Planning and Development Services
3300 South 1300 East • Millcreek, UT 84043
Phone: (801) 214-2700
email: jsmith@millcreek.us
www.millcreek.us

Geological Hazards Disclosure and Acknowledgement

Disclosure and Acknowledgement

Regarding Development of Property Located
Within a Geological Hazards Special Study Area

The undersigned , MIDWAY HOSPITALITY PARTNERS, LLC and RICHARD D. BURRASTON , hereby certify(ies) to be the owner(s) of the hereinafter described real property, which is located within Sale Lake County, State of Utah.

File/Permit Number: SD-20-010
Street Address: 3898 THOUSAND OAKS CIRCLE
Parcel Number SEE EXHIBIT "A" ATTACHED
Legal Description SEE EXHIBIT "A" ATTACHED
(For PUD's or Subdivision Only: PUD or Subdivision Name and Lot # are Sufficient)
Subdivision Name: 3898 THOUSAND OAKS SUBDIVISION
Lot #: 1-5

Acknowledges:

1. The property described above is either partially or wholly located within a Geological Hazards Special Study Area as defined in the Chapter 19.75, Geological Hazards Ordinance, in the Salt Lake County Code of Ordinances.

- ☐ Surface FaultRupture
- ☐ High Liquefaction Potential
- ☐ Moderate Liquefaction Potential
- ☑ Landslide
- ☐ Debris Flow
- ☐ Rock-Fall Path
- ☐ Avalanche Path

2. This file in accordance with the Geological Hazards Ordinance (Chapter 19.75) **requires:** ☑, **does not require:** ☐, site specific natural hazards study and report. If required by ordinance, a site specific geological hazards study and report has been prepared for the above described property which addresses the nature of the hazards and their potential effect on the proposed development of the property and the occupants thereof in terms of risk and potential damage. The report and conditions and requirements for development of the property are on file with the Salt Lake County Office of Township Services which is available for public inspection.

File #

13494343
12/10/2020 03:10 PM $40.00
Book - 11077 Pg - 9193-9212
RASHELLE HOBBS
RECORDER, SALT LAKE COUNTY, UTAH
3898 THOUSAND OAKS SUB
BY: JLA, DEPUTY - MA 20 P.

Planning and Development Services
3300 South 1300 East • Millcreek, UT 84043
Phone: (801) 214-2700
email: jsmith@millcreek.us
www.millcreek.us

Property Owner's Affidavit

Use This Section If Signing as an **Individual**

File #

STATE OF UTAH }
}ss
COUNTY OF SALT LAKE }

The foregoing instrument was acknowledged before me this _____ day of _____, _____,

By: _____.

Signed: _____

_____
Notary Public

My Commission Expires: _____

_____
Residing In

Use This Section If Signing as a **Corporation or Partnership**

STATE OF UTAH }
}ss
COUNTY OF ~~SALT LAKE~~ WASATCH }

The foregoing instrument was acknowledged before me this 4 day of December, 2020,

By: Bradley Wagstaff.

JULIE C. GILES
Notary Public
State of Utah
My Commission Expires 11/15/2022
COMMISSION NO. 703321

Signed: Bradley Wagstaff

Julie C Giles
Notary Public

My Commission Expires: 11-15-2022

Heber City, Utah
Residing In

Planning and Development Services
3300 South 1300 East • Millcreek, UT 84043
Phone: (801) 214-2700
email: jsmith@millcreek.us
www.millcreek.us

Property Owner's Affidavit

Use This Section If Signing as an **Individual**

File #

STATE OF UTAH }
}ss
COUNTY OF SALT LAKE }

The foregoing instrument was acknowledged before me this 4th day of december, 2020,
By: Richard Burraston.

Signed: Richard P Burraston

NOTARY PUBLIC
EMINA BAJRIC
COMM. # 708854
MY COMMISSION EXPIRES
OCTOBER 21, 2023
STATE OF UTAH

Emina Bajric
Notary Public

My Commission Expires: 10/21/2023

Salt Lake City, Utah
Residing In

Use This Section If Signing as a **Corporation or Partnership**

STATE OF UTAH }
}ss
COUNTY OF SALT LAKE }

The foregoing instrument was acknowledged before me this _____ day of _____, _____,

By: _____.

Signed: _____

_____
Notary Public

My Commission Expires: _____

_____
Residing In

EXHIBIT "A"

BOUNDARY DESCRIPTION

A PARCEL OF LAND BEING AN ENTIRE TRACT DESCRIBED IN THAT WARRANTY DEED, RECORDED AT ENTRY #12119097, IN BOOK 10355, ON PAGE 4598, IN THE OFFICE OF THE SALT LAKE COUNTY RECORDER. SAID PARCEL OF LAND IS LOCATED IN THE SOUTH HALF OF SECTION 01, TOWNSHIP 2 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN, IS DESCRIBED A FOLLOWS:

