WEBER COUNTY PLANNING DIVISION

Administrative Review Meeting Agenda

October 03, 2018
4:00 - 5:00 p.m.

1. **LVE061218: Consideration and action on a request for final plat approval of Eastwood Estates No. 10, 2nd Amendment, a proposal to reconfigure the non-buildable area within Lots 28 and 29, located at 5973 Spring Canyon Road in the Residential Estates – 20 (RE-20) Zone. (Keith Christian, Authorized Agent) Felix Lleverino, Presenter**

2. **UVH051418: Consideration and action for final plat approval of Hidden Spring Ridge Subdivision, a one log subdivision consisting of approximately 5.57 acres, located at 4437 N 2900 E, Liberty in the Forest Valley 3 (FV-3) Zone. (Donald & Renee Bingham, Applicants) Tammy Aydelotte, Presenter**

3. **Adjournment**

The meeting will be held in the Weber County, Breakout Room, in the Weber Center, 1st Floor, 2380 Washington Blvd., Ogden, Utah unless otherwise posted

In compliance with the American with Disabilities Act, persons needing auxiliary services for these meetings should call the Weber County Planning Commission at 801-399-8791

Staff Report to the Weber County Planning Division

Weber County Planning Division

Synopsis

Application Information

Application Request: Consideration and action on a request for approval of Eastwood Estates No 10 2nd Amendment, a proposal to reconfigure the non-buildable area within lots 28 and 29.
Agenda Date: Wednesday, October 03, 2018
Applicant: Keith Christian, Authorized Representative
File Number: LVE 061218

Property Information

Approximate Address: 5973 Spring Canyons Road
Project Area: 3.66 Acres
Zoning: Residential Estates (RE-20)
Existing Land Use: Vacant
Proposed Land Use: Residential
Parcel ID: 07-254-0008, 07-254-0009
Township, Range, Section: T5N, R1W, Section 24

Adjacent Land Use

North: Residential
East: Residential
South: Residential
West: Residential

Staff Information

Report Presenter: Felix Lleverino
flleverino@co.weber.ut.us
801-399-8767
Report Reviewer: RG

Applicable Land Use Codes

- Title 101 (General Provisions) Chapter 1 (Definitions)
- Title 104 (Zones) Chapter 3 (Residential Estates RE-20)
- Title 106 (Subdivisions) Chapter 1 (General Provisions) Section 8 (Final Plat Requirements)
- Title 108 (Standards) Chapter 18 (Drinking Water Source Protection)
- Title 108 (Standards) Chapter 22 (Natural Hazard Areas)

Development History

Eastwood Estates Subdivision Number 10 was recorded on September 5, 1979.

Background and Summary

The applicant is requesting approval of an amendment to the non-buildable area that was placed on lots 28 and 29 of Eastwood Estates Subdivision No. 10 (see Exhibit B). Access to the home will be exclusively from Spring Canyon Road and access to the tennis court will be from Melanie Lane.

As part of the approval process, the proposal has been reviewed against the current Weber County Land Use Code (LUC), and the standards of the RE-20 Zone found in LUC §104-3. The following section is a brief analysis of this project against current land use regulations.

Analysis

General Plan: This proposal conforms to the 1970 South East Planning Area Master Plan by encouraging medium density development that avoids geologic hazards thereby minimizing loss of property (see pages 9-16 of the master plan).

Zoning: The property is located in the RE-20 Zone. The purpose of this zone is stated in the LUC §104-3-1.

> *"The major purpose of the RE-15 and RE-20 Zones is to provide and protect residential development at a low density in a semi-agricultural or rural environment. It is also to provide for certain rural amenities on larger minimum lots, in conjunction with the primary residential nature of the zone."*

Small Subdivision: "The Planning Director is delegated administrative authority to approve small subdivisions if in his discretion there are no conditions which warrant its submittal to the planning commission LUC §106-1-8 (f))." This proposal qualifies as a small subdivision consisting of three or fewer lots for which no new streets are being created or realigned.

Drinking Water Source Protection Zone: This proposal is located in a Drinking Water Source Protection Zone #4. The prohibited uses within these zones may be found in LUC §108-18-6 (4). The intention of the landowner is to build a home and pursue residential type uses which are permitted.

Natural Hazards: A Geologic Hazard Investigation has been prepared by Western Geologic, Dated September 1, 2015. The Conclusions and recommendations portion of the Geologic report states that "Hazards posing a high risk to the site are earthquake ground shaking and radon. Moderate risk hazards include Faulting, landslides, and debris flows. No structures intended for human occupancy should be located in the west boundary without additional trenching to evaluate if active faults may be present. Streets, driveways, yards, tennis courts and non-occupied, non-attached features may be constructed within this area without further trenching studies. A geotechnical engineering study should be conducted prior to construction to address soil conditions, site grading, drainage, design, and slope stability. A Geotechnical Study has been conducted by GSH on September 9, 2015, job number 1931-01N-15 (see Exhibit E).

Building Site: The applicant has provided on the plat a delineation locating the buildable area within lots 28 and 29. There will also be a note placed on the plat for purchasers of the lot stating that development shall take place only within such designated areas. This requirement comes from LUC§106-1-8 (c)(4)(b).

Flood Zone: This parcel is within an area of minimal flood hazard and determined to be outside the 500-year flood level.

Secondary Water: Secondary water services from Weber Basin Conservancy District for lots 28 and 29 were secured back when the subdivision was recorded.

Culinary Water: Culinary water services from the Uintah Highlands Improvement District for lots 28 and 29 were secured back when the subdivision was recorded.

Sewer Services: Sewer services from the Uintah Highlands Improvement District for lots 28 and 29 were secured back when the subdivision was recorded.

Review Agencies: The Weber County Fire District has approved this proposal. Weber County Planning, Engineering, and Surveying have submitted comments that have been addressed by a revised subdivision plat.

Public Notice: Noticing was provided to all property owners of record within 500 feet of the subject property.

Staff Recommendation

Staff recommends final plat approval of Eastwood Estates Subdivision No. 10 2nd Amendment, a proposal to reconfigure the buildable area within lots 28 and 29. This recommendation is based on the following conditions:

1. Prior to recording the final Mylar, all applicable Weber County reviewing agency requirements shall be met.
2. A deferral agreement must be entered into by the owner and the agreement shall be recorded with the final Mylar.

This recommendation is based on the following findings:

1. The proposed subdivision conforms to the Ogden Valley General Plan.
2. The proposed subdivision complies with the applicable County codes.

Administrative Approval

Administrative final approval of Eastwood Estates Subdivision No. 10 2nd Amendment, a proposal to reconfigure the buildable area within lots 28 and 29 is hereby granted based upon its compliance with the Weber County Land Use Code. This approval is subject to the requirements of applicable review agencies and the conditions of approval listed in this staff report.

Date of Administrative Approval: _______________

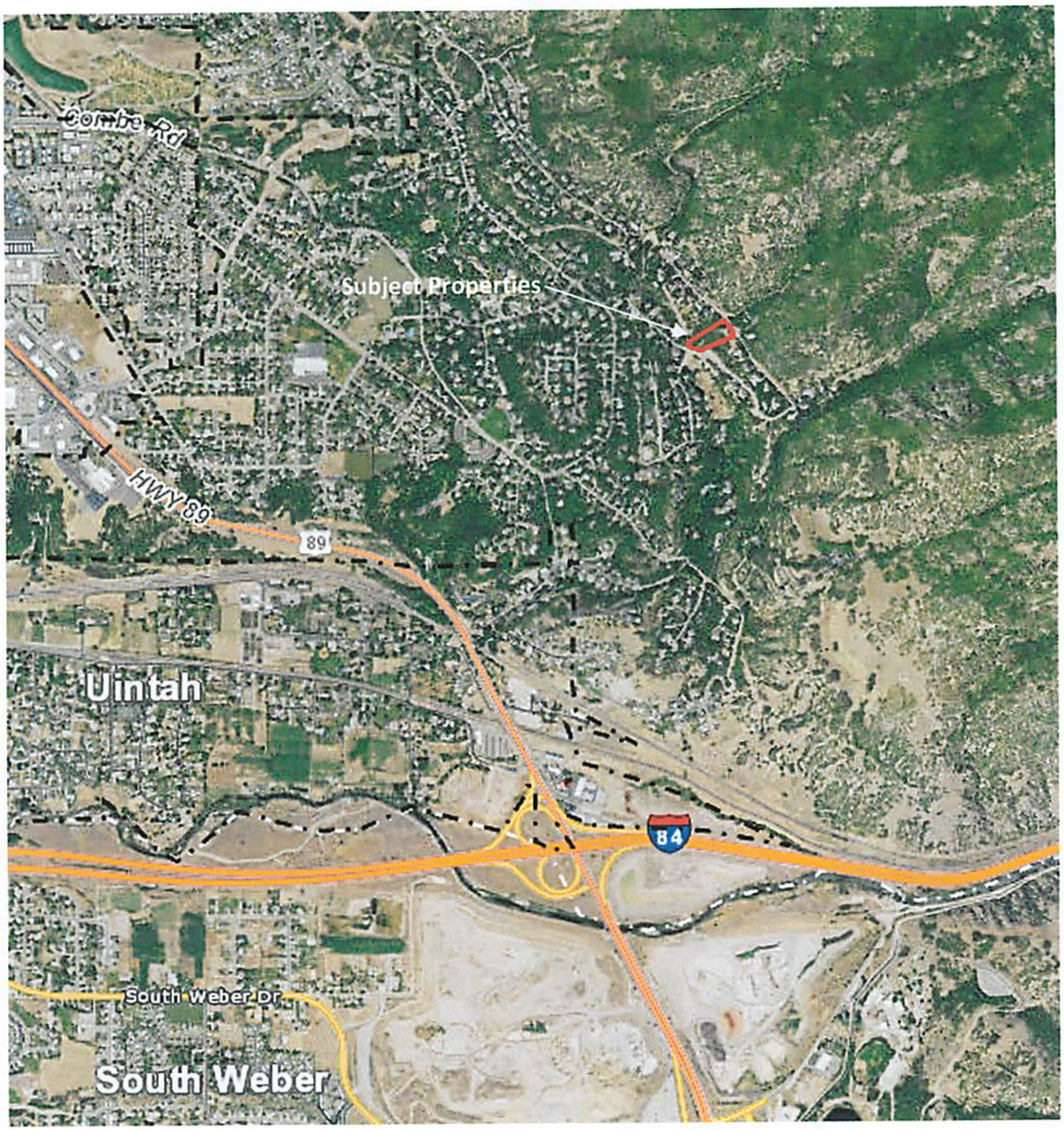
____

Rick Grover
Weber County Planning Director

Exhibits

A. Eastwood Estates No 10, 2nd Amendment
B. Eastwood Estates No 10
C. Current Recorders Plat
D. Geologic Hazard Evaluation
E. Geotechnical Study

