
10. INSTALL "NO PARKING FIRE LANE" SIGNS (12"X18" W/ RED LETTERS ON WHITE REFLECTIVE BACKGROUND)
11. EXCAVATED TRENCH FOR GEOTECHNICAL EXPLORATION - SEE GEOTECHNICAL REPORT
12. LOCATED SECONDARY FAULT LINE - SEE GEOTECHNICAL REPORT



VICINITY MAP
SCALE: 1"=1000'

LEGEND

- EXISTING REBAR AND CAP
- SET ENSIGN REBAR AND CAP
- EXISTING WATER METER
- PROPOSED WATER METER
- EXISTING WATER VALVE
- PROPOSED WATER VALVE
- EXISTING FIRE HYDRANT
- PROPOSED FIRE HYDRANT
- EXISTING SECONDARY WATER VALVE
- PROPOSED SECONDARY WATER VALVE
- EXISTING SANITARY SEWER MANHOLE
- PROPOSED SANITARY SEWER MANHOLE
- EXISTING STORM DRAIN CLEAN OUT BOX
- PROPOSED STORM DRAIN CLEAN OUT BOX
- EXISTING STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN COMBO BOX
- EXISTING LIGHT
- PROPOSED LIGHT
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER LINE
- EXISTING CULINARY WATER LINE
- PROPOSED CULINARY WATER LINE
- EXISTING SECONDARY WATER LINE
- PROPOSED SECONDARY WATER LINE
- EXISTING OVERHEAD POWER LINE
- TRENCH LOCATION - GEOTECHNICAL REPORT
- LOCATED SECONDARY FAULT LINE
- EXISTING CONTOURS
- EASEMENT
- EXISTING CONCRETE
- PROPOSED CONCRETE
- EXISTING SLOPE GREATER THAN 30%
- DRAINAGE ARROW

SITE IMPROVEMENT TABLE	
TYPE	AREA
TOTAL AREA (S.F.)	1,874,711
TOTAL AREA (ACRES)	43.037
TOTAL RESIDENTIAL LOTS	23
AVERAGE LOT SIZE (S.F.)	73,474
LOTS PER S.F.	81,509
LOTS PER ACRE	1.871
ANNEXATION AREA (ACRE)	20.07

HORIZONTAL GRAPHIC SCALE
80 0 40 80 160
(IN FEET)
HORZ: 1 inch = 80 ft.

ENSIGN
LAYTON
1485 W. Hill Field Rd., Ste. 204
Layton, UT 84041
Phone: 801.547.1100
Fax: 801.593.6315
SALT LAKE CITY
Phone: 801.255.0529
TOOELE
Phone: 435.843.3590
CEDAR CITY
Phone: 435.865.1453
RICHFIELD
Phone: 435.896.2983
COLORADO SPRINGS
Phone: 719.476.0119
WWW.ENSIGNENG.COM

FOR:
JPC CONTRACTING
40 NORTH 100 EAST
FARMINGTON, UT. 84025

CONTACT:
JERRY PRESTON
PHONE: 801-451-6525
FAX:

RESIDENCES AT FARMINGTON HILLS SUBDIVISION
PRELIMINARY PLAT - NOT TO BE RECORDED
400 NORTH TO 100 NORTH
FARMINGTON CITY, UTAH

PROFESSIONAL ENGINEER
CAMERON HESS PRESTON
No. 5049039
11-19-15
STATE OF UTAH

NO.	DATE	REVISION	BY
1			
2			
3			
4			
5			
6			
7			
8			

PRELIMINARY PLAT

PROJECT NUMBER L2162
PRINT DATE 11/20/15
DRAWN BY M.ELMER
CHECKED BY C.PRESTON
PROJECT MANAGER C.PRESTON

1 OF 2

14425 South Center Point Way Bluffdale, Utah 84065
Phone (801) 501-0583 | Fax (801) 501-0584

Geotechnical Investigation
Farmington Hills Development
Farmington, Utah

GeoStrata Job No. 1039-002

October 19, 2015

Prepared for:

Elite Craft Homes
40 North 100 East
Farmington, Utah
Attention: Mr. Jerry Preston

Learn More

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the Farmington Hills residential development located in Farmington, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and pavements.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are complied with. Subsurface conditions were investigated through the excavation of six exploratory test pits that extended to depths ranging from 6 to 13 feet below the site grade as it existed at the time of our investigation. The subject property is overlain by 1 to 2½ feet of topsoil composed of silt, sand, and gravel. Underlying the topsoil we encountered Pleistocene-aged lacustrine sand and gravel deposits.

All fill placed for the support of structures, concrete flatwork or pavements should consist of structural fill. Structural fill may consist of native sand and gravel soils with particles larger than 4 inches in diameter removed or an imported material. Structural fill may also consist of the native clay and silt soils, however the contractor should be aware that it can be difficult to moisture condition and compact the clay and silt soils to the specified maximum density. All structural fill should be free of vegetation, debris or frozen material, and should contain no inert materials larger than 4 inches nominal size. Alternatively, an imported structural fill meeting the specifications presented in the report may be used.

The foundation for the proposed structures may consist of conventional strip and/or spread footings founded on undisturbed native silty sand or gravel soils or on structural fill. Conventional strip footings founded entirely on undisturbed native silty sand and gravel soils, non-collapsible clayey sand, clay and silt soils, or on properly compacted structural fill may be proportioned for a maximum net allowable bearing capacity of **2,500 psf**.

An assumed CBR of 10.0 for near surface soils was utilized in the pavement design. Based on assumed traffic loads, we recommend a pavement section consisting of 3 inches of asphalt over 8 inches of untreated base for pavements on sand and gravel soils. Alternatively, a pavement section consisting of 3 inches of asphalt over 6 inches of untreated base over 6 inches of subbase may be used for pavements on sand and gravel soils.

NOTE: This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed Farmington Hills residential development located in Farmington, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and pavements.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report as in accordance with our signed proposal dated June 19, 2015. The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report.

2.2 PROJECT DESCRIPTION

The subject project consists of an approximately 44 acre parcel located in Farmington, Utah (See Plate A-1, *Site Vicinity Map*). We understand that the development will consist of 29 residential building lots occupied by single-family residential buildings one to two stories in height with basements. We anticipate footings loads on the order of 3 to 5 klf. Several residential roads along with associated utilities, curb & gutter, and sidewalks within the development will also be a part of the proposed construction. We assume that the loads associated with these structures will be relatively light.

3.0 METHOD OF STUDY

3.1 SUBSURFACE INVESTIGATION

As part of this investigation, subsurface soil conditions were explored by excavating six exploratory trenches at representative locations across the site. Representative faces of each of these trenches were logged as part of a geotechnical investigation. The trenches were excavated to depths ranging from 6 to 13 feet below the site grade as it existed at the time of our investigation. The approximate locations of the explorations are shown on the *Exploration Location Map*, Plate A-2 in Appendix A. Exploration points were selected to provide a representative cross section of the subsurface soil conditions in the anticipated vicinity of the proposed structures. Subsurface soil conditions as encountered in the explorations were logged at the time of our investigation by a qualified geotechnical engineer and are presented on the enclosed Test Pit Logs, Plates B-1 to B-6 in Appendix B. A *Key to USCS Soil Symbols and Terminology* is presented on Plate B-7.

The trenches were advanced using a trackhoe. Both relatively undisturbed and bulk soil samples were obtained in each of the test pit explorations. Bulk samples were collected from each trench location placed in bags and buckets. Due to the relatively granular nature of the soils exposed during our investigation, it was not feasible to collect undisturbed soil samples. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the *Unified Soil Classification System* (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Test Pit Logs.

3.2 LABORATORY TESTING

Geotechnical laboratory tests were conducted on samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. As mentioned previously. due to the relatively granular nature of the subsurface soils, it was not feasible to obtain relatively undisturbed samples, and as such our laboratory testing was limited. Laboratory tests conducted during this investigation include:

- Grain Size Distribution (ASTM D422)
- Direct Shear Test (ASTM D3080)

The results of laboratory tests are presented on the Test Pit Logs in Appendix B (Plates B-1 to B-6), the Laboratory Summary Table and the test result plates presented in Appendix C (Plates C-1 and C-4).

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

At the time of our subsurface investigation, the subject property existed as vacant hillside property. No structures were observed on the property at the time of our investigation, and the only improvements were unpaved roadways largely oriented in a north-south direction. The site was covered in moderate amounts of vegetation consisting of native weeds, sagebrush, and small trees. The eastern portion of the site slopes moderately to the west at an approximate 4:H:1V before steepening to a 1.5H:1V slope near the western portion of the site, although this value varies locally. Total topographic relief across the site is approximately 370 feet. The site is located at an approximate elevation ranging from 4,415 to 4,785 feet above mean seal level

4.2 SUBSURFACE CONDITIONS

The subsurface soil conditions were explored at the subject property by excavating six exploratory trenches to depths ranging from 6 to 13 feet below the existing site grade. Subsurface soil conditions were logged during our field investigation and are included on the test pit logs in Appendix B (Plates B-1 to B-6). The soil and moisture conditions encountered during our investigation are discussed below.

4.2.1 Soils

Based on our observations and geologic literature review, the subject property is overlain by 1 to 2½ feet of topsoil composed of silt, sand, gravel, and cobble with occasional boulders. Undocumented fill soils were not observed during our field investigation. Underlying the topsoil, we encountered Pleistocene-aged lacustrine sand deposits associated with both the transgressive and regressive phases of the Bonneville lake cycle. These deposits extended to the maximum depths explored as part of this investigation. Descriptions of the soil units encountered are described below:

Topsoil: Where observed, these soils consisted of moist, dark brown Silty SAND (SM) with gravel, cobble and occasional boulders. This unit has an organic appearance and texture, with roots throughout. Topsoil was encountered in each of the test pits excavated as part of this investigation.

Pleistocene-Aged Lacustrine Deposits: These soils typically consist of sand with some silt and rounded gravel deposited in beaches corresponding to the transgressive and regressive phases of Lake Bonneville. The soils we encountered largely consisted of coarse-grained sediment including Poorly Graded GRAVEL (GP-GM) with silt and sand, Poorly Graded GRAVEL (GP) with sand, Poorly Graded SAND (SP) with gravel, Silty GRAVEL (GM) with sand, and Silty SAND (SM) with gravel. Fine-grained sediments were encountered interbedded with the coarse-grained material, and consisted of SILT (ML), SILT (ML) with gravel, Sandy SILT (ML), and Sandy Lean CLAY (CL). In general, these fine-grained sediments had low to no plasticity, and contained occasional iron staining.