BEGINNING AT A POINT ON THE QUARTER SECTION LINE AT A LOT CORNER OF LOT 1506, MT. OLYMPUS HILLS NO. 15 SUBDIVISION, ACCORDING TO THE OFFICIAL PLAT THEREOF ON FILE AND OF RECORD IN THE SALT LAKE COUNTY RECORDER'S OFFICE, SAID POINT BEING SOUTH 00°03'00" EAST ALONG THE QUARTER SECTION LINE 3124.18 FEET FROM THE NORTH QUARTER CORNER OF SECTION 1, TOWNSHIP 2 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN, DAVIS COUNTY, UTAH; RUNNING THENCE NORTH 00°03'00" WEST 14.72 FEET ALONG SAID LOT LINE AND QUARTER SECTION LINE; THENCE NORTH 50°50'00" EAST 82.08 FEET ALONG THE SOUTHEASTERLY LINE OF SAID LOT 1506; THENCE SOUTH 39°10'00" EAST 119.85 FEET TO THE NORTHWEST LINE OF COVECREST DRIVE; THENCE SOUTH 50°50'00" WEST 2.99 FEET ALONG SAID LINE; THENCE SOUTHWESTERLY 11.35 FEET ALONG SAID LINE AND ALONG A 15.00-FOOT- RADIUS CURVE TO THE RIGHT, RUNNING THROUGH A CENTRAL ANGLE OF 43°20'42", CHORD BEARS SOUTH 72°30'21" WEST 11.08 FEET TO A POINT OF REVERSE CURVATURE; THENCE SOUTHWESTERLY 186.18 FEET ALONG SAID LINE AND ALONG A 40.00-FOOT-RADIUS CURVE TO THE LEFT, THROUGH A CENTRAL ANGLE OF 266°41'01", CHORD BEARS SOUTH 39°09'48" EAST 58.18 FEET TO A POINT OF REVERSE CURVATURE; THENCE NORTHEASTERLY 11.35 FEET ALONG SAID STREET AND ALONG A 15.00-FOOT-RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 43°20'19", CHORD BEARS NORTH 29°09'51" EAST 11.08 FEET; THENCE NORTH 50°50'00" EAST 3.00 FEET TO THE EASTERLY LINE OF COVECREST DRIVE; THENCE SOUTH 39°10'00" EAST 140.02 FEET ALONG THE SOUTHWEST LINE OF SAID LOT 11, MT. OLYMPUS COVE NO. 6 SUBDIVISION, ACCORDING TO THE OFFICIAL PLAT THEREOF ON FILE AND OF RECORD IN THE SALT LAKE COUNTY RECORDER'S OFFICE, AND ITS EXTENSION; THENCE SOUTH 52°16'00" WEST 63.77 FEET; THENCE SOUTH 80°04'00" WEST 65.32 FEET; THENCE SOUTH 64°11'00" WEST 33.24 FEET; THENCE NORTH 83°01'00" WEST 48.02 FEET; THENCE SOUTH 24°59'00" WEST 139.00 FEET; THENCE SOUTH 62°40'00 EAST 83.01 FEET; THENCE SOUTH 16°15'00" WEST 96.01 FEET; THENCE NORTH 85°10'00" WEST 54.91 FEET TO THE QUARTER SECTION LINE; THENCE SOUTH 00°03'00" EAST 34.76 FEET ALONG SAID QUARTER SECTION LINE TO NORTHEAST CORNER OF LOT 1526, MT. OLYMPUS HILLS NO. 15 SUBDIVISION, THENCE NORTH 51°00'00" WEST 203.94 FEET ALONG THE NORTHEAST LINE OF SAID LOT TO THE SOUTHEAST LINE OF THOUSAND OAKS CIRCLE; THENCE NORTH 39°00'00" EAST 65.00 FEET ALONG SAID SOUTHEAST LINE; THENCE NORTHEASTERLY 12.62 FEET ALONG A 15.00- FOOT-RADIUS CURVE TO THE RIGHT AND ALONG SAID LINE THROUGH A CENTRAL ANGLE OF 48°11'23", CHORD BEARS NORTH 63°05'41" EAST 12.25 FEET TO A POINT OF REVERSE CURVATURE; THENCE ALONG SAID LINE NORTHEASTERLY, A DISTANCE OF 217.07 FEET, ALONG A 45.00-FOOT-RADIUS CURVE TO THE LEFT, THROUGH A CENTRAL ANGLE OF 276°22'46", CHORD BEARS NORTH 51°00'00" WEST 60.00 FEET; TO A POINT OF REVERSE CURVATURE; THENCE SOUTHWESTERLY 12.62 FEET ALONG SAID STREET AND ALONG A 15.00-FOOT-RADIUS CURVE TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 48°11'23", CHORD BEARS SOUTH 14°54'19" WEST 12.25 FEET; THENCE SOUTH 39°00'00" WEST 15.27 FEET TO THE EASTERN MOST CORNER OF LOT 1522, MT. OLYMPUS HILLS NO. 15 SUBDIVISION, THENCE NORTH 51°00'00" WEST 120.61 FEET ALONG THE NORTHEAST LINE OF SAID LOT 1522 TO THE SOUTHEAST LINE OF LOT 1510 OF SAID SUBDIVISION; THENCE NORTH 46°40'00" EAST 356.53 FEET ALONG THE SOUTHEAST LINE OF LOTS 1510, 1509, AND 1508 OF SAID SUBDIVISION TO THE QUARTER SECTION LINE AND TO THE POINT OF BEGINNING.

PARCEL IDENTIFICATION NUMBERS:

22-01-332-013-0000
22-01-402-009-0000
22-01-376-001-0000
22-01-403-025-0000
22-01-332-012-0000
22-01-403-023-0000

CONSOLIDATED ENGINEERING
L A B O R A T O R I E S

October 29, 2020

Mogul Capital

Attention: Ms. Rachel M. Lambert
Vice President of Construction

Subject: **Geotechnical Investigation Report**
Thousand Oaks Subdivision
3892 E. Thousand Oaks Circle
Millcreek, Utah
CEL Project No. 20-57250

Dear Ms. Lambert,

Consolidated Engineering Laboratories (CEL), has completed a geotechnical investigation for the proposed Thousand Oaks Subdivision to be constructed at 3892 E. Thousand Oaks Circle in Millcreek, Utah. Field work for this investigation included excavation of three (3) test holes conducted on Tuesday, October 15, 2020. Field investigation results and geotechnical recommendations for foundation systems, site and subgrade preparation, excavation, pavements, and other construction considerations are presented herein. A summary of the geological hazards and recommendations for the mitigation of these risks as required by the City of Millcreek is included. This report has been prepared based on our understanding of the proposed construction, the results of our field work and laboratory data, and our experience in the local vicinity.

EXECUTIVE SUMMARY

The proposed site is suitable for construction, provided the recommendations contained in this report are followed. The following is a summary of our key findings and recommendations:

- The proposed construction at the site is geotechnically feasible, provided the recommendations of this report are implemented in the design and construction of the project. CEL anticipates our continued close involvement with the design and construction team as Geotechnical Engineer of Record (GEOR).
- Based on Utah Geological Survey hazard maps and special study literature, the project site is not located within an area indicated to pose risk for landslide, debris flow, or rockfall. Additionally, the immediate surrounding natural ground surface slopes less than 30 degrees. Therefore, a slope stability analysis and landslide evaluation is not required.
- The project site is located approximately ¼ mile outside of zones that require a special trench study for the Wasatch Fault. Therefore, a special fault trench study is not required.
- The subsurface soil conditions encountered in the test hole location attempted consist of gravel with cobbles, sand and silt to the maximum depth explored. Due to the inherent nature of the soil materials encountered at each location, practical refusal using a hand-auger was encountered at very shallow depths.. Groundwater was not encountered during site investigations. The existing

site for the proposed subdivision lots includes several existing single family residences and out-structures including swimming pools, tennis courts, landscaping and considerable site grading fills.