Area Map

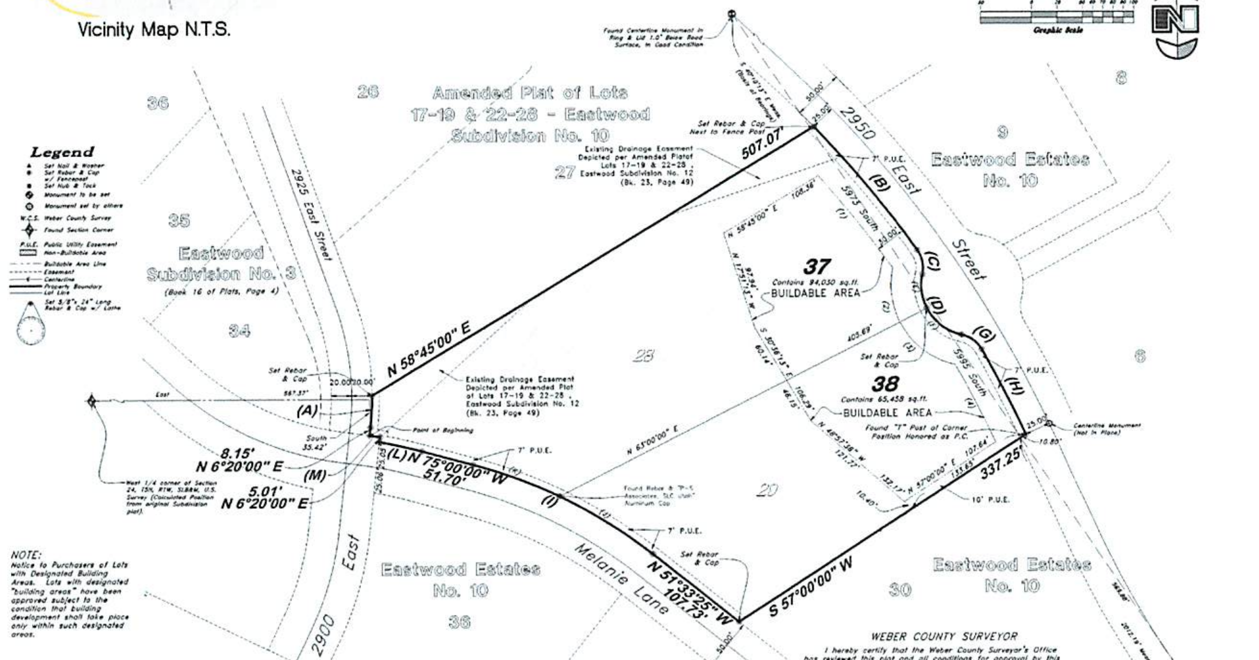


Eastwood Subdivision No. 10 - 2nd Amendment

All of Lot 29 of Eastwood Subdivision No. 10, and all of Lot 28, Amended plat of Lots 17-19 & 22-28, Eastwood Subdivision No. 10, Weber County Utah, being A part of the West Half of Section 24, T5N, R1W, SLB&M, U.S. Survey Weber County, Utah

September 2018

Vicinity Map N.T.S.



BOUNDARY DESCRIPTION

All of Lot 29 of Eastwood Subdivision No. 10 (Book 22 pages 74 & 75), and all of Lot 28, Amended plat of Lots 17-19 & 22-28, Eastwood Subdivision No. 10, (Book 23 page 49) Weber County Utah - According to the official Plats Thereof. More particularly described as follows:

Beginning at a point on the East right of way line of 2925 East Street, said point is 567.37 feet East and 35.42 feet South of the Calculated West Quarter Corner of Section 24, Township 5 North and Range 1 West, Salt Lake Base and Meridian, U.S. Survey, and running thence two (2) courses along said East right of way line as follows: (1) North 6°20'00" West 8.15 feet; and (2) Northeasterly along the arc of a 280.41 foot Radius curve to the left a distance of 31.15 feet (Central Angle equals 6°21'50" and Long Chord bears North 3°09'05" East at 31.13 feet); thence North 58°45'00" East 507.07 feet to the West right-of-way of 2950 East Street; thence five (5) courses along said West right of way line as follows: (1) Southeasterly along the arc of a 1090.21 foot radius curve to the right a distance of 158.04 feet (Central Angle equals 8°18'22" and Long Chord bears South 39°53'21" East at 157.91 feet); (2) Southeasterly along the arc of a 30.00 foot radius curve to the right a distance of 25.19 feet (Central Angle equals 48°07'03" and Long Chord bears South 11°40'39" East at 24.46 feet); (3) Southeasterly along the arc of a 50.00 foot radius curve to the left a distance of 78.64 feet (Central Angle equals 90°06'44" and Long Chord bears South 32°40'29" East at 70.78 feet); (4) Southeasterly along the arc of a 30.00 foot radius curve to the right a distance of 25.19 feet (Central Angle equals 48°07'03" and Long Chord bears South 53°40'19" East at 24.46 feet); and (5) Southeasterly along the arc of a 1090.21 foot radius curve to the right a distance of 94.12 feet (Central Angle equals 4°56'48" and Long Chord bears South 27°08'23" East at 94.09 feet); thence South 57°00'00" West 337.25 feet to the East right-of-way of Melanie Lane; thence four (4) courses along said East right of way line as follows: (1) North 51°33'25" West, 107.73 feet; (2) Northwesterly along the arc of a 483.08 foot radius curve to the left a distance of 197.66 feet (Central Angle equals 23°26'36" and Long Chord bears North 63°16'43" West at 196.28 feet); (3) North 75°00'00" West 51.70 feet; and (4) Northwesterly along the arc of a 478.58 foot radius curve to the left a distance of 42.38 feet (Central Angle equals 5°04'24" and Long Chord bears North 77°32'12" West at 42.36 feet) to the East right of way line of 2900 East Street; thence two (2) courses along said East right of way line of 2900 East Street as follows: (1) North 6°20'00" East 5.01 feet; and (2) Northwesterly along the arc of a 483.58 foot radius curve to the left a distance of 10.01 feet (Central Angle equals 1°11'10" and Long Chord bears North 80°42'07" West at 10.01 feet) to the point of beginning

Contains 3.661 Acres

BUILDABLE AREA CURVE DATA

	(1)	(2)	(3)	(4)
Δ	6°17'53"	39°22'26"	50°44'07"	4°38'17"
L	116.55'	34.98'	70.84'	85.82'
R	1060.21'	80.00'	80.00'	1060.21'
LC	116.49'	33.90'	68.55'	83.80'
	N 38°53'08" W	S 7°18'25" E	S 82°21'47" E	N 27°17'39" W

PROPERTY LINE CURVE DATA

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Δ	6°21'50"	8°18'22"	48°07'03"	90°06'44"	39°22'26"	50°44'17"	48°07'03"
L	31.15'	158.04'	25.19'	78.64'	34.36'	44.28'	25.19'
R	280.41'	1090.21'	30.00'	50.00'	50.00'	50.00'	30.00'
LC	31.13'	157.91'	24.46'	70.78'	33.69'	42.84'	24.46'
	N 3°09'05" E	S 39°53'21" E	S 11°40'39" E	S 32°40'29" E	S 7°18'20" E	S 82°21'42" E	S 53°40'19" E

	(H)	(I)	(J)	(K)	(L)	(M)
Δ	4°56'48"	23°26'36"	12°44'13"	10°42'23"	5°04'24"	1°11'10"
L	94.12'	197.66'	107.39'	90.27'	42.38'	10.01'
R	1090.21'	483.08'	483.08'	483.08'	478.58'	483.58'
LC	94.09'	196.28'	107.17'	90.14'	42.36'	10.01'
	S 27°08'23" E	N 63°16'43" W	N 57°55'32" W	N 69°38'50" W	N 77°32'12" W	N 80°42'07" W

GREAT BASIN ENGINEERING INC
5746 South 1475 East Ogden, Utah 84403
Main (801)394-4515 S.L.C (801)521-0222 Fax (801)392-7544
www.greatbasinengineering.com

SURVEYOR'S CERTIFICATE

I, Andy Hubbard, do hereby certify that I am a Professional Land Surveyor in the State of Utah, and that I hold License No. 6242920 in accordance with Title 58 Chapter 22, Professional Engineers and Land Surveyors Licensing Act. I also do hereby certify that "Eastwood Subdivision No. 10 - 2nd Amendment," in Weber County, Utah has been correctly drawn to the designated scale and is a true and correct representation of the following description of lands included in said subdivision, based on data compiled from records in the Weber County Recorder's Office, and of a survey made on the ground in accordance with Section 17-23-17. Monumented Lot corners have been set as shown on this drawing.

I also certify that Lots 37 and 38 within The Eastwood Estates Subdivision No. 10 - 2nd Amendment, in Weber County meet the frontage and area requirements of the Weber County Zoning Ordinance.