The stratification lines shown on the enclosed Test Pit Logs represent the approximate boundary between soil types. The actual in-situ transition may be gradual. Due to the nature and depositional characteristics of the native soils, care should be taken in interpolating subsurface conditions between and beyond the exploration locations.

4.2.2 Groundwater Conditions

Groundwater was not encountered in any of the test pits excavated for this investigation. Seasonal fluctuations in precipitation, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. However, it is not anticipated that groundwater will impact the proposed development.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

The site is located at an approximate elevation ranging from 4,415 to 4,785 feet above mean sea level, within the eastern boundary of the Great Salt Lake basin and the Wasatch Mountain Range. The Great Salt Lake basin is a deep, sediment-filled structural basin of Cenozoic age flanked by the Wasatch Range to the east and the Promontory Mountains, the Spring Hills, and the West Hills to the west (Hintze, 1980). The southern portion of the Salt Lake Basin is bordered on the west by the east shore of the Great Salt Lake. The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of the Salt Lake Basin is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983; Hintze, 1993). As the lake receded, streams began to incise large deltas that had formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Surface sediments are mapped at the site, and include Late Pleistocene lacustrine sand and gravel deposits (Machette, 1992).

5.2 SEISMICITY AND FAULTING

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is defined as a fault that has had activity within the Holocene (<11ka). Several splays of the Weber segment of the Wasatch Fault zone are mapped as being located throughout the site (Black et. al, 2003, Hecker, 1993). In order to assess the nature of the faults and delineate their location, GeoStrata is concurrently completing a fault trench investigation. The results of that investigation will be presented in a separate report. The most recent movement along the Weber Segment of the Wasatch Fault Zone occurred during the Quaternary period, and there is evidence that as many as 10 to 15 earthquakes have occurred along this segment in the last 15,000 years (Hecker, 1993). A location near Kaysville Utah indicated that the Weber Segment has a measurable offset of 1.4 to 3.4 meters per event (McCalpin, and others, 1994). The Weber Segment may be capable of producing earthquakes as

large as magnitude 7.5 (Ms) and has a recurrence interval of approximately 1,200 years. The site is also located approximately 20 miles east of the East Great Salt Lake Fault Zone (Hecker, 1993). Evidence suggests that this fault zone has been active during the Holocene (0 to 30,000 yrs) and has segment lengths comparable to that of the Wasatch Fault Zone, indicating that it is capable of producing earthquakes of a comparable magnitude (7.5 Ms). Analyses of ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Wasatch Front region. Each of the faults listed above show evidence of Holocene-aged movement, and is therefore considered active.

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U.S. Geological Survey as part of NEHRP/NSHMP (Frankel et al, 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012). Spectral responses for the Maximum Considered Earthquake (MCE_R) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a "firm rock" site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field exploration, it is our opinion that this location is best described as a Site Class D which represents a "stiff soil" profile. The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 40.9856° and -111.8804° respectively and the United States Geological Survey U.S. Seismic Design Maps tool version 3.1.0 (USGS, 2013). Based on the IBC, the site coefficients are F_a=1.00 and F_v= 1.30. From this procedure the peak ground acceleration (PGA) is estimated to be 0.55g.

MCE_R Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class D[a]

Site Location: **Latitude = 40.9856 N** **Longitude = -111.8804 W**	**Site Class C Site Coefficients:** **Fa = 1.00** **Fv = 1.30**
Spectral Period (sec)	**Response Spectrum Spectral Acceleration (g)**
0.2	$\mathbf{S_{MS}}=(F_a * S_s=1.00*1.37) = 1.37$
1.0	$\mathbf{S_{M1}}=(F_v * S_1=1.30*0.56) = 0.73$

[a] IBC 1613.3.4 recommends scaling the MCE_R values by 2/3 to obtain the design spectral response acceleration values; values reported in the table above have not been reduced.

5.3 LIQUEFACTION

Certain areas within the intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading, such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Based on our review of the *Liquefaction Special Study Areas, Wasatch Front and Nearby Areas, Utah*, the site is located in an area currently designated as having a "Very Low" liquefaction potential. "Very Low" liquefaction potential indicates that there is less than a 5 percent probability of having an earthquake within a 100-year period that will be strong enough to cause liquefaction. Groundwater was not encountered in any of the test pits excavated as part of our investigation. As such, the near-surface soils are not considered to be susceptible to liquefaction. It is possible that potentially liquefiable soils are also present at depths greater than those covered in our investigation. A liquefaction analysis was beyond the scope of the project; however, if the owner wishes to have greater understanding of the liquefaction potential of the soils at greater depths, a liquefaction analysis should be completed at the site.

14425 South Center Point Way Bluffdale, Utah 84065
Phone (801) 501-0583 | Fax (801) 501-0584

Geologic Hazards Assessment
Farmington Hills Development
Farmington, Utah

GeoStrata Job No. 1039-002

October 15, 2015

Prepared for:

Elite Craft Homes
40 North 100 East
Farmington, Utah
Attention: Mr. Jerry Preston

Learn More

1.0 EXECUTIVE SUMMARY

The purpose of this investigation and report is to assess the proposed Farmington Hills Subdivision for the presence of geologic hazards that may impact the planned development of the site. The Weber segment of the Wasatch fault zone is mapped trending through or adjacent to the western side of the subject site. Surface fault ruptures associated with the Weber segment of the Wasatch fault zone were observed in Trenches 1 and 2 excavated as a part of this investigation. It is our opinion that the observed faults are active surface fault ruptures. No surface fault ruptures were observed in Trenches 3 through 6. Since the observed faults are considered to be active a setback area was established on either side of the observed faults. Setback distances of 24 feet on the upthrown side of the faults and 29 feet on the downthrown side of the faults were used to develop the setback areas. No structures or any portions of any structures intended for human occupancy should be located within the setback areas. It is generally accepted practice to allow roadways, landscaping, driveways, and non-habitable structures such as detached garages and sheds to be located within the setback areas.

No Holocene-aged alluvial fan deposits are located within the proposed Farmington Hills development. Minor debris flow sediments were observed within the channel of an ephemeral drainage located immediately south of the existing Farmington City water tank on the southeastern portion of the site. It is considered possible that debris flow events may occur within this drainage. The potential flood and debris flow hazard associated with this ephemeral drainage channel, to the proposed Farmington Hills development, is considered low as long as the natural course and geometry of the drainage channel is maintained and considered during the development. These hazards are considered high with respect to the existing residences west of the mouth of the drainage channel.

Rock fall hazard was also assessed as part of this investigation. Our field observation would indicate that the rock fall hazard at the site is moderate. Our modeling would indicate the rock fall hazard for the subject property to be low. It is recommended that mitigation structures upslope from the subject site be design and constructed to further reduce the potential for rock-fall events from impacting the proposed development.

NOTICE: The scope of services provided within this report are limited to the assessment of the subsurface conditions for the proposed development. This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary is provided solely for purposes of overview. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

The purpose of this investigation and report is to assess the proposed Farmington Hills Subdivision residential development located at approximately 300 East 100 North to 400 North in Farmington City, Utah for the presence of geologic hazards that may impact the planned development of the site. The work performed for this report was performed in accordance with our proposal, dated June 19, 2015 and signed July 14, 2015. Our scope of services included the following:

- Review of available references and maps of the area.
- Stereographic aerial photograph interpretation of aerial photographs covering the site area.
- Review of the sub-meter Wasatch Front LiDAR elevation data (2013 to 2014) obtained from the State of Utah AGRC.
- Geologic reconnaissance of the site by an engineering geologist to observe and document pertinent surface features indicative of possible surface rupture fault hazards, debris flow hazards or other geologic hazards.
- Subsurface investigation consisting of trenching across portions of the site exposing the soil stratigraphy and observing the exposed soil for evidence of surface fault rupture or other geologic hazards.
- Preparation of hand drawn logs to document any fault structures, debris flow deposits or evidence of geologic hazards encountered during our subsurface investigation; and
- Evaluation of our observations combined with existing information and preparation of this written report with conclusions and recommendations regarding possible surface rupture hazards or any other geologic hazards observed to affect the site.

The recommendations contained in this report are subject to the limitations presented in the Limitations section of this report.

2.2 PROJECT DESCRIPTION

The project site is located in the foothills of the Wasatch Mountains at approximately 300 East between 100 North to 400 North in Farmington City, Utah. Proposed development, as currently planned, will consist of twenty three residential building lots as well as associated roadways and landscape areas. The subject property currently exists as undeveloped hillside property accessed

through unpaved trails and roadways. The subject site slopes moderately to the west throughout most of the subject site and steeply to the west along the western margin of the site. The subject site has an estimated topographic change of approximately 430 feet from east to west. The project site is shown on the Site Vicinity Map included in the Appendix of this report (Plate A-1). The Appendix also includes a Site Vicinity Geologic Map (Plate A-2 and A-2b) and an Exploration Location Map (Plate A-3).

3.0 METHODS OF STUDY

3.1 OFFICE INVESTIGATION

To prepare for the investigation, GeoStrata reviewed pertinent literature and maps listed in the references section of this report, which provided background information on the local geologic history of the area and the locations of suspected or known geologic hazards (Nelson and Personius, 1993; Black and others, 2003; Christenson and Shaw, 2008; U.S. Geological Survey, 2006). A detailed knowledge of the stratigraphic units expected in the area provided a useful time-stratigraphic framework for interpreting the units exposed in the trench excavated for this geologic hazards assessment. In addition, the presence of specific stratigraphic units is also very useful in determining the presence and severity of other geologic hazards that may be present on the subject property.

A stereographic aerial photograph interpretation was performed for the subject site using three sets of stereo aerial photographs obtained from the UGS as shown in Table 1.

Table 1

Source	Photo Number	Date	Scale
USFS	USFS-F-161	May 30, 1983	1:5,000
USFS	USFS-F-162	May 30, 1983	1:5,000
USFS	USFS-F-163	May 30, 1983	1:5,000
USFS	USFS-F-164	May 30, 1983	1:5,000
UGS OFR-548	WF1-6-079	1970	1:12,000
UGS OFR-548	WF1-6-080	1970	1:12,000
UGS OFR-548	WF1-6-081	1970	1:12,000
UGS OFR-548	WF2-5-121	1970	1:12,000
UGS OFR-548	WF2-5-122	1970	1:12,000
UGS OFR-548	WF2-5-123	1970	1:12,000

GeoStrata also conducted a review of the sub-meter Wasatch Front LiDAR elevation data (2013 to 2014) obtained from the State of Utah AGRC to assess the subject site for visible lineations or other surface fault rupture related geomorphology. The LiDAR elevation data was used to create hillshade imagery that could be reviewed for assessment of geomorphic features related to geologic hazards (Plates A-4 and A-5). We used this hillshade imagery and the stereographic

aerial photographs to map the location of the Weber segment of the Wasatch fault zone along the subject site for as part of preparing the Site Specific Geologic Map (Plate A-6).