- New lightly loaded residential structures may be supported on conventional strip and spread shallow foundations bearing entirely on properly prepared natural soils, Site Grading Fill, or Structural Fill designed using an allowable bearing pressure of 1,500 psf.
- Based on the existing construction, CEL anticipates demolition activities will be required prior to construction. All demolition debris and other deleterious material should be completely removed from the project site prior to construction.
- Portions of the on-site soils that are screened to remove oversized materials may be considered for re-use as fill materials, provided they meet the specifications provided in this report and can be effectively segregated, processed and stockpiled onsite without contamination. The Contractor should make an independent assessment of the suitability of the on-site soils for re-use as fill.
- Based on the soils encountered during the exploration, the subsurface soil profile is best represented by Site Class D (Default), according to the 2018 IBC, based on an assumed shear wave velocity profile for the area. This Site Class may likely be refined to a more soil/rock profile upon further measurement using surface geophysics or other methods, if desired.

PROPOSED CONSTRUCTION

CEL was provided a site plan showing the proposed improvements for the Thousand Oaks Subdivision prepared by Entellus, dated October 11, 2019. The proposed subdivision consists of 5 residential lots in the Olympus Cove area of Millcreek, Utah. Some of the lots are occupied by existing single family residences, tennis courts, retaining walls and other pavements and structures. Other lots are currently vacant. Based on review of available aerial photographic images from Google Earth®, the existing structures appear to be at least 40 years old. The subdivision includes areas showing moderate evidence of previous cuts and site grading fills around the existing construction. The project site has coordinates of approximately 40.67298° north latitude and 111.78615° west longitude using Google Earth™ aerial images.

GEOLOGIC HAZARDS

The project site is located within an area of Millcreek subject to Chapter 19.75 of the Geologic Hazards Ordinance adopted by Millcreek City. Based on email communications between you and Mr. Frederick Lutze and Robert May of Millcreek City, it was identified that the subdivision requires a geologic hazards report addressing 1) Fault Surface Rupture and 2) Landslide, Debris Flow and Rockfall, included in the geotechnical investigation.

Based on the published Surface Fault Rupture Hazard Map of the Fort Douglas Quadrangle, Davis and Salt Lake Counties by UGS, 2018, the site is located approximately ¼ mile south and west of the closest projected surface fault trace of the Salt Lake Segment of the Wasatch Fault system, capable of producing a large earthquake on the order of 7.1 Magnitude. The proposed subdivision is located outside of mapped areas requiring further fault trench study to evaluate the presence of Surface Fault Rupture. A map showing the Wasatch Fault in relation to the project site is presented on *Figure 4: Fault Map.*

The project site is mapped as having a "Very Low" potential for liquefaction, suggesting there is a less than

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5% percent chance that the site may experience ground shaking strong enough to induce liquefaction in a 100-year time period (Anderson, 1990).

A map of the near-surface geology of the area is provided on *Figure A-3: Geology Map.* Based on this map, soils within the boundaries of the project site consist of young alluvial deposits from the Pleistocene and Holocene. These soils consist mainly of near-surface boulders and gravel, with sand and fine-grained soils encountered within the matrix of the soil fabric.

Earthquake-induced loads for the site are provided in Table 1 below. The MCE_R spectral response acceleration for short periods, S_{MS} is adjusted for site class effects as required by IBC 2018. The values indicated "Null" in the table below may be provided through additional analyses if desired; however, it is anticipated that the structures will not have a fundamental period greater than 0.2 seconds. Design spectral response acceleration parameters as presented in the 2018 IBC are defined as a 5% damped design spectral response acceleration at short periods, S_{DS}, and at 1-second period, S_{D1}.

The ASCE 7 Hazard Tool was used to identify the following Seismic Design Coefficients, based on the site latitude (40.67298°) and longitude (-111.78615°), and the designated Risk Category II Structure.

Table 1: Seismic Design Coefficients

Seismic Design Parameter	**Design Value**
Site Class	"D" (Default)[a]
Mapped Spectral Response Acceleration	
Short Period, S_s	1.182 g
1-Second Period, S_1	0.437 g
Site Coefficient, F_a	1.2
Site Coefficient, F_v	Null
MCE (S_{MS})	1.418 g
MCE (S_{M1})	Null
Design Spectral Response Acceleration	
Short Period, S_{DS}	0.946 g
1-Second Period, S_{D1}	Null

[a] Site Class 'D' Default based on assumed shear wave velocity profile for site. Actual Site Class may be evaluated using measured shear wave velocity profile for upper 100 feet of soil using ground geophysics or other methods. Such a scope of work is beyond the current approved study; however, CEL would be pleased to provide an additional scope and fee proposal upon request.

SITE AND SUBSURFACE CONDITIONS

The site is located within the Millcreek township, as shown on *Figure 1, Site Vicinity Map.* The proposed project site slopes downward to the west at a maximum 20% grade with a total relief of approximately 40 feet. The site lies between an estimated ground surface elevation ranging from 5,500 to 4,960 feet-MSL, based on Google Earth™ aerial photographs.

The proposed test pits were not possible due to dense vegetation, fences, structures and terrain. Four (4) test holes, advanced using a hand-auger, in lieu of test pits, were conducted by a CEL representative under the direction of a licensed Professional Engineer in the State of Utah. The location of these test holes relative to the existing site features and landmarks are shown on the attached *Figure 2: Exploration Location Plan.* The test hole locations were selected to provide adequate coverage to characterize the subsurface soil conditions and properties below the proposed project improvements.

During excavation, soils encountered in the test holes were visually classified according to the Unified Soil Classification System. Disturbed soil samples were collected at selected intervals ranging from the surface to the maximum depth explored. Following completion, the test holes were backfilled with extra spoils. Groundwater was not encountered during any of the explorations.

A summary table of the soils encountered as well as the total depth explored in each test hole is summarized below:

Table 2: Test Hole Summary

Test Hole ID	Depth to Refusal	USCS Symbol and Soil Description
B-1	8"	(Fill) Sandy Gravel, yellow-tan, very dense, slightly moist
B-2	8"	Sandy Gravel (GP), light brown, very dense, slightly moist
B-3	8"	Sandy Gravel (GP), light brown, very dense, slightly moist
B-4	12"	Sandy Gravel (GP), light brown, very dense, slightly moist

LABORATORY TESTING RESULTS

A limited laboratory testing program was planned for samples obtained from the field exploration; however, due to very limited sample sizes recovered from the hand-auger excavations, the laboratory testing program was not possible. CEL suggests that laboratory testing be conducted during construction phases to obtain representative sample sizes of onsite materials for consideration of re-use as Site Grading or Structural Fill.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction, our review of the available geological literature, site observations, our evaluation and interpretation of the field data obtained during this exploration, our experience with similar subsurface conditions, and generally accepted geotechnical engineering principles and practices.