Signed this day of 09/26/2018, 2018.

6242920
License No.

Andy Hubbard

OWNER'S DEDICATION

We, the undersigned owners of the hereon described tract of land, hereby set apart and subdivide the same into lots and parcels as shown on this plat, and name said tract Eastwood Subdivision No. 10 - 2nd Amendment, and hereby dedicate, grant and convey to Weber those certain strips as easements for public utility and drainage purposes as shown hereon, the same to be used for the installation, maintenance, and operation of public utility service lines and drainage, as may be authorized by Weber County, with no buildings or structures being erected with such easements.

Signed this day of , 2018.

Herbert D. Christian - Owner

B. Carol Christian - Owner

Owner Contact Information:
Herbert and Carol Christian
1368 Eagle Court
Windsor, Colorado 80550

ACKNOWLEDGMENT

State of Utah
County of } ss

The foregoing instrument was acknowledged before me this ______ day of ______ 2018 by Herbert D. Christian and B. Carol Christian.

Residing At: ______

Commission Number: ______

Commission Expires: ______

A Notary Public commissioned in Utah

Print Name

NOTES:

1. 10' Wide Public Utility and Drainage Easements each side of property line as indicated by dashed lines, unless otherwise shown.

2. Lots with designated "Buildable Areas," have been approved subject to the condition that building development shall take place only within designated areas.

3. Due to the topography and the location of this subdivision all owners will accept responsibility for any storm water runoff from the road adjacent to this property until curb and gutter is installed

4. Eastwood Subdivision No. 10 - 2nd Amendment is located within a Natural Hazards Area. A Geotechnical and geologic investigation has been performed by GSH Geotechincal, Inc. Dated, September 9, 2015 Job No.1931O1N-15. The final report is available for public review at the Weber County Planning Division Office.

5. Notice to Purchasers of Lots with Designated Building Areas. Lots with designated "building areas" have been approved subject to the condition that building development shall take place only within such designated areas.

NARRATIVE

This survey and subdivision plat were requested by Herb Christian for the purpose of re-tracing the lot boundaries modifying the Non-Buildable area.

Centerline Monuments were found at the center of Cul-de-sac on 2950 East Street and at a centerline P.I. along 2950 East Street at approximately 6075 South.

A line bearing S 40°10'13" E between these two monuments was used as the Basis of Bearings as depicted on this drawing.

Property lines were established based on the original Eastwood Subdivision No 10 (book 22 pages 74 & 75), and the Amended Plat of Lots 17-19 & 22-28 Eastwood Subdivision No. 10 (Book 23 page 49).

A rebar with an aluminum cap stamped "P-S Assoc SLC UT" was found at the Rear common corner to both Lots its location checked and was honored.

A metal "T" post was found at the Northeast corner of Lot 37 and the Southeast corner of Lot 38. Both Tee Posts had a metal sign attached marking the original numbers. the location of the southeast corner of lot 38 was honored as the "T" post.

Street right of way lines were established based on the original Eastwood Subdivision No 10 (book 22 pages 74 & 75), and the Amended Plat of Lots 17-19 & 22-28 Eastwood Subdivision No. 10 (Book 23 page 49).

Property Corners were monuments as depicted on this survey.

WEBER COUNTY SURVEYOR

I hereby certify that the Weber County Surveyor's Office has reviewed this plat and all conditions for approval by this office have been satisfied. The approval of this plat by the Weber County Surveyor does not relieve the Licensed Land Surveyor who executed this plat from the responsibilities and/or liabilities associated therewith.

Signed this day of , 2018.

Signature

WEBER COUNTY COMMISSION ACCEPTANCE

This is to certify that this subdivision plat, the dedication of streets and other public ways and financial guarantee of public improvements associated with this subdivision, thereon are hereby approved and accepted by the Commissioners of Weber County, Utah this day of , 2018.

Title ______

Attest ______

Chair, Weber County Commission

WEBER COUNTY ATTORNEY

I have examined the financial guarantee and other documents associated with this subdivision plat and in my opinion they conform with the County Ordinance applicable thereto and now in force and affect.

Signed this day of , 2018.

Signature

WEBER COUNTY PLANNING COMMISSION

This is to certify that this subdivision plat was duly approved by the Weber County Planning Commission on the day of , 2018.

Chair, Weber County Planning Commission

WEBER COUNTY ENGINEER

I hereby certify that the required public improvement standards and drawings for this subdivision conform with County standards and the amount of the financial guarantee is sufficient for the installation of these improvements.

Signed this day of , 2018.

Signature

WEBER COUNTY RECORDER

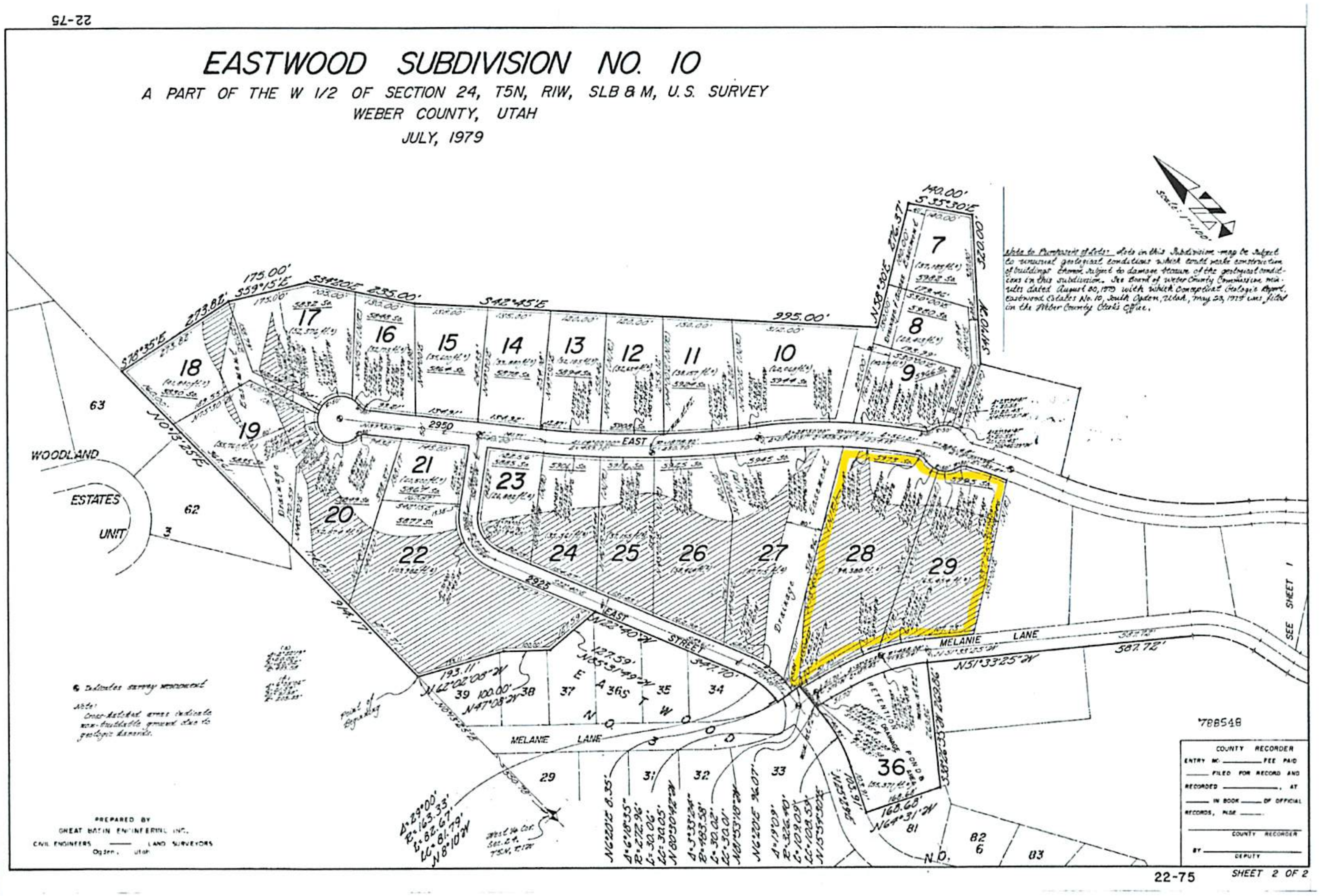
ENTRY NO. ______ FEE PAID ______ FILED FOR RECORD AND RECORDED ______, AT ______ IN BOOK ______ OF OFFICIAL RECORDS, PAGE ______. RECORDED FOR ______