The Exploration Location Map (Plate A-3) was produced to plan our assessment of the geologic hazards identified during our office research. One critical factor in the placement of exploration trenches across the site was the assessment of the surface fault rupture hazard along the western side of the subject site that was identified during our office research. The portion of the site that falls within the Surface Fault Rupture Special Study Zone needed to be assessed by means of trenching to assess the near surface geologic units for the presence or absence of active surface fault rupture hazards. No current Surface Fault Rupture Special Study Zone map is identified in the Farmington City Municipal Code (Chapter 30, 11-30-105 Development Standards, (4) Geologic Report). Christenson and others (2003) state that where special-study areas have not been defined, the UGS recommends that the width of special-study areas vary depending on whether the fault is well defined, buried (concealed) or approximately located. The recommended special-study areas for a well defined fault extend horizontally 500 feet (153 m) on the downthrown and 250 feet (76 m) on the upthrown side of mapped fault traces or outermost faults in a fault zone. In areas of high scarps where 250 feet (76 m) on the upthrown side does not extend to the top of the scarp, the special-study area is increased to 500 feet (153 m) on the upthrown side (Robison, 1993). A well-defined fault is defined as a fault where the fault trace is clearly detectable by a geologist qualified to conduct surface-fault rupture investigations as a physical feature at or just below the ground surface (typically shown as a solid line on a geologic map). Nelson and Personius (1993) map the portion of the Weber segment of the Wasatch fault zone trending through the subject site as a well defined fault trace (Plate A-2). The U.S. Geological Survey and Utah Geological Survey, 2006, Quaternary fault and fold database also report this section of the Weber segment of the Wasatch fault zone as a well defined fault trace (Plate A-3).

During our stereographic aerial photograph interpretation and our review of the sub-meter Wasatch Front LiDAR elevation data (2013 to 2014) obtained from the State of Utah AGRC to assess the subject site for visible lineations or other surface fault rupture related geomorphology we mapped the portion of the Weber segment along the western side of the subject site as a well defined fault (Plate A-4; Plate A-5; Plate A-6). The main trace of the Weber segment of the Wasatch fault zone, in the area of the subject site, was observed to correspond to a steeply west dipping escarpment that divided the site into a lower portion (in the northwest corner of the site) and an upper portion (throughout the remainder of the site). This escarpment was assessed to comprise the main fault scarp of the Weber segment. The base of the fault scarp defined a clear

liniment that we interpreted and mapped as the location of the location of the main Weber segment. It should be noted that the Weber segment is mapped further west of our mapped location on the U.S. Geological Survey and Utah Geological Survey, 2006, Quaternary fault and fold database (Plate A-3; Plate A-4). Plate A-3 also shows the special study area associated with the Weber segment across the subject site as we assessed it for this study. The fault location as assessed by GeoStrata was utilized to create the surface fault rupture special study zone, as shown on Plate A-3.

Several other lineations were also observed during our stereographic aerial photograph interpretation and our review of the sub-meter Wasatch Front LiDAR elevation data (2013 to 2014). These lineations were oriented generally east to west and are interpreted to comprise a number of small drainage swales eroded into the west dipping slope that makes up the subject site above and east of the Weber segment fault escarpment. These swales can be seen on Plate A-4 and Plate A-5. The Weber segment fault escarpment was also observed to be incised by several of these drainage swales within the subject site. One drainage located just south of and adjacent to the existing Farmington City water tank is down-cut approximately 10 to 20 feet into a well defined ephemeral drainage channel. This ephemeral drainage is associated with a small unnamed drainage basin canyon on the mountain front east of the subject site as can be seen on Plate A-2.

3.2 FIELD INVESTIGATION

An engineering geologist investigated the geologic conditions within the general site area. A field geologic reconnaissance was conducted to observe existing geologic conditions and to assess existing surficial evidence of surface fault ruptures, debris flow deposits or evidence other geologic hazards. Based on the results of our office research and field observations, six locations were selected for subsurface investigation by means of trenching. While conducting our fieldwork for the surface fault rupture hazard assessment we conducted site observations to assess what other geologic hazards might impact the site.

3.3 SUBSURFACE INVESTIGATION

Six exploratory trenches were excavated along the western side of the proposed development in order to expose and observe the subsurface soils and to assess the subject site for surface fault rupture hazards within the Surface Fault Rupture Special Study Area as shown on Plate A-3. The locations of the six trenches are shown on the Exploration Location Map (Plate A-3). Our trench excavations extended between approximately 30 feet to 130 feet farther east than the Surface

Fault Rupture Special Study Area to aid in assessing the proposed development for other geologic hazards and to assess the near surface soil conditions as part of our geotechnical assessment of the subject site. The geology exposed in these trenches will be described and interpreted in subsequent sections of this report.

4.0 GEOLOGIC CONDITIONS

4.1 GEOLOGIC SETTING

The site is located in Farmington City, Utah at an elevation ranging from 4400 to 4830 feet above mean sea level within the eastern portion of the Salt Lake Basin. The Salt Lake basin is a deep, sediment-filled structural basin of Cenozoic age flanked by the Wasatch Range and Wellsville Mountains to the east and the Promontory Mountains, the Spring Hills, and the West Hills to the west (Hintze, 1980). The southern portion of the Salt Lake Basin is bordered on the west by the east shore of the Great Salt Lake. The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah (Stokes, 1986).

The near-surface geology of the Salt Lake Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983; Hintze, 1993). As the lake receded, streams began to incise large deltas that had formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover.

Surface sediments within the subject site are mapped as uppermost Pleistocene lacustrine sand (lbpg) mapped below the Provo shoreline where deposits cannot be correlated with a specific phase of the Bonneville Lake Cycle (Nelson and Personius, 1993). This unit is reported to consist of sand, silty sand, gravelly sand, and minor silt. Often consists of a thin, discontinuous veneer of Provo regressional deposits, overlying Bonneville transgressional deposits. Numerous shorelines developed on these deposits usually cannot be identified as either trangressional or regressional.

4.2 TECTONIC SETTING

The majority of the subject site is located on the west dipping bench located along the western foothills of the Wasatch Mountain Range. The Weber segment of the Wasatch fault zone is mapped trending through or adjacent to the western side of the subject site. A steeply west dipping scarp trends along the Weber segment. The Weber segment extends for about 35 miles from its southern terminus to northern terminus (Nelson and Personius, 1993). The southern terminus of the Weber Segment occurs at the Salt Lake Salient, a ridge of Paleozoic and Tertiary bedrock that extends west of the Wasatch Front at the northern end of the Salt Lake rupture

segment. The geometry of linkage between the main rupture zones in the Weber segment and faults in the interior of the Salt Lake salient is not clear. Surface scarps at the southern margin of the salient are discontinuous but apparently extend into the large normal fault along the eastern boundary of the segment. There is no reported evidence for Quaternary movement on this fault in the interior of the salient, so presumably the Quaternary ruptures have not reactivated most of this fault. The Pleasant View Salient marks the boundary between the Weber Segment and the Brigham City Segment to the north (Personius, 1986, Zoback, 1983). Prior paleoseismic studies report that the Weber segment of the Wasatch fault is thought to have experienced four surface faulting seismic events since the middle Holocene. Nelson and others (2006) report four surface faulting seismic events since the middle Holocene with the most recent event being a partial segment rupture which occurred approximately 500 years ago resulting in a 1.6 feet surface rupture displacement. DuRoss and others (2009) report evidence from the 2007 Rice Creek trench site of as many as six surface faulting seismic events during the Holocene with four surface faulting events in approximately the past 5,400 years. This data from DuRoss and others (2009) supports the partial segment surface rupture timing reported by Nelson and others (2006). A location near Kaysville, Utah indicated that the Weber Segment has a measureable offset of 1.4 to 3.4 meters per event (McCalpin and others, 1994). The Weber Segment may be capable of producing earthquakes as large as magnitude 7.5 (Ms). The consensus preferred recurrence interval for the Weber segment, determined by the Utah Quaternary Fault Working Group, is approximately 1,400 years for the past four surface fault rupture earthquakes (Lund, 2005).

The site is also located approximately 9 miles east of the East Great Salt Lake fault zone (Hecker, 1993). Evidence suggests that this fault zone has been active during Holocene times (0 to 10,000 years) and has segment lengths comparable to that of the Wasatch fault zone, indicating that it is capable of producing earthquakes of a comparable magnitude (7.5 Ms).

Analysis of the ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Salt Lake City region. Each of the faults listed above show evidence of Holocene-aged movement, and is therefore considered active.

AGEC
Applied GeoTech

January 6, 2016

Farmington City - Planning Commission
160 South Main Street
Farmington, Utah 84025

Attention: Eric Anderson
EMAIL: eanderson@farmington.utah.gov

Subject: Review of Geologic and Geotechnical Investigation Reports
Farmington Hills Development
400 North to 100 North 350 East
Farmington, Utah
Project No. 1151090

Gentlemen:

Applied Geotechnical Engineering Consultants, Inc. (AGEC) was requested to review the geologic hazards assessment report for the Farmington Hills development in Farmington, Utah prepared by Geostrata for Elite Craft Homes under Geostrata Job No. 1039-002 dated October 15, 2015. We were requested to review the geotechnical investigation report prepared by the same company for the same client under Geostrata Job No. 1039-002 dated October 19, 2015. The preliminary plat dated November 19, 2015 was provided.

GEOLOGIC HAZARDS ASSESSMENT REVIEW

The geologic hazards assessment report addresses surface-fault-rupture, rockfall and alluvial-fan-flooding/debris-flow hazards. The geotechnical report addresses liquefaction and slope-stability hazards.

1. Surface-fault-rupture Hazard

The surface-fault-rupture hazard is generally adequately addressed in the report. Plate A-7 shows a non-buildable area, which we assume is primarily associated with slope stability and faulting. However, the non-buildable area has a gap just west of the Geostrata-mapped fault shown on the plate, which we expect should be designated as a non-buildable area. A clarification should be provided by Geostrata indicating what is intended by this gap in the non-buildable area.

Condition

We recommend that building excavations within the surface-fault-rupture-hazard, special-study area be observed at the time of construction by a geologist to determine if there are potentially active faults which extend into this area. Building locations should be modified accordingly.