This site is considered geotechnically suitable for the proposed improvements, provided the recommendations of this report are incorporated into the design and implemented during construction. The predominant geotechnical and geological issues that need to be addressed at this site are discussed in detail below.

1. Geologic Hazards

Based on our review of the available geologic literature, hazards such as landslides, rockfall, debris flow, slope failure and surface fault rupture were found to be outside of areas indicated for presence of such

hazards. Additionally, due to the shallow slope of the surrounding ground level, an analysis for landslides, rockfall, debris flow, and slope failure are not required.

The position of the site in relationship to the areas encompassing the Wasatch Fault surface rupture area do not coincide. Based on published maps by the Utah Geologic Survey (Anderson, 2018), the site is located outside delineated zones suggesting special fault trench studies or fault setback requirements. A special fault trenching study is not warranted for this site prior to construction.

2. Site Grading

Significant site grading is anticipated to consist of moderate cuts and fills to achieve designed foundation elevations. Excavation is anticipated to be accomplished using standard excavation equipment. However, due to the density of the on-site soils and size of potential boulders, heavy-duty excavation equipment may be necessary to achieve the designed foundation elevations. Specialty excavation equipment, including rock hammers may be necessary in tight excavations or utility trenches.

Onsite granular soils are generally suitable for re-use as Site Grading Fill and Structural Fill, provided they meet the recommendations provide in this report. Materials proposed for use as fill should be tested for gradation and quality to very conformance with the requirements presented in this report.

Fill materials should be moisture conditioned prior to placement. Fills should be placed in loose horizontal lifts not to exceed 8 inches and compacted with appropriately sized compaction equipment in uniform passes until the desired relative compaction levels are achieved. Site and subsurface soil conditions should be considered when selecting the type of compaction equipment and rolling patterns to achieve the required minimum relative compaction.

3. Subgrade Preparation and Fill Material Requirements

Representatives of the Geotechnical Engineer should be retained to observe and confirm that footing excavations are established in soils suitable for the recommended maximum design bearing capacity prior to formwork and reinforcing steel placement. If any unsuitable subgrade is encountered, the footing excavation should be deepened until suitable supporting, undisturbed natural material is encountered. The over-excavation should be backfilled using Structural Fill or lean concrete (or a controlled low-strength material) up to the bottom of the footing concrete.

All topsoil, landscaping materials, and demolition debris should be removed down to undisturbed native soils, prior to subgrade preparation or placement of Structural Fill, Site Grading Fill, or concrete.

Exposed subgrades beneath proposed foundations and floor slabs should be proof-rolled to aid in assessing subgrade conditions prior to placing reworked native soil or Structural Fill.

The site should be graded to create a relatively level surface to receive fill and to provide a uniform thickness of fill beneath building and pavement areas.

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Recommended relative compaction requirements for this project, based on the Modified Proctor (ASTM Test Method D1557) are shown on the table below. Depending on final project details, some items listed below may not apply to this project.

Table 3. Project Compaction Recommendations

Description	Minimum Percent Relative Compaction (ASTM D1557)	Maximum Percent Variation from Optimum Moisture Content
Structural Fill Beneath Footings and Foundations	95	+/- 2
Engineered Fill, Site Grading Fill or Backfill Beneath Floor Slabs	95	+/- 2
AC Pavement, Subgrade, Upper 12"	95	+/- 2
AC Pavement, Subgrade Onsite Soil or Fill	92	+/- 2
AC Pavement, Untreated Base Course (UTBC)	95	+/- 2
Concrete Hardscape, Aggregate Base Course	95	+/- 2
Concrete Hardscape, Subgrade Soil	92	+/- 2
Underground Utility and Culvert Backfill (upper 5 feet)	95	+/- 2
Underground Utility and Culvert Backfill (deeper than 5 feet)	92	+/- 2
Underground Utility Backfill – Landscape Areas	90	+/- 2
Underground Utility Backfill, Clean Sand	92	+/- 2

Imported fill or re-processed on-site soil meeting the requirements for Engineered Fill or Structural Fill should be non-expansive, granular, well-graded, and contain enough fines (passing #200 sieve) to bind together. Additionally, materials should be free of environmental contaminants, organic material and debris, and should not contain particles larger than the specified maximum. Imported fill or re-processed native soil should be approved by the Geotechnical Engineer prior to use on site.

Table 4: Fill Specifications

Fill Type	Plasticity Index (PI)	Percent Fines (%)	Maximum Particle Size	Purpose
Engineered Fill[a]	<15	<35	4 inches	Granular backfill, fill beneath floor slabs, other flatwork
Structural Fill	<15	<15	3 inches	Structural Footings
Recycled Crushed Concrete	N/A	N/A	4 inches	Drainage course, subgrade stabilization

On-site soils below any stripped material having an organic content of less than three percent by weight, free of construction debris, free of expansive soils, and meeting the gradation requirements above may be used as Structural Fill as approved by the Geotechnical Engineer. The contractor should review the results of this report and make an independent evaluation of the suitability of the onsite soils for re-use as Site Grading or Structural Fill, and the effort required to segregate/stockpile, process (e.g. moisture condition), place and compact to meet the minimum requirements indicated herein.

Backfill materials for utility trenches should meet project and manufacturer recommendations for gradation and quality.

4. Undocumented Fill

Undocumented fill was encountered in Test Hole B-1 and was observed over several areas of the site. Undocumented fill may be defined as fill materials with unknown origin or documentation of material quality, placement and relative compaction. These materials are man-made and have an unknown density or consistency, resulting in an inherent risk of densification over time. Undocumented fill should be removed to undisturbed natural soil prior to subgrade preparation and placement and compaction of new fill. Undocumented fill materials may be suitable for resuse as Site Grading or Structural Fill if they meet the requirements stated in this report.