WEBER COUNTY RECORDER

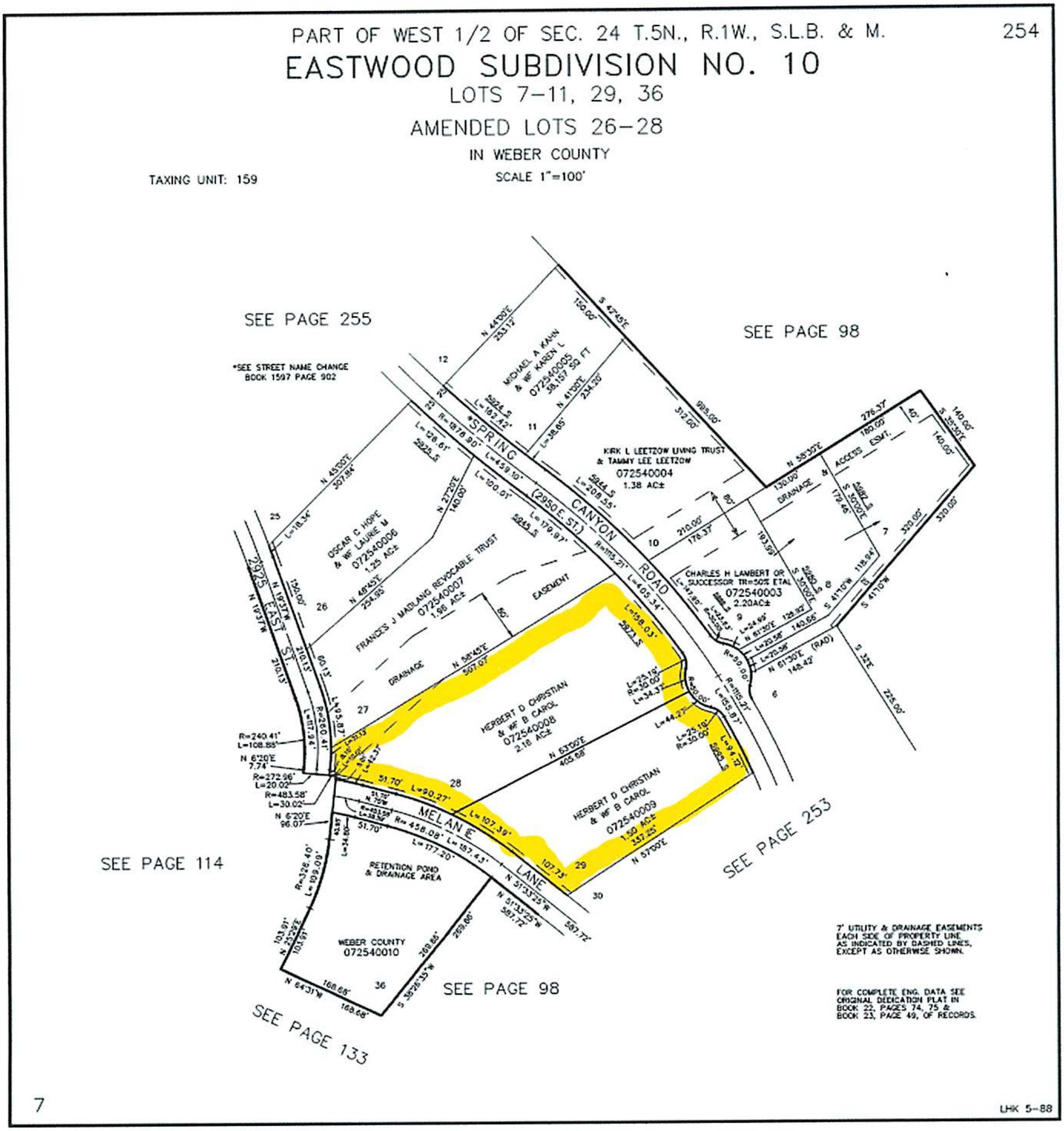
BY: ______
DEPUTY

08N233 - 52

Exhibit B



22-75
EASTWOOD SUBDIVISION NO. 10
A PART OF THE W 1/2 OF SECTION 24, T5N, R1W, SLB & M, U.S. SURVEY
WEBER COUNTY, UTAH
JULY, 1979
WOODLAND
ESTATES
UNIT 3
2950 EAST
2925 EAST STREET
MELANIE LANE
EASTWOOD
SEE SHEET 1
RETENTION POND
PREPARED BY
GREAT BASIN ENGINEERING INC.
CIVIL ENGINEERS — LAND SURVEYORS
Ogden, Utah
788548
COUNTY RECORDER
22-75
SHEET 2 OF 2


PART OF WEST 1/2 OF SEC. 24 T.5N., R.1W., S.L.B. & M.
254
EASTWOOD SUBDIVISION NO. 10
LOTS 7-11, 29, 36
AMENDED LOTS 26-28
IN WEBER COUNTY
TAXING UNIT: 159
SCALE 1"=100'
SEE PAGE 255
SEE PAGE 98
*SEE STREET NAME CHANGE BOOK 1597 PAGE 902
MICHAEL A KAHN & WF KAREN L 072540005
KIRK L LEETZOW LIVING TRUST & TAMMY LEE LEETZOW 072540004 1.38 AC±
OSCAR C HOPE & WF LAURIE M 072540006 1.25 AC±
FRANCES J MADLANG REVOCABLE TRUST 072540007 1.96 AC±
CHARLES H LAMBERT OR SUCCESSOR TR=50% ETAL 072540003 2.20AC±
HERBERT D CHRISTIAN & WF B CAROL 072540008 2.18 AC±
HERBERT D CHRISTIAN & WF B CAROL 072540009 1.50 AC±
*SPRING CANYON ROAD (2950 E. ST.)
2925 EAST ST.
MELANIE LANE
RETENTION POND & DRAINAGE AREA
WEBER COUNTY 072540010
SEE PAGE 114
SEE PAGE 253
SEE PAGE 98
SEE PAGE 133
7' UTILITY & DRAINAGE EASEMENTS EACH SIDE OF PROPERTY LINE AS INDICATED BY DASHED LINES, EXCEPT AS OTHERWISE SHOWN.
FOR COMPLETE ENG. DATA SEE ORIGINAL DEDICATION PLAT IN BOOK 22, PAGES 74, 75 & BOOK 23, PAGE 49, OF RECORDS.
7
LHK 5-88

REPORT

GEOLOGIC HAZARDS EVALUATION

EASTWOOD ESTATES LOTS 28 AND 29

5973-5995 SOUTH 2950 EAST

OGDEN, WEBER COUNTY, UTAH

Prepared for

GSH Geotechnical
1596 West 2650 South, Suite 107
Ogden, Utah 84401

September 1, 2015

Prepared by

Western GeoLogic, LLC
2150 South 1300 East, Suite 500
Salt Lake City, Utah 84106

Voice: 801.359.7222
Fax: 801.990.4601
Web: www.westerngeologic-com

WESTERN GEOLOGIC, LLC
2150 SOUTH 1300 EAST, SUITE 500
SALT LAKE CITY, UT 84106 USA

Phone: 801.359.7222 Fax: 801.990.4601 Email: cnelson@westerngeologic.com

September 1, 2015

Andrew M. Harris, PE
Senior Geotechnical Engineer
GSH Geotechnical, Inc.
1596 West 2650 South, Suite 107
Ogden, Utah 84401

SUBJECT: Geologic Hazards Evaluation
Eastwood Estates Lots 28 and 29
5973-5995 South 2950 East
Ogden, Weber County, Utah

Dear Mr. Harris:

This report presents results of an engineering geology and geologic hazards review and evaluation conducted by Western GeoLogic, LLC (Western GeoLogic) for Eastwood Estates Lots 28 and 29, 5973-5995 South 2950 East, Ogden, Weber County, Utah, Utah (Figure 1 – Project Location). The site is in the foothills at the western base of the Wasatch Range north of Bybee Reservoir (Pond) and northwest of the mouth of Spring Creek Canyon, and is located in Section 24, Township 5 North, Range 1 West (Salt Lake Base Line and Meridian; Figure 1). Elevation of the site ranges from about 5,050 feet to 5,210 feet above sea level. It is our understanding that the current intended site use is for development of one residential home in the eastern (upper) part of the site (Figure 2).

PURPOSE AND SCOPE

The purpose and scope of this investigation is to identify and interpret evident surficial geologic conditions at the site and identify potential risk from geologic hazards to the Project. This investigation is intended to: (1) provide geologic information and assessment of geologic conditions at the site; (2) identify potential geologic hazards that may be present and qualitatively assess their risk to the intended site use; and (3) provide recommendations for additional site- and hazard-specific studies or mitigation measures, as may be needed based on our findings. Such recommendations could require further multi-disciplinary evaluations, and/or may need design criteria that are beyond our professional scope to provide.

The following services were performed in accordance with the above stated purpose and scope:

- A site reconnaissance conducted by an experienced certified engineering geologist to assess the site setting and look for adverse geologic conditions;

- Excavation and logging of three test pits to evaluate subsurface conditions in the area of the proposed home at the site;
- Review of readily-available geologic maps, reports, and air photos; and
- Evaluation of available data and preparation of this report, which presents the results of our study.

The engineering geology section of this report has been prepared following generally accepted professional engineering geologic principles and practice in Utah, and the Guidelines for Preparing Engineering Geologic reports in Utah (Utah Section of the Association of Engineering Geologists, 1986.

HYDROLOGY

The U.S. Geological Survey (USGS) topographic map of the Ogden Quadrangle shows no natural springs in the Project vicinity, and no active streams are mapped crossing the site. Spring Creek Canyon is to the south, Dry Canyon is to the north, and an unnamed ephemeral drainage flows southwestward to near the northeast site corner. The ephemeral drainage flows beneath 2950 East Street and discharges about 160 feet to the southwest north of the property.

The subsurface hydrology in the area is dominated by the East Shore aquifer system. This aquifer system is comprised of a shallow, unconfined water table zone, and the deeper, often confined, Sunset and Delta aquifers (Feth and others, 1966). The depth to the shallow unconfined aquifer varies somewhat depending on topography and climatic and seasonal fluctuations. It is influenced by seepage from irrigation systems, and infiltration from precipitation and urban runoff. The Sunset aquifer (typical depth 250-400 feet) and Delta aquifer (typical depth 500-700 feet) provide water that generally meets the standards for public drinking water supply. Based on topography, the local groundwater flow is expected to be to the southwest.

Elevation of the shallow aquifer varies somewhat based on seasonal and climatic fluctuations. No significant groundwater was encountered in any of the borings conducted by GSH at the site or in any of the test pits conducted for this report. Perched conditions may be found at depth, but were not evident in the borings or test pits. We anticipate the depth to groundwater to be greater than 50 feet in the area.