Condition

2. Alluvial-fan Flooding/Debris Flow

The study indicates that debris flow is a potential hazard within a drainage that cuts through Lot 22 and may be a concern for driveways at Lots 22 and 23 which are proposed to cross the drainage. It is stated that modifications to the drainage could have an influence on the extent of the debris-flow-hazard area. We recommend that the area of debris-flow hazard be delineated on plans for the proposed development. The expected debris-flow volume should be quantified to allow for appropriate mitigation design as needed.

Condition

3. Rockfall

The report indicates that rockfall is a potential hazard in the eastern portion of the property. The area of potential hazard should be delineated on a map to identify the area of concern.

Condition

Construction of a chainlink fence or other form of deflection structure is recommended in the report. The location, design and size of the rock fall mitigation structures should be provided.

4. Landslides

The geologic hazards assessment report does not address landslides. We recommend that the geologist review aerial photographs, geologic literature, Lidar data and other information along with site reconnaissance to determine if there is evidence of landslides on or near the property. The geologist should be involved in selecting appropriate cross sections and subsurface conditions for the slope stability analysis provided in the geotechnical study.

further study

GEOTECHNICAL INVESTIGATION REVIEW

The geotechnical investigation report generally addresses geotechnical concerns associated with the project with the exception of slope stability and the selection of a granular subgrade for design of the pavement section. Subsurface exploration in the eastern portion of the property appears to be lacking.

1. Slope Stability

Subsurface investigation to a depth of 13 feet for a reported slope height of 370 feet and slopes of up to 1½ horizontal to 1 vertical is typically not considered adequate to characterize subsurface conditions for slope stability evaluation. We recommend deeper subsurface investigation be performed in key areas where slope stability may be a concern for the proposed development. Cut and fill slopes for the roads planned to extend up the relatively steep slope in the western portion of the property should be evaluated from a slope stability standpoint. Retaining systems for both cut and fill slopes should be appropriately designed.

Further study

conditions

(1) (2)

The friction value used in the stability analysis is high considering the presence of sand and unknown soil conditions below the investigated depth. Deeper subsurface investigation and likely more laboratory testing along with correlations of strength to material types given in published literature will provide a better understanding of subsurface material strengths and allow for selection of suitable strength values.

The model for the slope stability analysis does not include a water table. This might be an appropriate assumption, however, the depth of exploration is not great enough to identify whether or not there is a water table. The geotechnical engineer should consider the potential for a water table to develop in the slope due to water infiltration from landscape watering and other factors that may result in a change in subsurface water conditions due to the proposed development.

The locations of slope profiles used for the stability analysis are not shown.

2. Pavement Design

The pavement recommendations given in the report are based on a granular subgrade although clay was encountered in the western portion of the site. Recommendations for an alternative pavement section should be provided for areas of clay subgrade.

3. Subsurface Investigation

There are no reported test pits, borings or trenches for the eastern portion of the property. As previously noted, the depth of investigation for the slopes in western portion of the property is not considered adequate. Additional subsurface investigation is recommended.

4. Lateral Earth Pressures

It appears a friction angle of 40 degrees and soil unit weight of 120 pounds per cubic foot were used for lateral earth pressure recommendations. Such values may be low for backfill types and compaction methods that may be used. The amount of movement required to develop the passive pressure recommended may be more than what is considered acceptable for some structures. The recommended seismic increases do not appear to be consistent with IBC 2012.

5. Clay

Clay was encountered in some of the test pits. It appears the clay was not considered in most geotechnical recommendations.

6. Seismic Design Information

The values provide for the mapped acceleration parameters are not consistent with the IBC 2012 values. The table on page 8 mixes Site Class D with Site Class C information.

PRELIMINARY PLAT REVIEW

The preliminary plat provided to us does not incorporate recommendations provided in the geologic and geotechnical studies. The subdivision layout should be modified to include recommendations from these studies along with additional information developed by the geologic/geotechnical consultant with completion of additional studies recommended herein.

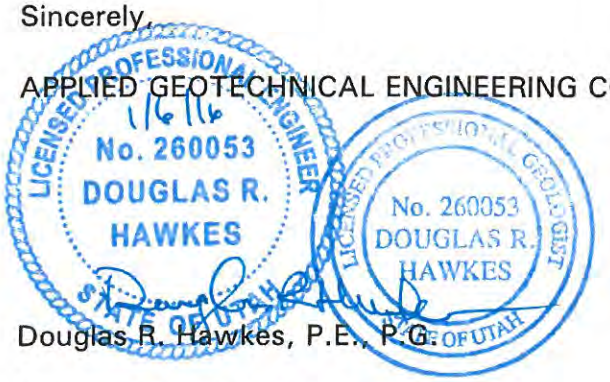
LIMITATIONS

This letter has been prepared in accordance with generally accepted geologic and geotechnical engineering practices in the area for the use of the client. The conclusions and recommendations included in the letter are based on our understanding of the site and review of the consultant's reports. We have not performed an independent study for the proposed development.

If you have questions or if we can be of further service, please call.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Douglas R. Hawkes, P.E., P.G.

Reviewed by JRM, P.E.

DRH/rs

14425 South Center Point Way Bluffdale, Utah 84065
Phone (801) 501-0583 | Fax (801) 501-0584

Revised Geotechnical Investigation
Farmington Hills Development
Farmington, Utah

GeoStrata Job No. 1039-002

February 26, 2016

Prepared for:

Elite Craft Homes
40 North 100 East
Farmington, Utah
Attention: Mr. Jerry Preston

Learn More

1.0 EXECUTIVE SUMMARY

This report presents the results of a revised geotechnical investigation conducted for the Farmington Hills residential development located in Farmington, Utah. GeoStrata previously completed a geotechnical investigation for the proposed development, the results of which are summarized in a report titled "Geotechnical Investigation, Farmington Hills Development, Farmington, Utah, GeoStrata project number 1039-002, and dated October 19, 2015. GeoStrata received review comments from the City's reviewing agency, AGEC, in a letter dated January 6, 2016. In this letter, prepared by Mr. Douglas R. Hawkes, P.E., P.G., a total of 4 review comments were prepared concerning geological issues, and another 6 comments were prepared concerning geotechnical issues. The purposes of this additional investigation and revised geotechnical report were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and pavements while taking into account the review comments presented in the January 6, 2016 AGEC report.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are complied with. Subsurface conditions were investigated through the excavation of nine exploratory test pits that extended to depths ranging from 6 to 13 feet below the site grade, and two boreholes that extended to depths ranging from 67½ to 75½ feet below the existing site grade as it existed at the time of our investigation. The subject property is overlain by 1 to 2½ feet of topsoil composed of silt, sand, and gravel. Underlying the topsoil we encountered Pleistocene-aged lacustrine sand and gravel deposits which extended to depths ranging from 61½ to 70 feet before grading into bedrock consisting of the Farmington Formation.

All fill placed for the support of structures, concrete flatwork or pavements should consist of structural fill. Structural fill may consist of native sand and gravel soils with particles larger than 4 inches in diameter removed or an imported material. Structural fill may also consist of the native clay and silt soils, however the contractor should be aware that it can be difficult to moisture condition and compact the clay and silt soils to the specified maximum density. All structural fill should be free of vegetation, debris or frozen material, and should contain no inert materials larger than 4 inches nominal size. Alternatively, an imported structural fill meeting the specifications presented in the report may be used.

The foundation for the proposed structures may consist of conventional strip and/or spread footings founded on undisturbed native silty sand or gravel soils or on structural fill. Conventional strip footings founded entirely on these materials may be proportioned for a maximum net allowable bearing capacity of **2,500 psf**. Conventional strip footings founded entirely on undisturbed native silt and clay soils may be proportioned for a maximum net allowable bearing capacity of **1,500 psf**.

An assumed CBR of 10.0 for near surface granular soils and an assumed CBR of 3.0 for near surface fine-grained soils were utilized in the pavement design. Based on assumed traffic loads, we recommend the following pavement sections for areas underlain by granular soils;

Flexible Pavement Section – coarse-grained soils	
Asphalt Concrete (in)	Untreated Base Course (in)
3	8

Flexible Pavement Section – coarse-grained soils		
Asphalt Concrete (in)	Untreated Base Course (in)	Granular Borrow (in)
3	6	6

Whereas the following pavement sections are recommended for areas underlain by fine-grained soils;

Flexible Pavement Section – fine-grained soils	
Asphalt Concrete (in)	Untreated Base Course (in)
3	18

Flexible Pavement Section – fine-grained soils		
Asphalt Concrete (in)	Untreated Base Course (in)	Granular Borrow (in)
3	6	16

NOTE: This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a revised geotechnical investigation conducted for the proposed Farmington Hills residential development located in Farmington, Utah. GeoStrata previously completed a geotechnical investigation for the proposed development, the results of which are summarized in a report titled "Geotechnical Investigation, Farmington Hills Development, Farmington, Utah, GeoStrata project number 1039-002, and dated October 19, 2015. GeoStrata received review comments from the City's reviewing agency, AGEC, in a letter dated January 6, 2016. In this letter, prepared by Mr. Douglas R. Hawkes, P.E., P.G., a total of 4 review comments were prepared concerning geological issues, and another 6 comments were prepared concerning geotechnical issues. The purposes of this additional investigation and revised geotechnical report were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and pavements while taking into account the review comments presented in the January 6, 2016 AGEC report. It should be noted that the geological issues presented in the January 6, 2016 letter will be addressed in a separate report.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report as in accordance with our signed proposal dated June 19, 2015. The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report.

2.2 PROJECT DESCRIPTION

The subject project consists of an approximately 44 acre parcel located in Farmington, Utah (See Plate A-1, *Site Vicinity Map*). We understand that the development will consist of 29 residential building lots occupied by single-family residential buildings one to two stories in height with basements. We anticipate footings loads on the order of 3 to 5 klf. Several residential roads along with associated utilities curb & gutter, and sidewalks within the development will also be a part of the proposed construction. We assume that the loads associated with these structures will be relatively light.

3.0 METHOD OF STUDY

3.1 SUBSURFACE INVESTIGATION

As part of our original investigation, subsurface soil conditions were explored by excavating six exploratory trenches (TP-1 to TP-6) at representative locations across the site. Representative faces of each of the trenches were logged as part of a geotechnical investigation. The trenches were excavated to depths ranging from 6 to 13 feet below the site grade as it existed at the time of our investigation. As part of our updated field investigation, GeoStrata returned to the site and completed two additional exploratory boreholes (B-1 and B-2) and three additional test pits (TP-7 to TP-9) in order to further our understanding of the subsurface soils as well as to assess the slope stability at the site. Our boreholes extended to depths ranging from 67½ to 75½ feet below the existing site grade, and were advanced near the steepest slopes within the vicinity of the proposed development. The boreholes were advanced using a Mobile B-80 truck-mounted drill rig, and ODEX drilling was utilized. In addition, three additional test pits were advanced as part of our updated field investigation (TP-7 to TP-9). These test pits were excavated on the eastern portion of the site, and extended to depths ranging from 11 to 13 feet below the existing site grade, and were excavated to gain additional information about the subsurface soils on the eastern portions of the lot.