5. Temporary and Permanent Cut and Fill Slopes

Below-grade construction for deeper trench excavations may require either temporary excavation slopes or shoring if excavations are planned to extend more than four (4) feet below existing grade. The Contractor should incorporate all appropriate requirements of OSHA into the design of the temporary construction slopes or shoring system. Excavation safety regulations are provided in the OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, Subpart P, and apply to excavations greater than four feet in depth. The Contractor, or the specialty subcontractor, should design temporary construction slopes to conform to the OSHA regulations and should determine actual temporary slope inclinations based on the subsurface conditions exposed at the time of construction. Temporary cut slope excavations greater than 4 feet deep may be constructed at 1.5:1 or flatter. Excavations extending greater than 4 feet in fine-grained material, such as clays and silts, may be constructed at a 1:1 slope.

In areas where subgrade soils consist of interlayered granular and fine-grained soils, or areas that are ambiguous or uncertain to the contractor, a 1.5:1 slope should be used. Temporary excavations less than 4 feet deep may be constructed with near vertical walls. More granular (sandy) soils will require a flatter slope of 1.5:1 for temporary conditions. If temporary slopes are left open for extended periods of time, exposure to weather such as rain could have detrimental effects to foundation subgrade. These effects include sloughing and erosion of surficial soils exposed in the excavations. We recommend that all vehicles and other surcharge loads be kept at least 10 feet, or the height of the slope away from the top of temporary slopes, and that such temporary slopes are protected from excessive drying or saturation during construction. In addition, adequate provisions should be made to prevent surface water from ponding on top of the slope or from flowing over the slope face. Desiccation or excessive moisture in the excavation could reduce stability and require shoring or laying back side slopes.

Permanent fill slopes constructed using properly placed and compacted granular Site Grading Fill or Structural Fill as recommended in this report may be constructed at 2:1 horizontal to vertical. Site grading

shall be designed to divert surface water away from the fill slope. The surface of the fill slope should be vegetated with native grasses or shrubs/trees requiring minimal watering to mitigate the risk of erosional sloughing of the fill slope.

6. Groundwater

Groundwater was not encountered within the explored test hole locations and depths at the time of our field exploration. It is anticipated that groundwater is deeper than 25 feet below ground surface at this location. A detailed investigation of local groundwater conditions was not performed and is beyond the scope of this study. Groundwater levels vary with changes in precipitation, seasonal weather, surface water, local irrigation practices, and other site-specific factors. Perched water may occur, especially above clayey soils or impervious bedrock. Groundwater levels in this area are typically lowest in the late summer-early fall and highest in the late winter-early spring; consequently, the water table may fluctuate at times.

7. Seismic Ground Shaking

The site is located near the Wasatch Fault, which is capable of producing a moment magnitude 7.1 earthquake. The building design should consider the effects of seismic activity in accordance with the latest edition of the International Building Code (IBC) and the seismic parameters provided in Table 1.

8. Settlement

Shallow soil strata are generally comprised of coarse-grained soils such as cobble, gravel, and sand. Therefore, it is anticipated that settlement of the onsite soils will be primarily immediate and will occur during construction. The calculated settlement for relatively minor footing loads and an allowable bearing pressure of 1,500 psf is less than one inch. See "Approximate Total Settlement" in Table 5 below.

9. Frost-Susceptible Soils

Frost action during cold weather may cause uplift of portions of the foundation if they are not founded below the frost line. Foundations should have a minimum embedment depth of 30 inches below final grade for frost protection. See "Minimum Footing Depth" in Table 5 below.

10. Collapsible Soils

Based on our observations and the laboratory test results, CEL anticipates the potential for collapse to be negligible. If materials that appear to be susceptible to collapse are encountered, CEL should be notified. Evidence of collapsible soils include presence of dry, loose, sandy or silty soils.

11. Foundations

Structural elements such as columns or load-bearing walls may be supported on a conventional shallow foundation system bearing on properly prepared Structural Fill, as applicable. Foundations may be designed in accordance with the recommendations provided in Table 5 below.

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Table 5. Foundation Design Recommendations

Description	Criteria
Foundation Type	Conventional continuous and shallow spread footings
Bearing Material	Individual structures must be entirely supported on any of the following materials: Properly prepared native soils and Site Grading Fill. Foundation bearing materials should be supported on properly prepared subgrade. Any existing fill materials must be completely removed from below foundation elements.
Net Allowable Bearing Capacity	1. Properly prepared native soils 1,500 psf
	2. On at least 2-feet of properly placed and compacted Structural Fill 2,500 psf
Minimum Footing Width	**Walls:** 18 inches **Columns:** 24 inches
Minimum Footing Depth	30 inch embedment depth or 12 inches over non-frost susceptible materials.
Ultimate Coefficient of Sliding Friction	0.30 (Properly prepared natural soils and Site Grading Fill) 0.40 (Structural Fill)
Approximate Total Settlement	1 inch or less

These bearing capacities are net values, as the weight of the footing itself has already been accounted for and can be neglected as a load for design purposes. The allowable bearing capacities may be increased by 1/3 for temporary wind and seismic loads. The allowable bearing pressure provided above has been provided based on assumed relatively light column and wall loads for typical residential construction. Higher bearing pressures may be possible. CEL should be retained to modify the recommended allowable bearing pressure and anticipated settlement once proposed building loads are available.

12. Lateral Earth Pressures and Retaining Systems

Foundation elements may be designed to resist lateral loads with a combination of bottom friction and passive resistance. Below-grade retaining structures may be designed using the lateral earth pressures (LEP) as shown in Table 6 below.

The static lateral earth pressures assume clean, free-draining horizontal backfill conditions with sufficient drainage to preclude the development of hydrostatic pressures behind the wall. The following guidelines should be used to determine the design type for each retaining wall:

- Cantilevered retaining walls designed to allow sufficient deflection on the order of 0.001 x wall height (H) for dense sand backfill (AASHTO 2014) may be designed using active earth pressures.
- Restrained walls (basement) pinned at the top and bottom or otherwise restricted to be less

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than the above threshold, may be designed using at-rest pressures.

- Passive earth pressure resistance may be used for walls or structures pushing into the undisturbed native soil; however, this value should be reduced by ½ when used in conjunction with the lateral friction factor for the design of retaining structures.