GEOLOGY

Seismotectonic Setting

The property is located along the western base of the Wasatch Range, a major north-south trending mountain range marking the eastern boundary of the Basin and Range physiographic province (Stokes, 1977, 1986). The Basin and Range province is characterized by a series of generally north-trending elongate mountain ranges, separated by predominately alluvial and lacustrine sediment-filled valleys and typically bounded on one or both sides by major normal faults (Stewart, 1978). The boundary between the Basin and Range and Middle Rocky Mountains provinces is the prominent, west-facing escarpment along the Wasatch fault zone (WFZ) at the base of the Wasatch Range. Late Cenozoic normal faulting, a characteristic of the Basin and Range, began between about 17 and 10 million years ago in the Nevada (Stewart, 1980) and Utah (Anderson, 1989) portions of the province. The faulting is a result of a roughly east-west directed, regional extensional stress regime that has continued to the present (Zoback and Zoback, 1989; Zoback, 1989).

The WFZ is one of the longest and most active normal-slip faults in the world, and extends for 213 miles along the western base of the Wasatch Range from southeastern Idaho to north-central Utah (Machette and others, 1992). The fault zone generally trends north-south and, at the surface, can form a zone of deformation up to several hundred feet wide containing many subparallel west-dipping main faults and east-dipping antithetic faults. Previous studies divided the fault zone into 10 segments, each of which rupture independently and are capable of generating large-magnitude surface-faulting earthquakes (Machette and others, 1992). The central five segments of the fault (Brigham City, Weber, Salt Lake, Provo, and Nephi) have each produced two or more surface-faulting earthquakes in the past 6,000 years (Black and others, 2003). The main trace of the Weber segment is mapped slightly west of the Project near the intersection of 2925 East Street and Melanie Lane (Figures 2 and 3). The western part of the Project extends into the Surface Fault Rupture Special Study Area on Weber County maps, although no structures are currently planned in this area (Figure 2).

The Weber segment of the WFZ extends for about 35 miles from the southern edge of the Plain View salient near North Ogden to the northern edge of the Salt Lake salient near North Salt Lake (Machette and others, 1992). Previous paleoseismic studies indicate four large-magnitude surface-faulting earthquakes have occurred on the Weber segment since mid-Holocene time. Nelson and others (2006) report finding evidence for four events at the Garner Canyon and East Ogden sites, including what they infer was a partial segment rupture (with 1.6 feet of displacement) around 500 years ago. This partial segment rupture was not evident at the Kaysville site of McCalpin and others (1994), although chronologic intervals for the remaining three earthquakes were similar. DuRoss and others (2009) report paleoseismic data from the 2007 Rice Creek site support a preferred scenario of six surface-faulting earthquakes in Holocene time, with four events since about 5,400 years ago, and confirm Nelson and others' (2006) partial segment rupture timing.

Lund (2005) indicates preferred earthquake timing for the last four surface-faulting earthquakes on the Weber segment is: (1) an event Z between 200 to 800 years ago (partial segment rupture) and/or between 500 and 1,400 years ago (complete segment rupture), (2) an event Y between 2,300 and 3,700 years ago, (3) an event X between 3,800 and 5,200 years ago, and (4) an event W between 5,400 and 6,800 years ago. The consensus preferred recurrence interval for the Weber segment, as determined by the Utah Quaternary Fault Working Group, is 1,400 years for the past four surface-faulting earthquakes (Lund, 2005).

The site is also in the central portion of the Intermountain Seismic Belt (ISB), a generally north-south trending zone of historical seismicity along the eastern margin of the Basin and Range province extending from northern Arizona to northwestern Montana (Sbar and others, 1972; Smith and Sbar, 1974). At least 16 earthquakes of magnitude 6.0 or greater have occurred within the ISB since 1850; the largest of these earthquakes was a M_S 7.5 event in 1959 near Hebgen Lake, Montana. However, none of these earthquakes occurred along the Wasatch fault or other known late Quaternary faults (Arabasz and others, 1992; Smith and Arabasz, 1991). The closest of these events was the 1934 Hansel Valley (M_S 6.6) event north of the Great Salt Lake.

Surficial Geology
The site is located within the Wasatch Front Valley System, a deep sediment-filled, structural basin flanked by the Wasatch Range to the east and the Lakeside Mountains to the west. The Project is located at and below the highest (Bonneville) shoreline of Lake Bonneville. Surficial geology of the site is mapped by Yonkee and Lowe (2004) as alluvial-fan deposits graded to the Bonneville shoreline, and lacustrine sand and gravel from Pleistocene Lake Bonneville (units Qaf4 and Qlg4; Figure 3). Further west is Holocene alluvium and colluvium (units Qafl and Qc; Figure 3). Yonkee and Lowe (2004) also map a queried landslide deposit (Qms5?; Figure 3) northeast of the Project. The main trace of the Weber segment is mapped near the southwest site corner (Figure 3).

Yonkee and Lowe (2004) describe surficial units in the site vicinity, from youngest to oldest in age, as follows:

> ***Qaf – Alluvial-fan deposits, undivided.*** Mixture of clast-supported, moderately sorted, pebble to cobble gravel and sand deposited by streams, and matrix-supported, poorly sorted, pebble to boulder gravel to diamicton deposited by debris flows; mapped where deposits lack cross-cutting relations and relative age is uncertain; exposed thickness less than 9 meters (30 ft).
>
> ***Qc – Colluvium.*** Weakly to non-layered, variably sorted, matrix- to clast-supported, pebble to boulder gravel and diamicton of local origin; contains angular to sub-angular clasts in variable amounts of clay, silt, and sand matrix; deposits formed mostly by creep and slope wash, also includes small landslides, talus, debris cones, minor alluvium, and small bedrock exposures; found mostly along vegetated slopes in Wasatch Range, and locally covering scarps along the Wasatch fault zone; thickness probably less than 15 meters (50 ft) in most areas.
>
> ***Qmf – Debris-flow deposits, undivided.*** Matrix- to clast-supported cobble and boulder gravel, with variable amounts of sand, silt, and clay matrix; surfaces variably rubbly and commonly have levees and channels; includes multiple events graded to various levels above modern channels; unit grades into alluvial fans at mouths of canyons, and into colluvium, talus, and slide deposits at higher elevations in source areas; thickness probably less than 9 meters (30 ft).

Qms – Landslide deposits, undivided. Unsorted, unstratified deposits of angular boulders, sand, silt, clay, and bedrock blocks; deposits generally found on steeper slopes that are covered by thick vegetation and display hummocky topography; deposits formed by single to multiple slides, slumps, and flows; mapped where lack of cross-cutting relations prevents relative age determination; queried where hummocky topography is more subdued; thickness uncertain.

Qaf1 – Younger alluvial-fan deposits, Holocene. Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; forms fans having distinct levees and channels at mouths of mountain-front canyons; exposed thickness less than 6 meters (20 ft).

Qms1 – Younger landslide deposits, Holocene. Unsorted, unstratified mixtures of gravel, sand, silt, and clay redeposited by slides, slumps, and flows; deposits display distinctly hummocky topography and fresh scarps, and are currently or have been recently active; many of these deposits are within older slide complexes.

Qaf2 – Older alluvial-fan deposits, Holocene. Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; forms fans with poorly preserved levees that are slightly incised by modern stream channels; exposed thickness less than 6 meters (20 ft).

Qaf3 – Alluvial-fan deposits, Bonneville regressive. Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; contains mostly angular to subrounded clasts plus some recycled, well-rounded lacustrine clasts; forms fans having subdued morphology that are graded to the Provo or other regressive shorelines and are incised by modem stream channels; exposed thickness less than 9 meters (30 ft).

Qaf4 – Alluvial-fan deposits, Bonneville transgressive. Mixture of gravel deposited by streams and diamicton deposited by debris flows; gravel contains mostly angular to subrounded clasts; locally weakly cemented with calcite; fans have subdued morphology, display top surfaces graded to the Bonneville shoreline, and are deeply incised by modern stream channels; total thickness of some composite fans as much as 60 meters (200 ft).

Qd4 – Deltaic deposits, Bonneville transgressive. Topset beds of clast-supported, moderately to well-sorted, pebble gravel and gravelly sand; contains abundant subrounded to rounded basement clasts; deposited as Lake Bonneville was near a transgressive shoreline at an elevation of about 1,520 meters (5,000 ft); thickness of topset beds 2 to 4 meters (7 - 13 ft).

Qlg4 – Lacustrine gravel-bearing deposits, Bonneville transgressive. Clast-supported, moderately to well-sorted, pebble to cobble gravel, with some silt to sand in interfluve areas and away from mountain front; gravels contain rounded to subrounded clasts, and some subangular clasts derived from reworking of mass-wasting and alluvial-fan deposits; deposited in higher energy environments along shorelines and small fan deltas as Lake Bonneville was transgressing; grades westward away from shorelines into fine-grained lacustrine deposits (Qlf4); total thickness locally as much as 60 meters (200 ft).

Qlf4 – Lacustrine fine-grained deposits, Bonneville transgressive. Intervals of calcareous clay to silt, and intervals of rhythmically interbedded fine to medium sand and silt near mouth of Weber Canyon; deposited in deeper water environments, and as delta bottomset beds during transgression of Lake Bonneville; total thickness, including subsurface deposits, locally as much as 150 meters (500 ft).

Qms5 – Landslide deposits, pre-Bonneville to Bonneville transgressive. Unsorted, unstratified deposits of angular boulders, sand, silt, clay, and bedrock blocks; deposited by multiple slides, slumps, and flows; parts of these slides are covered by Lake Bonneville deposits and reworked along the Bonneville shoreline, and parts of some slides are interlayered with Bonneville-transgressive lacustrine deposits.

Bedrock of the Farmington Canyon Complex:

Xfgh – Granitic gneiss of Ogden hanging wall. Light- to pink-gray, moderately to strongly foliated, fine- to medium-grained, hornblende-bearing granitic gneiss with rare orthopyroxene; gneiss is locally fractured and displays red hematite alteration; gneiss cut by variably deformed, light-colored pegmatitic dikes; unit also contains small pods of meta-gabbro and amphibolite; gradational contacts with migmatitic gneiss.