The approximate locations of all of our explorations are shown on the *Exploration Location Map*, Plate A-2 in Appendix A. Exploration points were selected to provide a representative cross section of the subsurface soil conditions in the anticipated vicinity of the proposed structures. Subsurface soil conditions as encountered in the explorations were logged at the time of our investigation by a qualified geotechnical engineer and are presented on the enclosed on our original Test Pit Logs as well as on our updated Test Pit Logs and Borehole Logs, Plates B-1 to B-14 in Appendix B. A *Key to USCS Soil Symbols and Terminology* is presented on Plate B-15.

Both relatively undisturbed and bulk soil samples were obtained in each of our original and updated test pit explorations. Bulk samples were collected from each trench location placed in bags and buckets. Due to the relatively granular nature of the soils exposed during our investigation, it was not feasible to collect undisturbed soil samples. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the *Unified Soil Classification System* (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Test Pit and Borehole logs.

3.2 LABORATORY TESTING

Geotechnical laboratory tests were conducted on samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. As mentioned previously, due to the relatively granular nature of the subsurface soils, it was not feasible to obtain relatively undisturbed samples, and as such our laboratory testing was limited. Laboratory tests conducted during this investigation include:

- Grain Size Distribution (ASTM D422)
- Direct Shear Test (ASTM D3080)

The results of laboratory tests are presented on the Test Pit and Borehole Logs in Appendix B (Plates B-1 to B-14), the Laboratory Summary Table and the test result plates presented in Appendix C (Plates C-1 to C-7).

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care.

7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our limited field exploration, laboratory testing, and understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil and groundwater conditions could exist between and beyond the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, GeoStrata should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, GeoStrata should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction. GeoStrata staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement.
- Observation of foundation soils to assess their suitability for footing placement.
- Observation of soft/loose soils over-excavation.
- Observation of temporary excavations and shoring.
- Consultation as may be required during construction.
- Quality control and observation of concrete placement.

We also recommend that project plans and specifications be reviewed by GeoStrata to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 501-0583.

0 1,500 3,000 6,000 9,000 12,000 Feet

Base Map:
NAIP 2011 1m Orthophotography.

N

GeoStrata

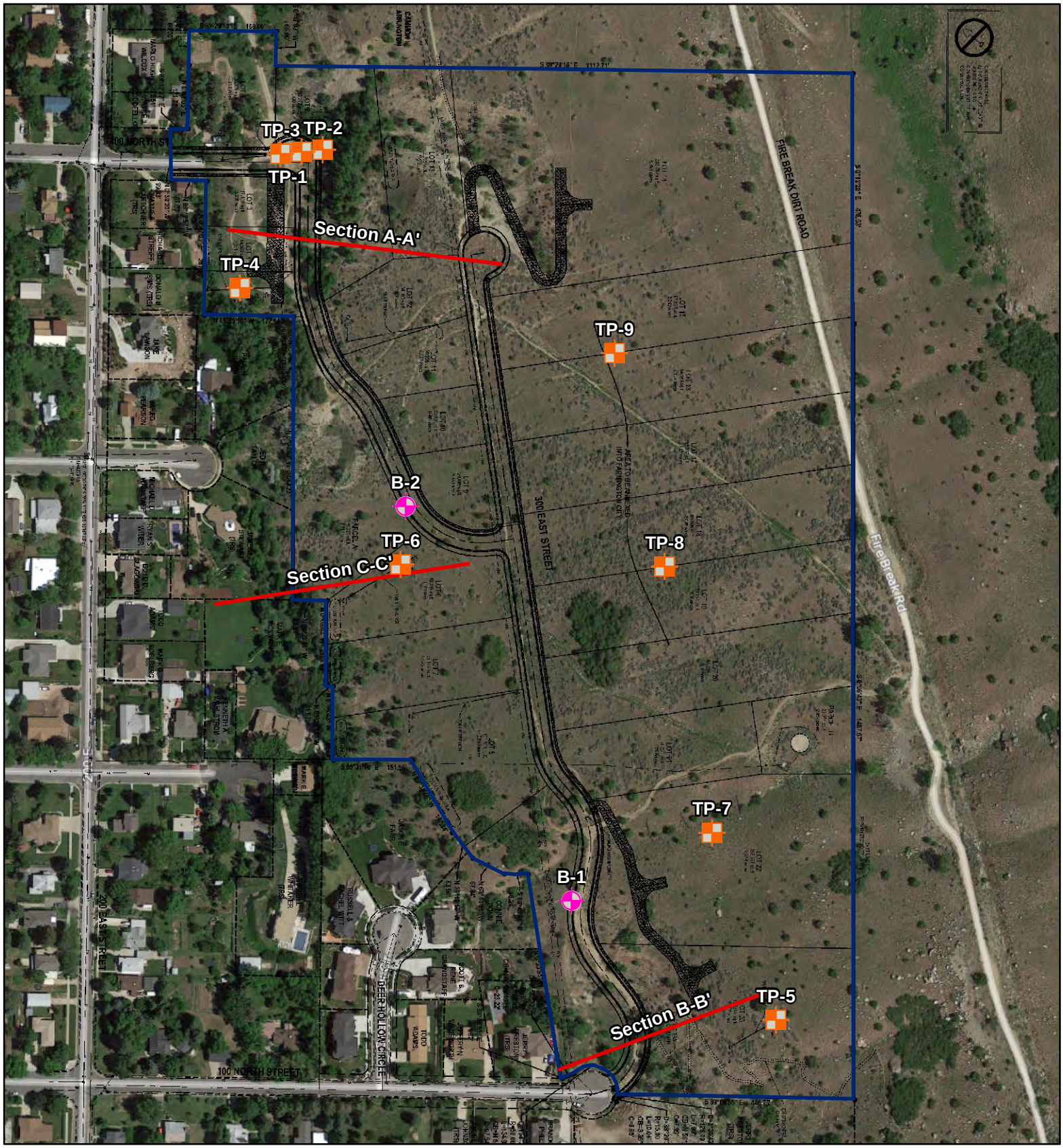
Legend

Approximate Site Boundary

Elite Craft Homes
Farmington Hills Subdivision
Farmington, UT
Project Number: 1039-002

Site Vicinity Map

Plate A-1



0 95 190 380 570 760 Feet

Base Map:
Utah AGRC Hybrid Basemap
Preliminary Plat, Ensign Engineering, 2015

N

GeoStrata

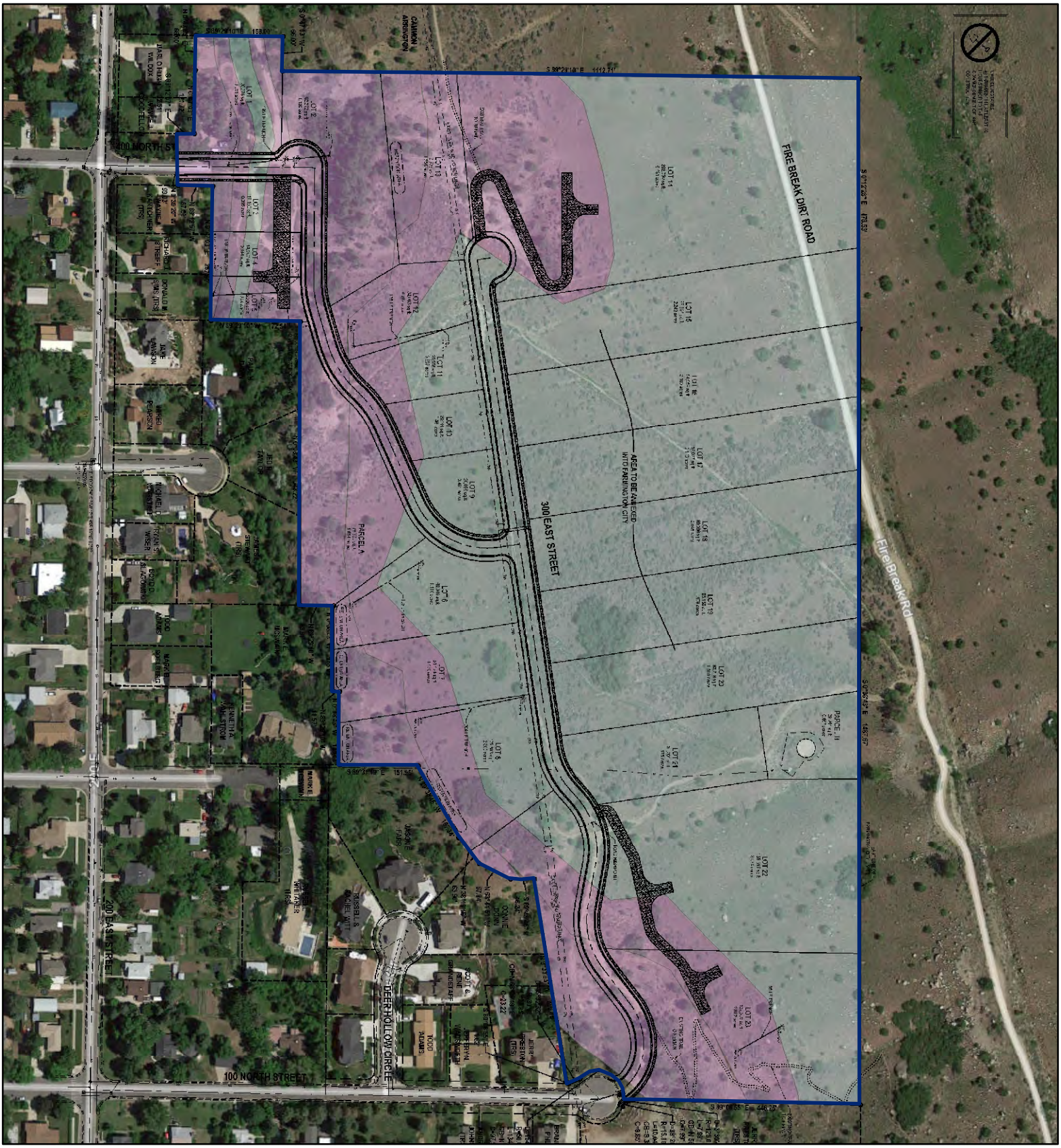
Legend

- Approximate Boring Location
- Approximate Test Pit Location
- Slope Cross Section
- Approximate Site Boundary