Per IBC 2018, retaining walls less than 6 feet high may be designed without consideration of seismic (dynamic) lateral earth pressure components. Otherwise, dynamic pressures should be added to static values for the seismic loading condition. Retaining walls greater than 6 feet tall and allowed to deflect greater than 0.001xH may be designed using a dynamic lateral earth pressure based on a seismic coefficient of 0.64 Peak Geometric Mean Ground Acceleration (PGA_M). A PGA_M of 0.64 provided in the ASCE 7 Hazard Tool was used for calculating the dynamic LEP components using Mikola and Sitar (2013). Table 6 below shows the static and dynamic LEP for active, at-rest, and passive conditions under both static and dynamic loads:

Table 6: Lateral Earth Pressures for Static and Dynamic Conditions

Retained Height (ft)	Allowed Deflection	Design Type	Soil Backfill	
			Static (pcf)	Dynamic (pcf)
< 6 feet	> 0.001xH	Active	30	N/A[a]
	< 0.001xH	At-rest	48	N/A[a]
	> 0.01xH	Passive	525	N/A[a]
> 6 feet	> 0.001xH	Active	30	30[b]
	< 0.001xH	At-rest	48	48[b]

a. Dynamic LEP not required for walls <6 feet tall
b. Mikola and Sitar (2013)

13. Pavement Design

CEL has made assumptions for traffic loading variables based on the character of the proposed construction. These assumptions are listed in Table 7 below. The Client shall review and understand these assumptions to make sure they reflect intended use and loading of pavements. Based on soils encountered during subsurface exploration, a subgrade California Bearing Ratio (CBR) value of 10 has been assumed for near-surface granular soils. Table 8 below provides minimum thickness requirements for assured pavement function. If pavements are used for support of construction equipment during building construction, thicker pavement sections will be required.

Table 7: Traffic loading assumptions

Vehicle Description	Average Daily Traffic Volume
Passenger Car	100
Pick-up truck or van	50
Package delivery truck	2
Garbage/dumpster truck	1

Table 8: Flexible Pavement Thickness Specifications

Pavement Section Component	Light Duty Driveways and Parking	Heavy Duty Trash Enclosures and Driveways
Asphaltic Concrete	3.0 inches	6.0 inches
Crushed Aggregate Base	6.0 inches	8.0 inches

LIMITATIONS

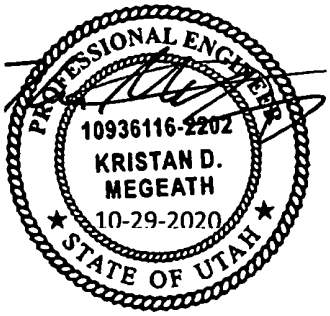
The conclusions and recommendations contained in this letter report are based on the subsurface data obtained at the areas described in this report. If soils encountered during construction differ considerably, CEL shall be notified immediately to reevaluate our conclusions and recommendations as warranted. Additional exploration and testing may be warranted to confirm these conclusions and recommendations in other areas of the site.

CLOSURE

We sincerely appreciate the opportunity to be of service to you on this project. Please contact the undersigned at 801-891-3786, or at cgarris@ce-labs.com with any questions or to provide additional assistance.

Respectfully submitted,

CONSOLIDATED ENGINEERING LABORATORIES (CEL)



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Principal Geotechnical Engineer

Kris Megeath, P.E.
Project Geotechnical Engineer

CTG/kdm
Distribution:
PDF to Addressee, Rachel M. Lambert

Attachments:

Figure 1: Site Vicinity Map
Figure 2: Exploration Location Map
Figure 3: Geology Map
Figure 4: Fault Map

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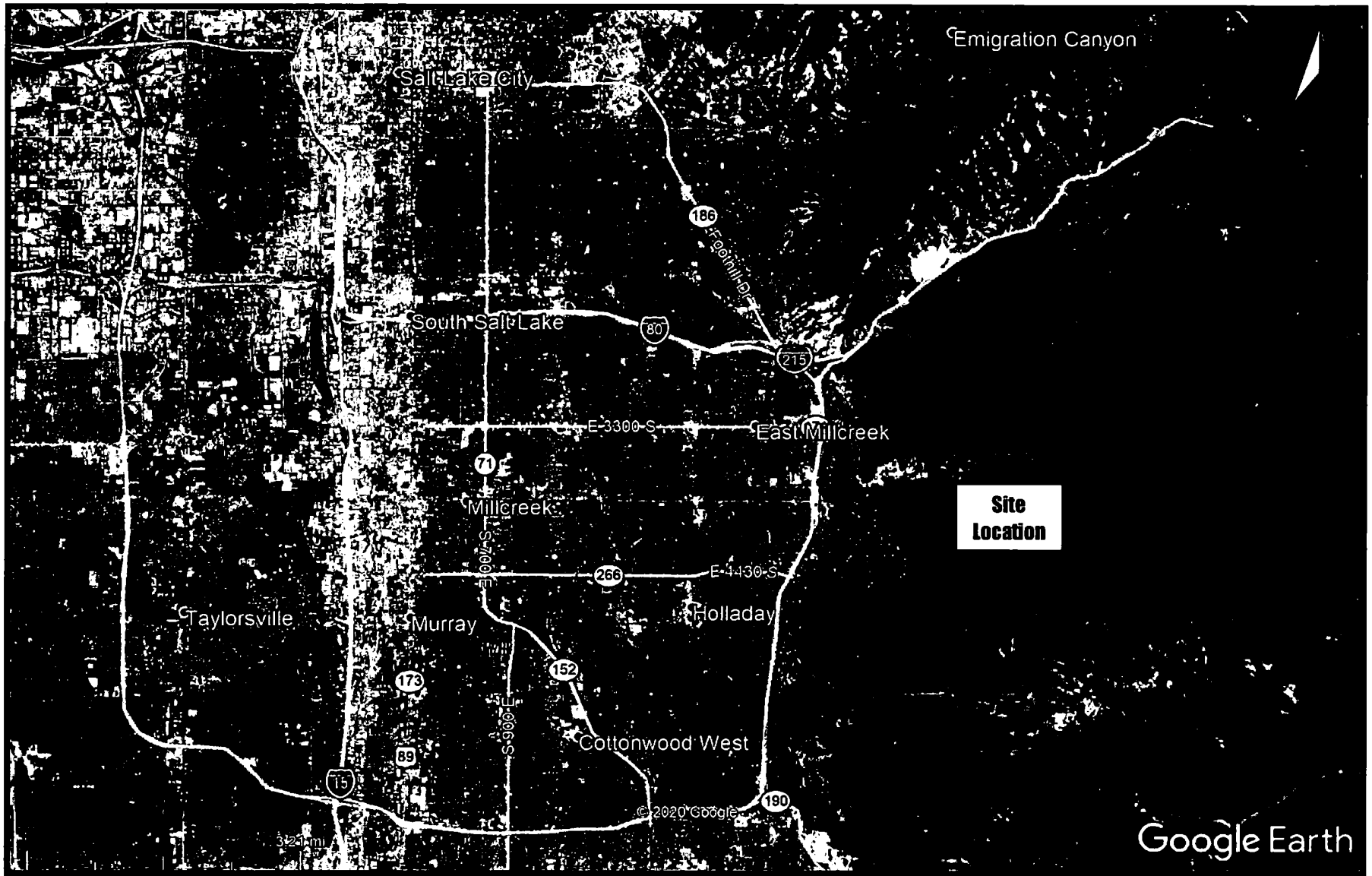