Xfm – Migmatitic gneiss. Medium- to light-pink-gray, strongly foliated and layered, migmatitic, quartzo-feldspathic gneiss with widespread garnet and biotite; gneiss cut by widespread, variably deformed, pegmatitic dikes; unit also contains widespread amphibolite layers, granitic gneiss bands, and some thin layers of biotite-rich schist; gradational contacts with granitic gneiss.

Xfb – Biotite-rich schist. Medium-gray to dark-brown, strongly foliated, biotite-rich schist with widespread garnet and sillimanite; displays alternating biotite-rich and quartz-feldspar-rich bands that are rotated into complex fold patterns; schist cut by variably deformed, garnet-bearing pegmatite dikes; unit also contains some thin layers of amphibolite, quartz-rich gneiss, and granitic gneiss; gradational contacts with migmatitic gneiss.

References included in the above unit descriptions are not provided in this report, but are provided in Yonkee and Lowe (2004).

Lake Bonneville History
Lakes occupied nearly 100 basins in the western United States during late-Quaternary time, the largest of which was Lake Bonneville in northwestern Utah. The Bonneville basin consists of several topographically closed basins created by regional extension in the Basin and Range (Gwynn, 1980; Miller, 1990), and has been an area of internal drainage for much of the past 15 million years. Lake Bonneville consisted of numerous topographically closed basins, including the Salt Lake and Cache Valleys (Oviatt and others, 1992). Sediments from Lake Bonneville underlie the site and site vicinity.

Timing of events related to the transgression and regression of Lake Bonneville is indicated by calendar age estimates of significant radiocarbon dates in the Bonneville Basin (Donald Currey, University of Utah; written communication to the Utah Geological Survey, 1996; and verbal communication to the Utah Quaternary Fault Parameters Working Group, 2004). Approximately 32,500 years ago, Lake Bonneville began a slow transgression (rise) to its highest level of 5,160 to 5,200 feet above mean sea level. The lake rise eventually slowed as water levels approached an external basin threshold in northern Cache Valley at Red Rock Pass near Zenda, Idaho. Lake Bonneville reached the Red Rock Pass threshold and occupied its highest shoreline, termed the Bonneville beach, after about 18,000 years ago. During the transgression and highstand, major drainages that emanate from within the Wasatch Range (such as the Weber River) formed large deltaic complexes in the lake at their canyon mouths. The lake remained at its highest level until 16,500 years ago, when headward erosion of the Snake River-Bonneville basin drainage divide caused a catastrophic incision of the threshold and the lake level lowered by roughly 360 feet in fewer than two months (Jarrett and Malde, 1987; O'Conner, 1993).

Following the Bonneville flood, the lake stabilized and formed a lower shoreline referred to as the Provo shoreline. Climatic factors then caused the lake to regress rapidly from the Provo shoreline, and by about 13,000 years ago the lake had eventually dropped below historic levels of Great Salt Lake. Oviatt and others (1992) deem this low stage the end of the Bonneville lake cycle. Drainages that fed Lake Bonneville began downcutting through stranded deltaic complexes and near-shore deposits as the lake receded from the Provo shoreline. Great Salt Lake experienced a brief transgression between 12,800 and 11,600 years ago to the Gilbert level at about 4,250 feet before receding to and remaining within about 20 feet of its historic average level (Lund, 1990).

SITE CHARACTERIZATION

Air Photo Observations

A 1952 aerial photograph available from the U.S. Geological Survey (frame AAJ-3K-203, Figure 4) was reviewed to obtain information about the geomorphology of the site and surrounding area. The main trace of the Weber segment of the WFZ is evident on Figure 4 slightly west of the Project, and the highest (Bonneville) shoreline of Lake Bonneville is evident near the southeast corner of the site. The shoreline is obscured by a small post-lake alluvial fan emanating from the unnamed canyon to the east. The fan shows a bifurcated morphology that suggests past debris flows extended southward onto the shoreline and then turned northwestward back into the channel. The ephemeral drainage emanating from the unnamed canyon appears incised through the alluvial fan, indicating it may no longer be active. A younger Holocene fan formed by deposition from this drainage is downslope to the west of the Project. A northwest-trending bench about 50 to 75 feet wide crosses the western part of the Project, but is not evident further north or south. We infer this bench is an older shoreline formed at a lower elevation west of the canyon mouth as the Lake Bonneville transgressed to its highest shoreline.

No other geologic hazards are evident on the photo at the site or in the area, including the queried landslide east of the Project on Figure 3. The landslide morphology appears to be weak or nonexistent and its provenance is uncertain, although it could be an old rockslide similar to those found along the range front a few miles to the north (such as the Beus Canyon and College rockslides of Pashley and Wiggins, 1972)

Empirical Observations

On August 3, 2015, Mr. Bill D. Black of Western GeoLogic conducted a reconnaissance of the property and immediate vicinity. Weather at the time of the site reconnaissance was cloudy and raining with temperatures in the 70's (°F). The site is on southwest-facing slopes at the base of the Wasatch Range at and below the Bonneville shoreline. Vegetation at the site consists of scrub oak, sage brush, and grasses. Slopes in the upper (eastern part of the site) dip at about an overall 7:1 (horizontal:vertical) gradient, and then steepen southwestward to around 2:1. The steep slopes are heavily vegetated and showed no evidence for ongoing or recent instability. The steep slopes bound a narrow bench with about an 8:1 westward dip, corresponding to the sub-Bonneville shoreline discussed above, and then continue westward to Melanie Lane. The lower steep slope section (below the bench) is likely the upper part of the scarp of the main trace of the active Weber Segment of the WFZ, although it may be in part modified by road grading for Melanie Lane.

An unnamed drainage is northeast of the Project that flows from a small canyon to a small catchment basin on the east side of 2950 East Street. The drainage appears to be a possible source for debris flows, although it has been intercepted by fill materials emplaced for the street. The drainage is piped westward beneath the street and discharges north of the site back into its natural course. The drainage was dry at the time of our investigation, and appeared heavily vegetated and deeply incised west of 2950 East Street. No evidence for debris flow levees was observed, and no other geologic hazards were evident.

Subsurface Investigation

On August 3, 2015 three test pits were excavated at the site with a large trackhoe to evaluate subsurface conditions. Test pit locations are shown on Figure 5. Logs of the test pits at a scale of 1 inch equals 5 feet are shown on Figure 6. The test pits all exposed a similar sequence of near-shore lacustrine sand and gravel deposits from Lake Bonneville (unit 1) overlain by post-lake alluvium from a combination of debris flows and slope wash (unit 2, Figure 6). A weak paleosol A horizon was observed on the top of unit 1 in test pits 1 and 3 (unit 1A), but was not evident in test pit 2. A roughly one-foot thick modern A-horizon soil was evident on top of units 2 in all the test pits. Unit 2 has a maximum thickness in test pit 3 of about 5 feet, but no paleosols or stratigraphic contacts were evident to delineate individual debris flows. Based on soil carbonate in unit 2 and the paleosol A horizon on unit 1, we believe unit 2 to be latest Pleistocene to early Holocene in age. No groundwater was encountered in any of the test pits to their explored depths.

Cross Section

Figure 7 shows one cross section (A-A') across the proposed home location at the site at a scale of 1 inch equals 40 feet, with no vertical exaggeration. The cross section location is shown on Figure 4. Unit contacts and dips are inferred from the test pit data, GSH boring logs, geologic mapping on Figure 3, and site observations. The cross section displays a thin veneer of alluvium overlying lacustrine sand and gravel from Lake Bonneville, which in turn overlies older alluvium and likely weathered Farmington Canyon Complex bedrock. The contact between the older alluvium and Lake Bonneville deposits is inferred to be at a depth of about 20 feet in GSH boring B-1, and the contact between the older alluvium and weathered bedrock is below the explored depth of B-1 (>50 feet). Further to the west, all these deposits would be down-dropped significantly across the WFZ.

GEOLOGIC HAZARDS

Assessment of potential geologic hazards and the resulting risks imposed is critical in determining the suitability of the site for development. Table 1 below shows a summary of the geologic hazards reviewed at the site, as well as a relative (qualitative) assessment of risk to the Project for each hazard. A "high" hazard rating (H) indicates a hazard is present at the site (whether currently or in the geologic past) that is likely to pose significant risk to the proposed development. A "moderate" hazard rating (M) indicates a hazard that poses an equivocal risk or only impacts a small portion of the development. A "low" hazard rating (L) indicates the hazard is not present, poses little or no risk, and/or is not likely to significantly impact the Project. High and moderate-risk hazards may require further studies or mitigation, whereas low-risk hazards typically require no additional studies or mitigation. We note that these hazard ratings represent a conservative assessment for the entire site and risk may vary in some areas. Careful selection of development areas can minimize risk by avoiding known hazard areas.

Table 1. *Geologic hazards summary.*

Hazard	H	M	L	...Hazard Rating
Earthquake Ground Shaking	X			
Surface Fault Rupture		X		
Liquefaction and Lateral-spread Ground Failure			X	
Tectonic Deformation			X	
Seismic Seiche and Storm Surge			X	
Stream Flooding			X	
Shallow Groundwater			X	
Landslides and Slope Failures		X		
Debris Flows and Floods		X		
Rock Fall			X	
Radon	X			
Problem Soil			X	

Earthquake Ground Shaking

Ground shaking refers to the ground surface acceleration caused by seismic waves generated during an earthquake. Strong ground motion is likely to present a significant risk during moderate to large earthquakes located within a 60 mile radius of the project area (Boore and others, 1993). Seismic sources include mapped active faults, as well as a random or "floating" earthquake source on faults not evident at the surface. Mapped active faults within this distance include: the East and West Cache fault zones; the Brigham City, Weber, Salt Lake, and Provo segments of the Wasatch fault zone; the East Great Salt Lake fault zone; the Morgan fault; the West Valley fault zone; the Oquirrh fault zone; and the Bear River fault zone (Black and others, 2003).