Elite Craft Homes
Farmington Hills Subdivision
Farmington, UT
Project Number: 1039-002

Exploration Location Map

Plate A-2



0 100 200 400 600 800 Feet

Base Map:
Utah AGRC Hybrid Basemap
Preliminary Plat, Ensign Engineering, 2015

N

GeoStrata

Legend

- Approximate Site Boundary

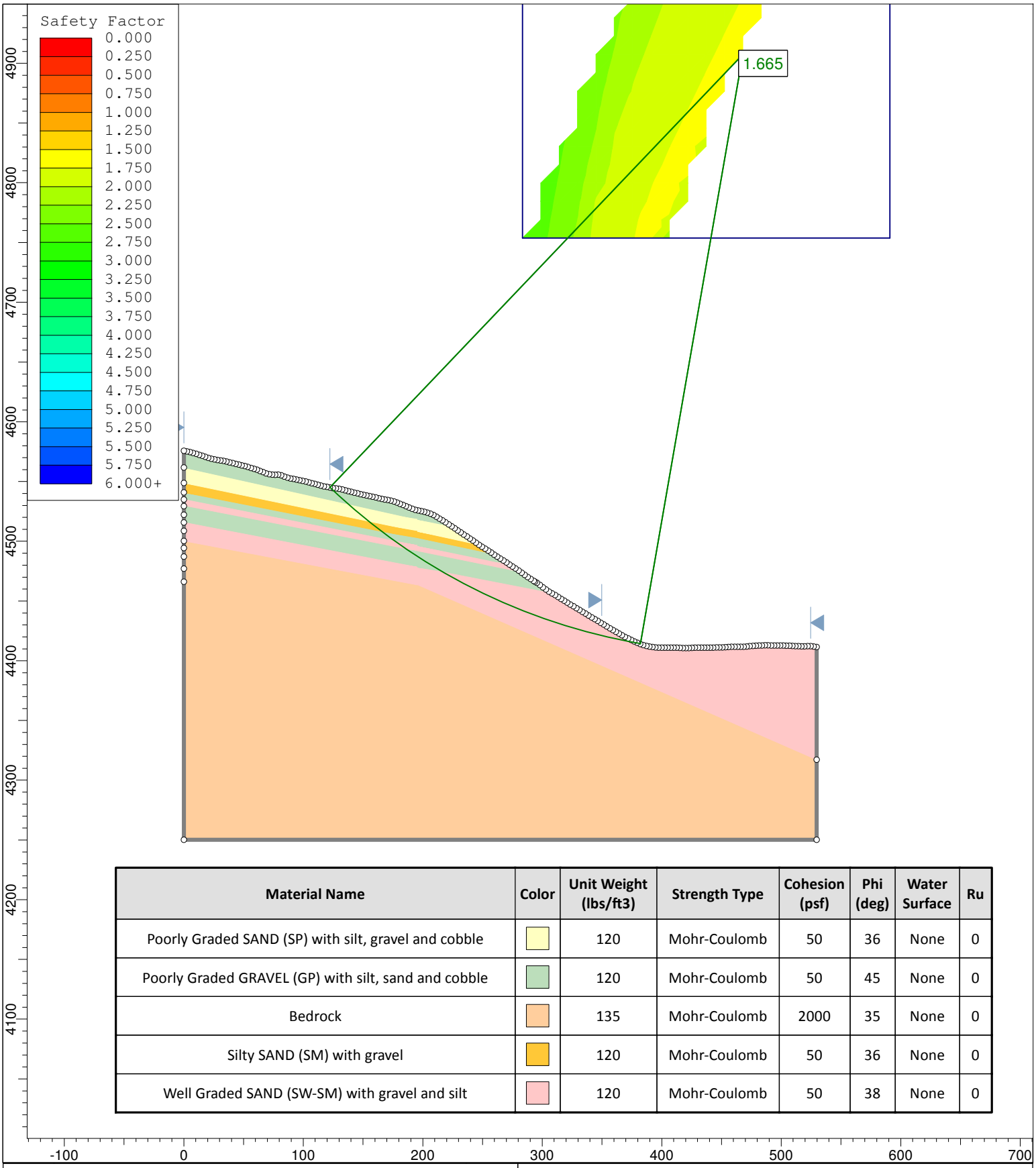
BuildableArea

- Buildable Area
- Non-Buildable Area

Elite Craft Homes
Farmington Hills Subdivision
Farmington, UT
Project Number: 1039-002

Setback Map

Plate A-3



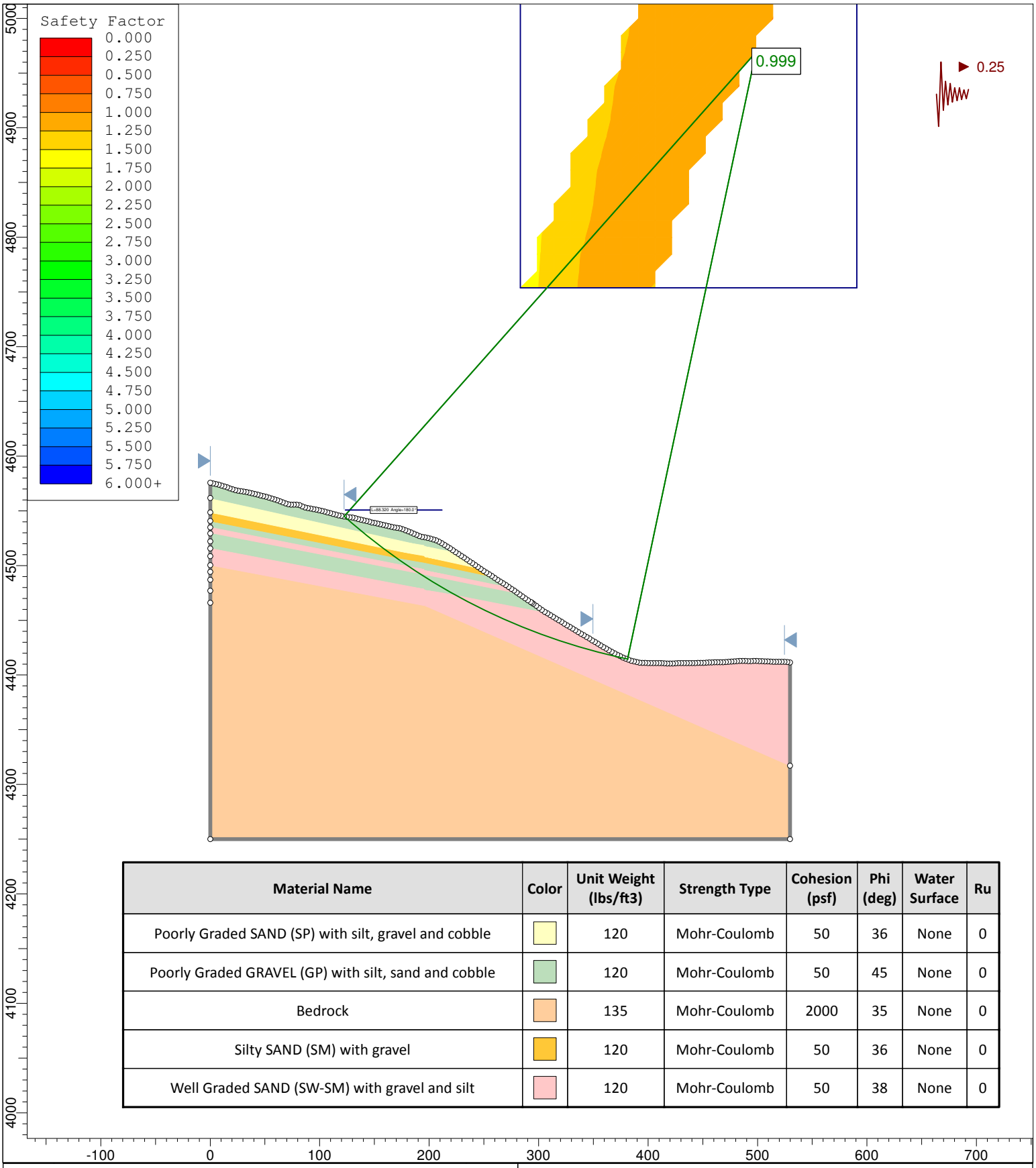
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Poorly Graded SAND (SP) with silt, gravel and cobble		120	Mohr-Coulomb	50	36	None	0
Poorly Graded GRAVEL (GP) with silt, sand and cobble		120	Mohr-Coulomb	50	45	None	0
Bedrock		135	Mohr-Coulomb	2000	35	None	0
Silty SAND (SM) with gravel		120	Mohr-Coulomb	50	36	None	0
Well Graded SAND (SW-SM) with gravel and silt		120	Mohr-Coulomb	50	38	None	0

GeoStrata

Farmington Hills - Section A-A' Static

Farmington Hills Development
Elite Craft Homes
Farmington, Utah
GeoStrata Project No. 1039-001