FIGURE 1

Site Vicinity Map

SOURCE: Google Earth
DATE: October 19, 2020
SCALE: Not to Scale

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Thousand Oaks Subdivision
3892 E Thousand Oaks Circle
Millcreek, Utah
CEL Project Number: 20-57250

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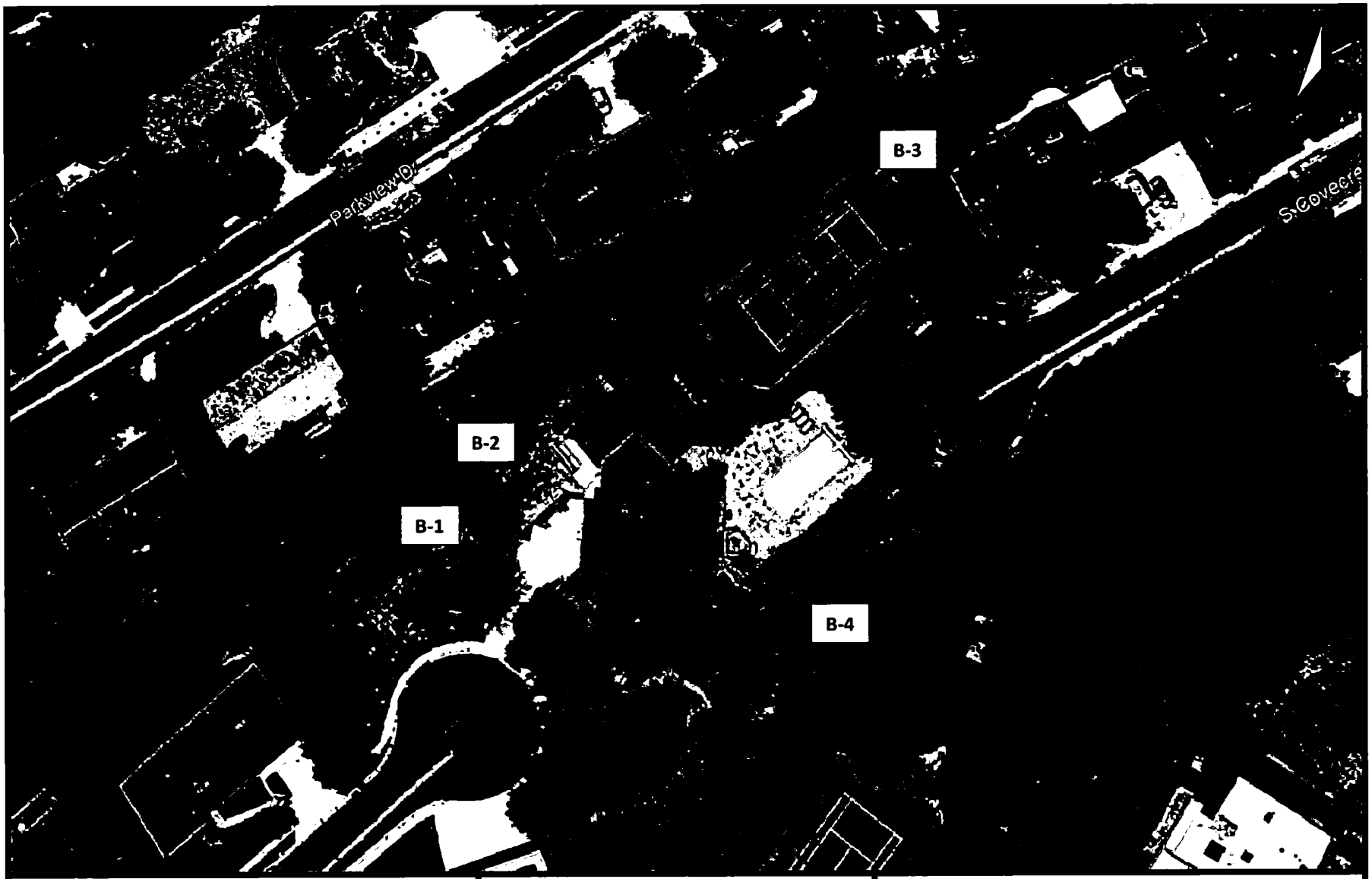