The extent of property damage and loss of life due to ground shaking depends on factors such as: (1) proximity of the earthquake and strength of seismic waves at the surface (horizontal motions are the most damaging); (2) amplitude, duration, and frequency of ground motions; (3) nature of foundation materials; and (4) building design (Costa and Baker, 1981). Peak ground, 0.2 second spectral, and 1.0 second spectral accelerations (percent of gravity, %g) at the site with 10% and 2% probabilities of exceedance in 50 years are estimated in Frankel and others (2002) as follows:

41.154026° N, -111.906968° W	**10% PE in 50yr**	**2% PE in 50yr**
PGA	19.77	60.91
0.2 sec SA	47.95	140.67
1.0 sec SA	16.97	57.84

Given the above information, earthquake ground shaking is a high risk to the site. The hazard from earthquake ground shaking can be adequately mitigated by prudent design and construction.

Surface Fault Rupture

Movement along faults at depth generates earthquakes. During earthquakes larger than Richter magnitude 6.5, ruptures along normal faults in the intermountain region generally propagate to the surface (Smith and Arabasz, 1991) as one side of the fault is uplifted and the other side down dropped. The resulting fault scarp has a near-vertical slope. The surface rupture may be expressed as a large singular rupture or several smaller ruptures in a broad zone. Ground displacement from surface fault rupture can cause significant damage or even collapse to structures located on an active fault.

The main trace of the Weber segment is mapped slightly west of the Project near the intersection of 2925 East Street and Melanie Lane (Figures 3-5), and the western part of the Project extends into the Surface Fault Rupture Special Study Area (SFRSSA) on Weber County maps. However, no structures are currently planned in the SFRSSA (Figure 2). No trenching was conducted to evaluate the hazard from surface faulting at the site given the current development plan and risk of destabilizing steep slopes in the western part of the site. Existing risk in the area of the proposed home footprint is low, but risk increases in the western part of the Project with proximity to the fault. Given the above, we rate the hazard from surface faulting at the site as moderate. No structures designed for human occupancy should be located in the SFRSSA (west of the boundary) without additional trenching to evaluate the risk from surface faulting.

Liquefaction and Lateral-spread Ground Failure
Liquefaction occurs when saturated, loose, cohesionless, soils lose their support capabilities during a seismic event because of the development of excessive pore pressure. Earthquake-induced liquefaction can present a significant risk to structures from bearing-capacity failures to structural footings and foundations, and can damage structures and roadway embankments by triggering lateral spread landslides. Earthquakes of Richter magnitude 5 are generally regarded as the lower threshold for liquefaction. Liquefaction potential at the site is a combination of expected seismic (earthquake ground shaking) accelerations, groundwater conditions, and presence of susceptible soils.

Sandy lacustrine deposits possibly susceptible to liquefaction are present in the upper 30 feet of the site subsurface and the site is in an area of potentially strong shaking (as discussed in the Earthquake Ground Shaking Section above). However, groundwater at the site appears to be greater than 50 feet deep. Based on the above, we rate the hazard from liquefaction as low, although risk could vary depending on factors such as perched groundwater and seasonal conditions.

Tectonic Deformation
Tectonic deformation refers to subsidence from warping, lowering, and tilting of a valley floor that accompanies surface-faulting earthquakes on normal faults. Large-scale tectonic subsidence may accompany earthquakes along large normal faults (Lund, 1990). Tectonic subsidence is believed to mainly impact those areas immediately adjacent to the downthrown side of a normal fault. The site is not on the downthrown side of any mapped active faults, and therefore we rate that hazard from tectonic deformation as low.

Seismic Seiche and Storm Surge
Earthquake-induced seiche presents a risk to structures within the wave-oscillation zone along the edges of large bodies of water, such as the Great Salt Lake. Given the elevation of the subject property and distance from large bodies of water, the risk to the subject property from seismic seiches is rated as low.

Stream Flooding
Stream flooding may be caused by direct precipitation, melting snow, or a combination of both. In much of Utah, floods are most common in April through June during spring snowmelt. High flows may be sustained from a few days to several weeks, and the potential for flooding depends on a variety of factors such as surface hydrology, site grading and drainage, and runoff.

No active drainages cross the site or were evident during our reconnaissance. One ephemeral drainage is mapped in the unnamed canyon northeast of the site that is piped beneath 2950 East Street and discharges into its natural course downslope. This drainage does not enter the property. Given all the above, we rate the hazard from stream flooding as low. Site hydrology and runoff should be addressed in the civil engineering design and grading plan for the Project.

Shallow Groundwater
No springs are shown on the topographic map for the Ogden quadrangle at the site and no springs were observed during our site reconnaissance. No groundwater was encountered in any of the borings conducted by GSH at the site to depths of 50 feet, or in any of the test pits conducted for this report. We anticipate the depth to groundwater to be greater than 50 feet in the area. Given the above, we rate the risk from shallow groundwater as low, although the risk may vary locally depending on factors such as perched groundwater and seasonal conditions.

Landslides and Slope Failures
Slope stability hazards such as landslides, slumps, and other mass movements can develop along moderate to steep slopes where a slope has been disturbed, the head of a slope loaded, or where increased groundwater pore pressures result in driving forces within the slope exceeding restraining forces. Slopes exhibiting prior failures, and also deposits from large landslides, are particularly vulnerable to instability and reactivation.

The western half of the site is on steep 2:1 (horizontal:vertical) slopes underlain by lacustrine sand and gravel deposits. Several Holocene landslides (unit Qms1) are shown in lacustrine deposits in the area, including in similar lacustrine gravel deposits as those underlying the site about 0.3 miles to the northwest (Figure 3). However, no existing landslides are mapped at the site and no evidence for ongoing or recent instability was observed. Given the above, we rate the hazard from landslides as moderate. We recommend stability of the slopes be evaluated in a geotechnical engineering evaluation prior to building based on site-specific data and subsurface information included in this report. Recommendations for reducing the risk from landsliding should be provided if factors of safety are determined to be unsuitable. Care should also be taken that site grading does not destabilize slopes in this area without prior geotechnical analysis and grading plans, that proper drainage is maintained, and no non-engineered cuts are made in slope toes.

Debris Flows
Debris flow hazards are typically associated with unconsolidated alluvial fan deposits at the mouths of large range-front drainages, such as those along the Wasatch Front. Debris flows have historically significant damage in the Wasatch Front area.

An ephemeral drainage is in the unnamed canyon northeast of the site that flows southwestward to near the northeast site corner and forms an inverted Y-shaped alluvial fan emanating from the canyon mouth (Figure 4). The alluvial fan obscures (and is therefore younger than) the Bonneville shoreline (Figure 4). Figures 3 and 4 show the eastern and northern parts of the site are underlain by this alluvial fan. The ephemeral drainage currently flows from the canyon mouth to a small catchment basin on the northeast side of 2950 East Street, where it is piped beneath the road and discharges about 160 feet to the southwest roughly 20 feet north of the site (Figure 5). Fill materials emplaced for 2950 East Street appears to have blocked the natural drainage course (Figures 4 and 5). Prior to modification, the drainage appears to have incised a channel across the fan, suggesting the alluvial fan was no longer active (Figure 4). Deposition moved to lower slopes to the west and formed a younger alluvial fan (Figure 4). Test pit data confirm that one or more debris flows have emanated from the canyon and impacted the site since the lake retreat of Lake Bonneville (Figure 6). Individual flows could not be delineated, but the deposits have a maximum thickness of 5 feet in test pit 3 (unit 2, Figure 6) and appear to be latest Pleistocene to early Holocene in age based on soil development.

The drainage basin for the unnamed canyon covers an area of about 97 acres (0.39 km^2) and includes three ephemeral drainages with lengths of from 2,485 to 3,026 feet (Figure 1). Van Dine (1996; Figure 5) provides a correlation to estimate design magnitude debris flow volumes based on drainage basin area. Based on a drainage basin area of 0.39 km^2 (97 acres), Van Dine (1996, Figure 5) estimates a design magnitude volume of about 5,000 m^3 (6,540 yd^3). Hungr and others (1984) also provide a correlation to estimate design magnitude debris flow volumes based on drainage length (aka empirical bulking). Based on our observations, the drainages are in loose sediments over weathered bedrock, which would be a Hungr and others' (1984) Channel Type B drainage with a corresponding sediment bulking factor of 2 to 4 yd^3/ft. Giraud (2005) indicates bulking rates for intermittent and ephemeral streams are generally lower than rates for perennial streams, and similar ephemeral drainages have showed bulking rates of 1.5 to 5 yd^3/ft (Mulvey and Lowe, 1992; McDonald and Giraud, 2002). We believe a bulking rate of 2 yd^3/ft is appropriate. Given this bulking rate and a maximum length of 3,026 feet, Hungr and others' (1984) correlation would estimate a design magnitude volume of 6,052 yd^3, which is within 10% of the estimate based on drainage basin area (6,540 yd^3, above).

The unnamed canyon northeast of the Project thus appears capable of generating a significant flow. However, the fan underlying the site appears to have been inactive for several thousand years, and alluvial deposition appears to have moved to lower slopes to the west in Holocene time. Based on the above, we rate the risk from debris flows to the Project as moderate. Risk could vary if flow and deposition patters have been altered by development. Recommendations should therefore be provided in the civil engineering design for the proposed home to reduce the hazard from debris flows and floods. Such recommendations may include raising the building pad by at least the maximum past flow thickness (5 feet), eliminating north-facing below-grade entryways, grading routing channels and berms to direct debris and water away from the home, or a combination of the above. However, care should be taken that potential floodwaters and debris are not directed into adjoining properties.