Plate D-1



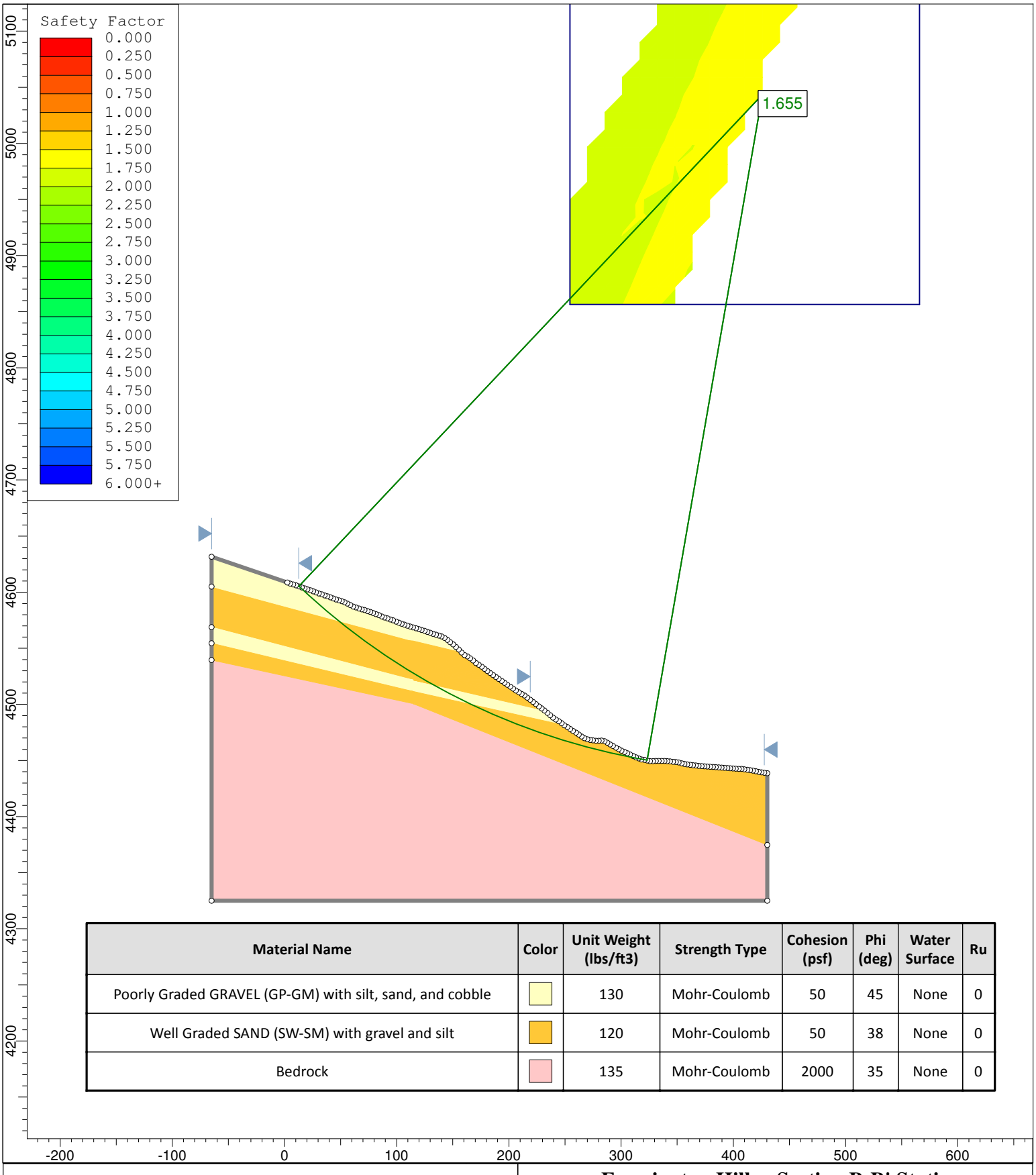
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Poorly Graded SAND (SP) with silt, gravel and cobble		120	Mohr-Coulomb	50	36	None	0
Poorly Graded GRAVEL (GP) with silt, sand and cobble		120	Mohr-Coulomb	50	45	None	0
Bedrock		135	Mohr-Coulomb	2000	35	None	0
Silty SAND (SM) with gravel		120	Mohr-Coulomb	50	36	None	0
Well Graded SAND (SW-SM) with gravel and silt		120	Mohr-Coulomb	50	38	None	0

GeoStrata

Farmington Hills - Section A-A' PStatic

Farmington Hills Development
Elite Craft Homes
Farmington, Utah
GeoStrata Project No. 1039-001

Plate D-2



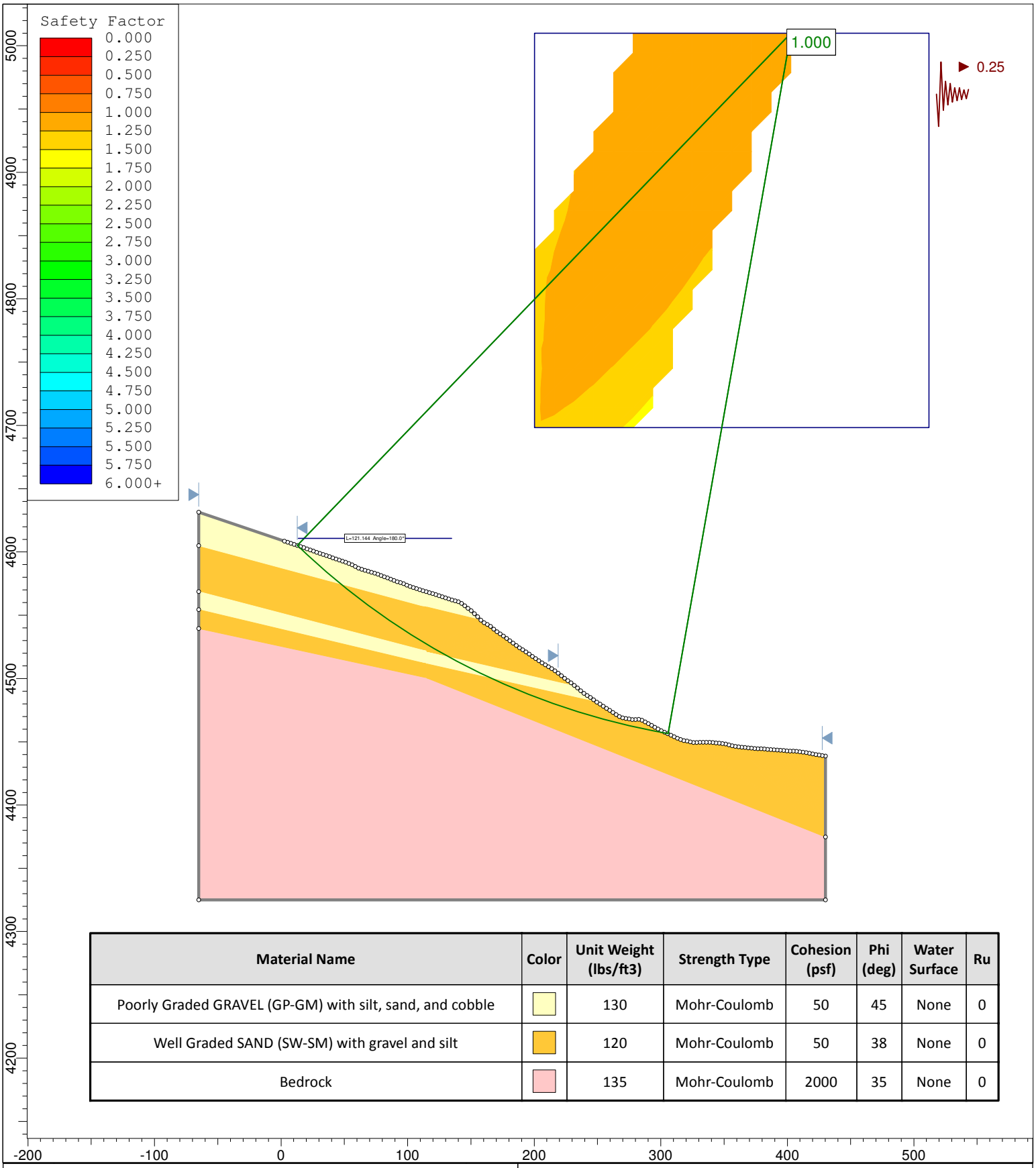
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Poorly Graded GRAVEL (GP-GM) with silt, sand, and cobble		130	Mohr-Coulomb	50	45	None	0
Well Graded SAND (SW-SM) with gravel and silt		120	Mohr-Coulomb	50	38	None	0
Bedrock		135	Mohr-Coulomb	2000	35	None	0

GeoStrata

Farmington Hills - Section B-B' Static

Farmington Hills Development
Elite Craft Homes
Farmington, Utah
GeoStrata Project No. 1039-001

Plate D-3



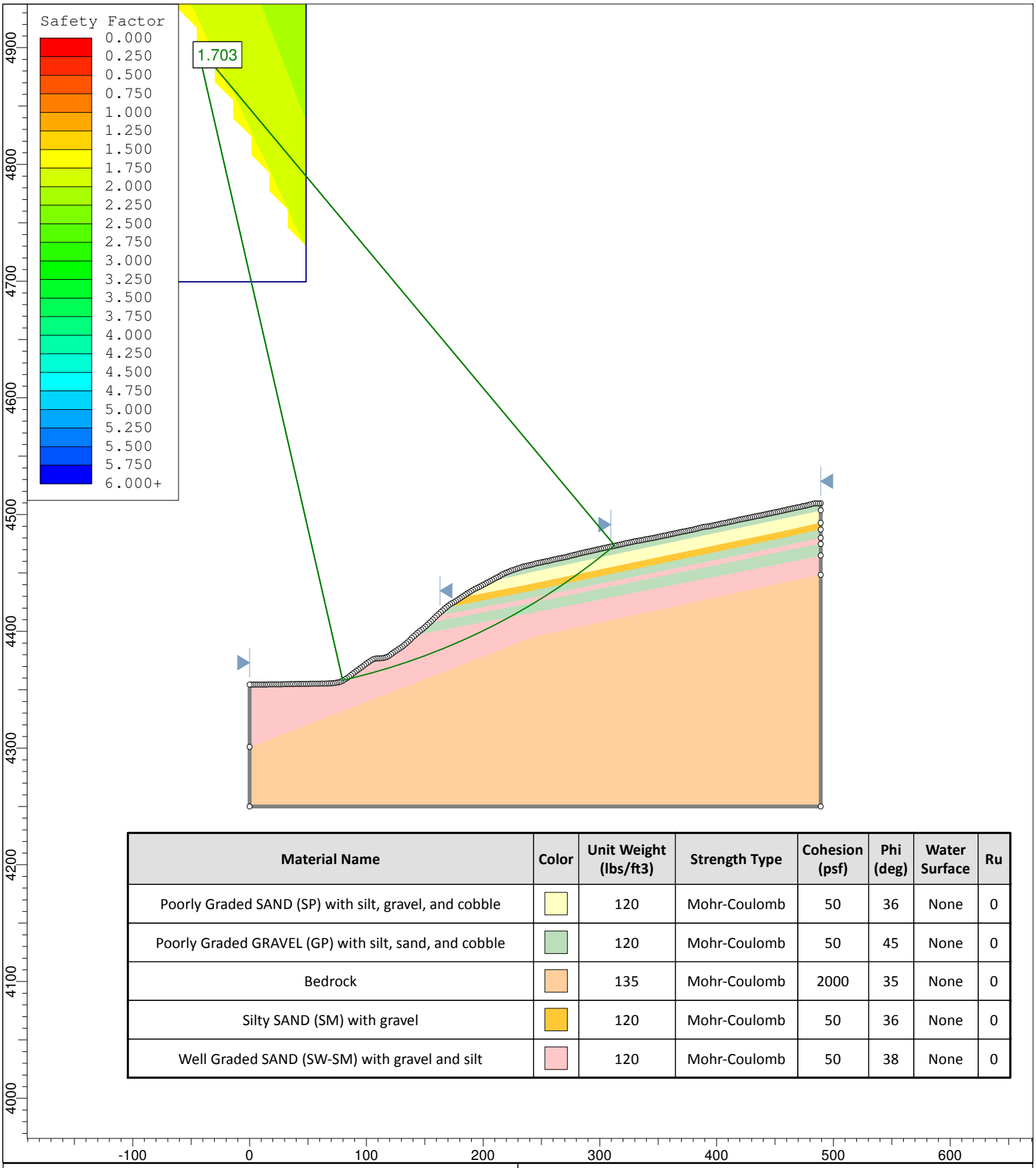
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Poorly Graded GRAVEL (GP-GM) with silt, sand, and cobble		130	Mohr-Coulomb	50	45	None	0
Well Graded SAND (SW-SM) with gravel and silt		120	Mohr-Coulomb	50	38	None	0
Bedrock		135	Mohr-Coulomb	2000	35	None	0