FIGURE 2

Exploration Location Plan

SOURCE: Google Earth
DATE: October 19, 2020
SCALE: Not to Scale

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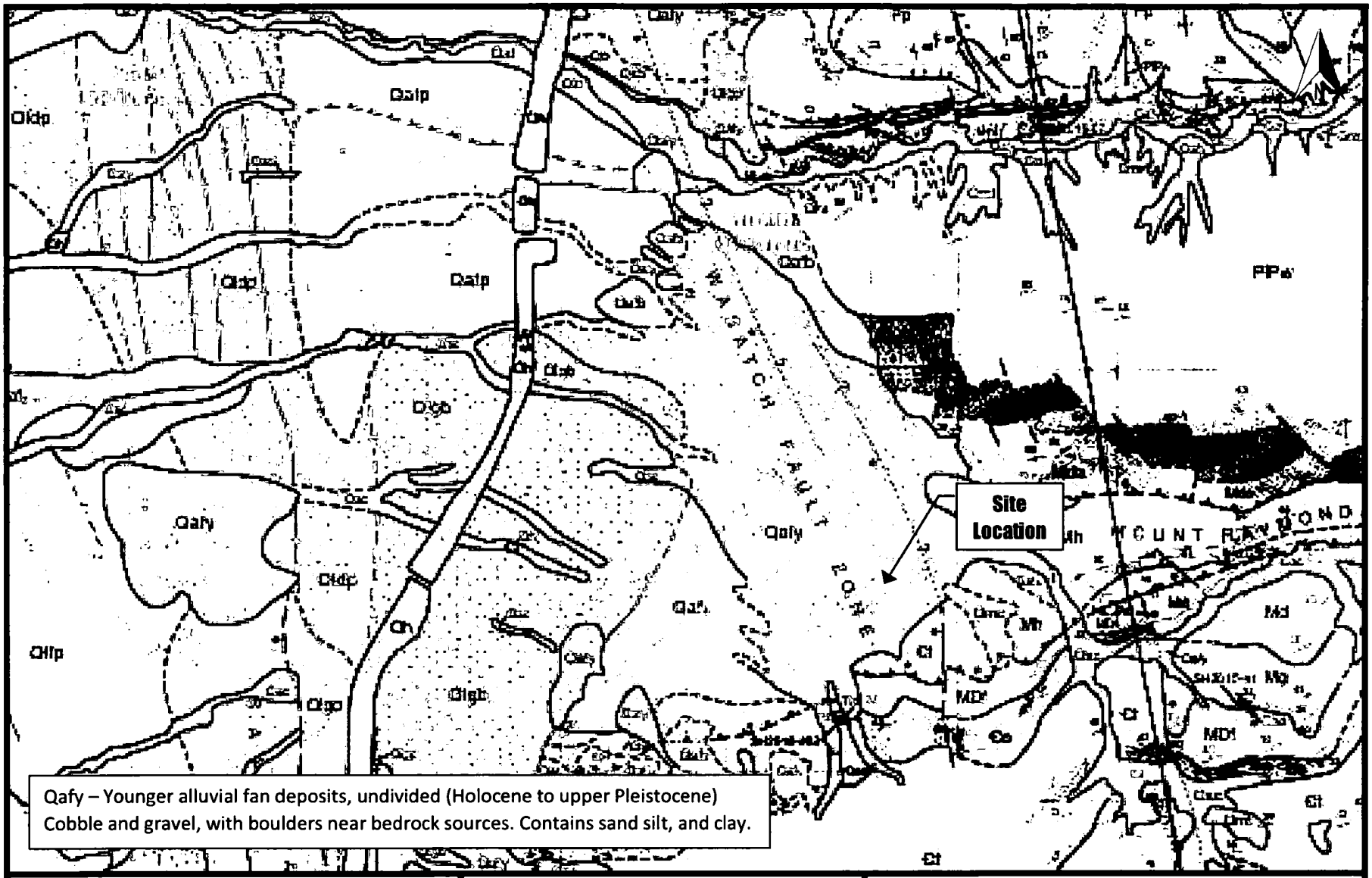

FIGURE 3
Geology Map
SOURCE: UGS Geology Map
DATE: October 19, 2020
SCALE: Not to Scale

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Thousand Oaks Subdivision
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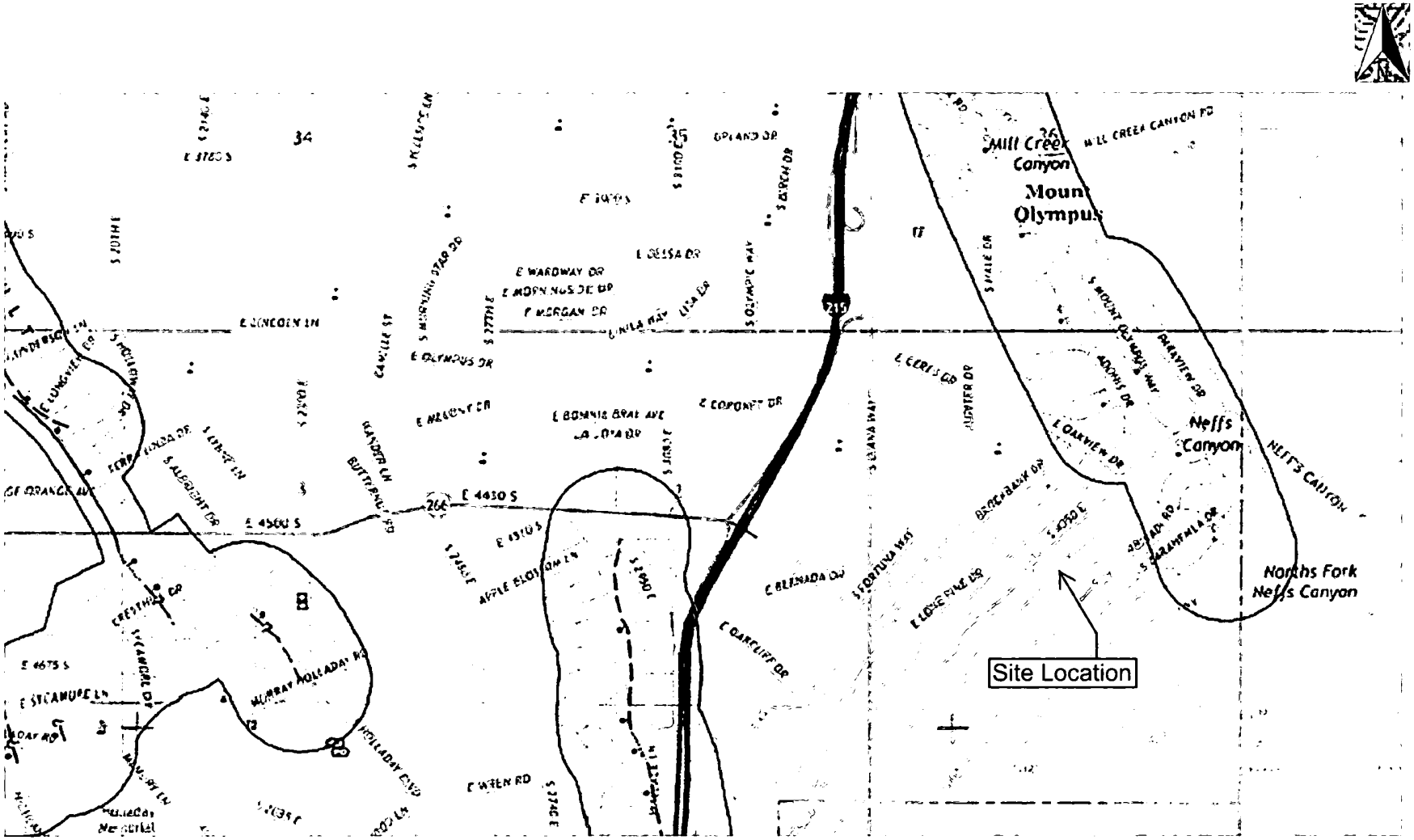

FIGURE 4

Fault Study Zone Map

SOURCE: UGS (Anderson, 2018)
DATE: October 29, 2020 SCALE: Not to Scale

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