GeoStrata

Farmington Hills - Section B-B' PStatic

Farmington Hills Development
Elite Craft Homes
Farmington, Utah
GeoStrata Project No. 1039-001

Plate D-4



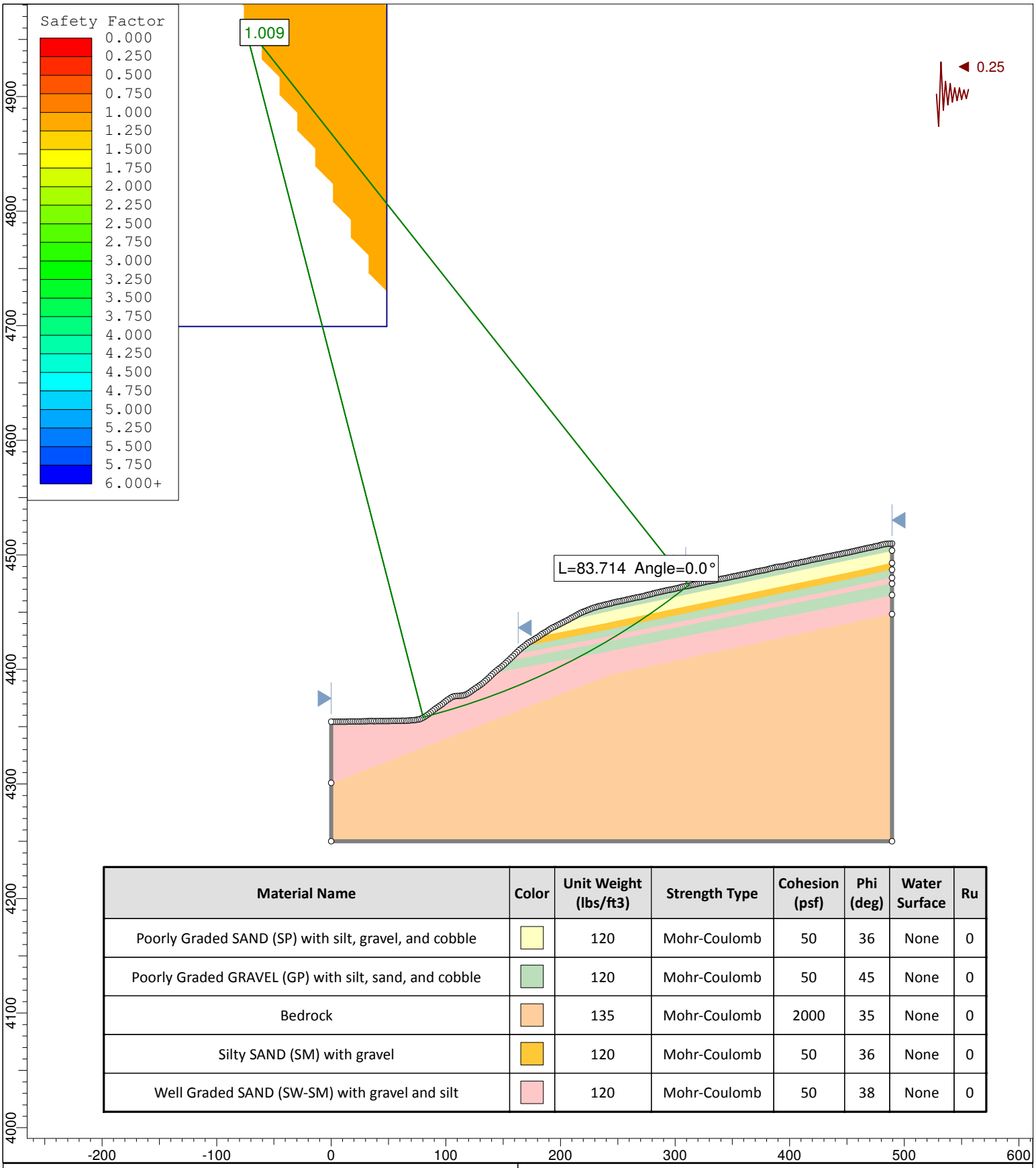
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Poorly Graded SAND (SP) with silt, gravel, and cobble		120	Mohr-Coulomb	50	36	None	0
Poorly Graded GRAVEL (GP) with silt, sand, and cobble		120	Mohr-Coulomb	50	45	None	0
Bedrock		135	Mohr-Coulomb	2000	35	None	0
Silty SAND (SM) with gravel		120	Mohr-Coulomb	50	36	None	0
Well Graded SAND (SW-SM) with gravel and silt		120	Mohr-Coulomb	50	38	None	0

GeoStrata

Farmington Hill - Section C-C' Static

Farmington Hills Development
Elite Craft Homes
Farmington, Utah
GeoStrata Project No. 1039-002

Plate D-5



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Poorly Graded SAND (SP) with silt, gravel, and cobble		120	Mohr-Coulomb	50	36	None	0
Poorly Graded GRAVEL (GP) with silt, sand, and cobble		120	Mohr-Coulomb	50	45	None	0
Bedrock		135	Mohr-Coulomb	2000	35	None	0
Silty SAND (SM) with gravel		120	Mohr-Coulomb	50	36	None	0
Well Graded SAND (SW-SM) with gravel and silt		120	Mohr-Coulomb	50	38	None	0

GeoStrata

Farmington Hill - Section C-C' PStatic

Farmington Hills Development
Elite Craft Homes
Farmington, Utah
GeoStrata Project No. 1039-002

Plate D-6

AGEC
Applied GeoTech

March 3, 2016

Farmington City - Planning Commission
160 South Main Street
Farmington, Utah 84025

Attention: Eric Anderson
EMAIL: eanderson@farmington.utah.gov

Subject: Review of Revised Geotechnical Report and
Response to Review Comments
Farmington Hills Development
400 North to 100 North 350 East
Farmington, Utah
Project No. 1151090

Gentlemen:

Applied Geotechnical Engineering Consultants, Inc. (AGEC) was requested to review the revised geotechnical report, addendum letter dated March 2, 2016 and the response to our review comments from Geostrata. The revised geotechnical study is dated February 26, 2016 under Job No. 1039-002. The letter with the response to our review comments is dated February 28, 2016. We previously provided review comments for reports prepared by Geostrata for the Farmington Hills development and submitted our letter dated January 6, 2016 under Project No. 1151090.

REVISED GEOTECHNICAL STUDY REVIEW

We find the geotechnical study to be adequate in addressing geotechnical concerns.

GEOSTRATA RESPONSE LETTER REVIEW

The geotechnical aspects of the project are addressed in the revised geotechnical report and addendum letter.

1. Faulting and Landslide
The comments with respect to faulting and landslides are addressed adequately in the response letter.

2. Alluvial-fan Flooding/Debris Flow

The alluvial-fan flooding/debris flow is discussed in the response letter. However, it is our professional opinion that the site is not located on a debris-flow fan and thus neither of these hazards are significant at the property. Flooding along drainages could be a concern and should be addressed by the civil engineer for the project as there are several small drainages that cross through the site and flooding along these drainages may be a concern. The review of such flood control design should be reviewed by individuals who are familiar with such designs.

3. Rockfall

Review of the rockfall-hazard study would require significantly more time in which we would need to visit the site and observe source areas and run out areas, review aerial photographs and likely perform our own analysis to determine the adequacy of the study provided by Geostrata. We can provide this additional service, if requested.

Review of aerial photographs from 1952 and looking at Google Earth images of recent conditions, would indicate that there are boulders on the ground surface in the eastern portion of the site. Several of these boulders are located west of the area shown as "rockfall hazard zone" on Plate A-12 of the Geostrata letter. A profile of the ground surface from the cliffs above the site to beyond the site was developed based on the USGS 7½ minute quadrangles of the area. The boulders on the property are within the expected shadow angle (The angle formed from the cliff base to the boulders.) given in the published literature for potential rockfall shadow angles (Turner and Schuster, 2012) and thus it is reasonable to expect that the boulders came in the form of rockfall from the cliffs above the site. However, installation of rockfall mitigation features such as rock fences or berms at the r ecommended locations would sufficiently mitigate the rockfall hazard west of such features if the rockfall mitigation features are suitably designed. It would provide no protection for rockfall hazard east of such structures.

Plate A-7b shows buildable areas east of recommended rockfall mitigation zones and in some areas of slopes greater than 30 percent. The Farmington City Foothill ordinance does not allow development of areas having slopes of 30 percent or greater. The buildable area shown on Plate A-7b should be modified accordingly.

PRELIMINARY PLAT REVIEW

We have not received a revised preliminary plat to review for this project. We recommend that the subdivision layout be modified to include recommendations from the Geostrata studies.

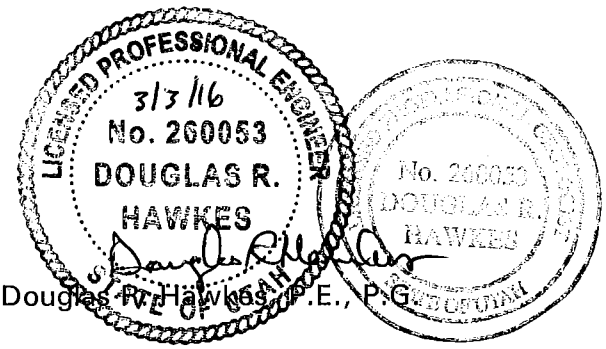
LIMITATIONS

This letter has been prepared in accordance with generally accepted geologic and geotechnical engineering practices in the area for the use of the client. The conclusions and recommendations included in the letter are based on our understanding of the site and review of the consultant's reports. We have not performed an independent study for the proposed development.

If you have questions or if we can be of further service, please call.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Douglas R. Hawkes, P.E., P.G.

Reviewed by JEN, P.E.

DRH/rs
Reference:

Turner, A.K. and Schuster, R.L., 2012; Rockfall characterization and control, Transportation Research Board, Washington, D.C.