Rock Fall

No significant bedrock outcrops were observed in higher slopes east of the property, and no boulders from rock falls were observed at the site. Given this, we rate the hazard from rock falls as low.

Radon
Radon comes from the natural (radioactive) breakdown of uranium in soil, rock, and water and can seep into homes through cracks in floor slabs or other openings. The site is located in an area of "High" radon-hazard potential (Black and Solomon, 1996). A high hazard potential indicates geologic factors are favorable for indoor radon concentrations exceeding 4 picocuries per liter of air, which would be above the EPA recommended level. Actual indoor radon levels can be affected by non-geologic factors such as building construction, maintenance, and weather. Long-term indoor testing following construction is the best method to characterize the radon hazard and determine if mitigation measures are required.

Swelling and Collapsible Soils
Surficial soils that contain certain clays can swell or collapse when wet. Given the subsurface soil conditions observed at the site, we do not anticipate that any soils susceptible to swelling or collapse will be present. However, a geotechnical engineering evaluation should be performed to address soil conditions and provide specific recommendations for site grading, subgrade preparation, and footing and foundation design.

CONCLUSIONS AND RECOMMENDATIONS

Geologic hazards posing a high relative risk to the site are earthquake ground shaking and radon. Moderate-risk hazards include surface faulting, landslides, and debris flows. The following recommendations are provided to address these hazards:

- Proposed homes should be designed and constructed to current seismic standards to reduce the potential ground-shaking hazard.
- No structures intended for human occupancy should be located in the SFRSSA (west of the boundary) on Figures 2 and 5 without additional trenching to evaluate if active faults may be present. It is generally accepted practice to allow streets, driveways, yards, tennis courts, and non-occupied, non-attached structures to be constructed within this area without further trenching studies.
- A design-level geotechnical engineering study should be conducted prior to construction to: (1) address soil conditions at the site for use in foundation design, site grading, and drainage; (2) provide recommendations regarding building design to reduce risk from seismic acceleration; and (3) evaluate stability of slopes at the site, including providing recommendations for reducing the risk of landsliding if the factors of safety are deemed unsuitable.
- Site grading and drainage should be addressed in the civil engineering design for the development, including providing recommendations to reduce risk from debris flows and floods to the proposed home.

The site appears suitable for the proposed development given the scope of this report and findings herein, and assuming our recommendations provided above are followed.

Availability of Report

The report should be made available to architects, building contractors, and in the event of a future property sale, real estate agents and potential buyers. This report should be referenced for information on technical data only as interpreted from observations and not as a warranty of conditions throughout the site. The report should be submitted in its entirety, or referenced appropriately, as part of any document submittal to a government agency responsible for planning decisions or geologic review. Incomplete submittals void the professional seals and signatures we provide herein. Although this report and the data herein are the property of the Client, the report format is the intellectual property of Western Geologic and should not be copied, used, or modified without express permission of the authors.

LIMITATIONS

This investigation was performed at the request of the Client using the methods and procedures consistent with good commercial and customary practice designed to conform to acceptable industry standards. The analysis and recommendations submitted in this report are based upon the data obtained from site-specific observations and compilation of known geologic information. This information and the conclusions of this report should not be interpolated to adjacent properties without additional site-specific information. In the event that any changes are later made in the location of the proposed site, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or approved in writing by the engineering geologist.

This report has been prepared by the staff of Western GeoLogic for the Client under the professional supervision of the principal and/or senior staff whose seal(s) and signatures appear hereon. Neither Western GeoLogic, nor any staff member assigned to this investigation has any interest or contemplated interest, financial or otherwise, in the subject or surrounding properties, or in any entity which owns, leases, or occupies the subject or surrounding properties or which may be responsible for environmental issues identified during the course of this investigation, and has no personal bias with respect to the parties involved.

The information contained in this report has received appropriate technical review and approval. The conclusions represent professional judgment and are founded upon the findings of the investigations identified in the report and the interpretation of such data based on our experience and expertise according to the existing standard of care. No other warranty or limitation exists, either expressed or implied.

The investigation was prepared in accordance with the approved scope of work outlined in our proposal for the use and benefit of the Client; its successors, and assignees. It is based, in part, upon documents, writings, and information owned, possessed, or secured by the Client. Neither this report, nor any information contained herein shall be used or relied upon for any purpose by any other person or entity without the express written permission of the Client. This report is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance written consent of Western GeoLogic.

In expressing the opinions stated in this report, Western GeoLogic has exercised the degree of skill and care ordinarily exercised by a reasonable prudent environmental professional in the same community and in the same time frame given the same or similar facts and circumstances. Documentation and data provided by the Client, designated representatives of the Client or other interested third parties, or from the public domain, and referred to in the preparation of this assessment, have been used and referenced with the understanding that Western GeoLogic assumes no responsibility or liability for their accuracy. The independent conclusions represent our professional judgment based on information and data available to us during the course of this assignment. Factual information regarding operations, conditions, and test data provided by the Client or their representative has been assumed to be correct and complete. The conclusions presented are based on the data provided, observations, and conditions that existed at the time of the field exploration.

It has been a pleasure working with you on this project. Should you have any questions, please call.

Sincerely,
Western GeoLogic, LLC

LICENSED PROFESSIONAL GEOLOGIST
9-1-2015
BILL DUANE BLACK
NO. 5224898-2250
STATE OF UTAH

Bill. D. Black, P.G.
Senior Engineering Geologist

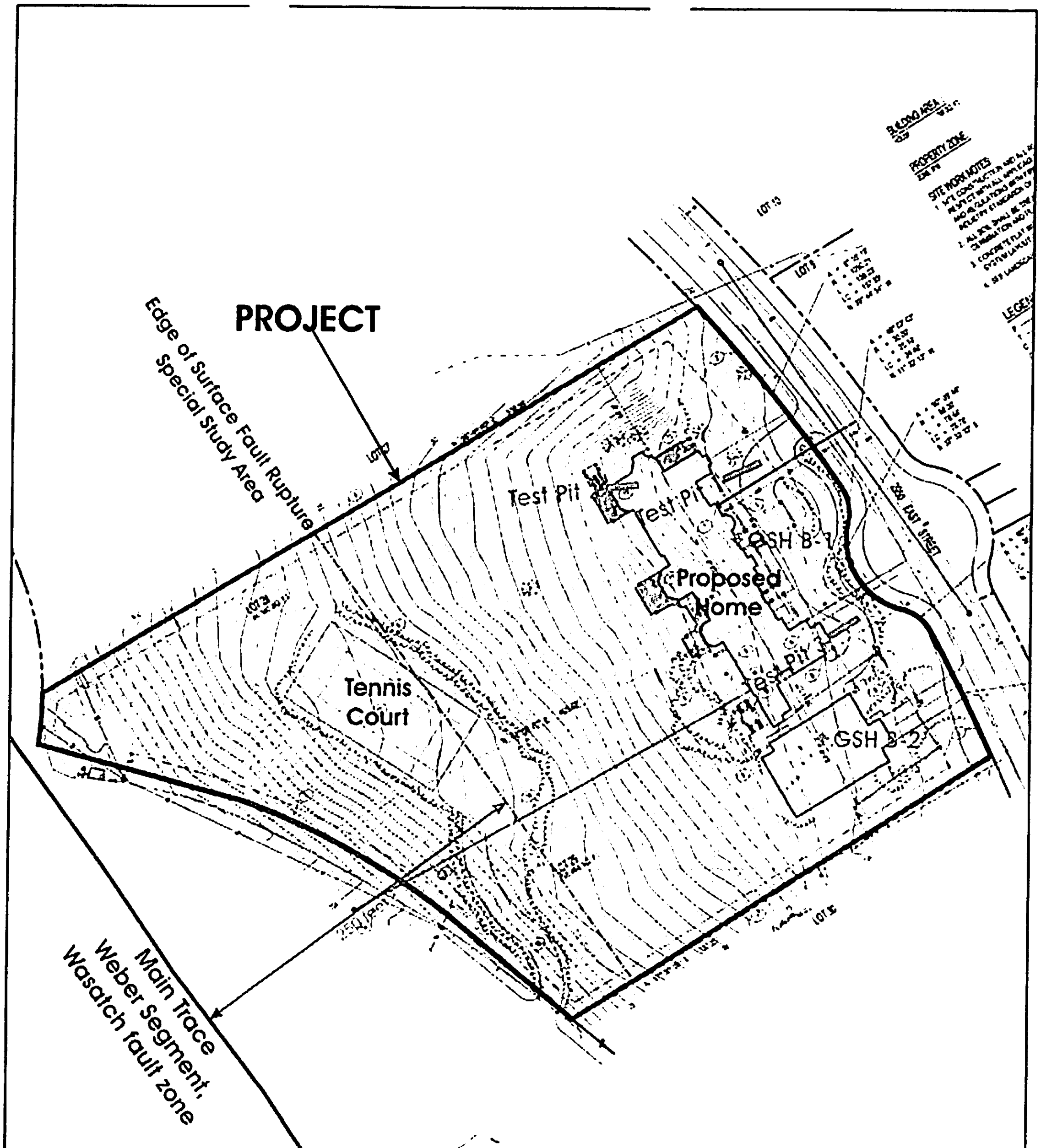
Reviewed by:

LICENSED PROFESSIONAL GEOLOGIST
CRAIG V NELSON
5251804
STATE OF UTAH

Craig V. Nelson, P.G.
Principal Engineering Geologist

ATTACHMENTS

Figure 1. Location Map (8.5"x11")
Figure 2. Development Plan (8.5"x11")
Figure 3. Geologic Map (8.5"x11")
Figure 4. 1952 Air Photo (8.5"x11")
Figure 5. Site Plan (8.5"x11")
Figure 6. Test Pit Logs (11"x17")
Figure 7. Cross Section (11"x17")



Source: undated Design Source Site Plan prepared for Herb & Carol Christian.

WESTERN GEOLOGIC

N W E S

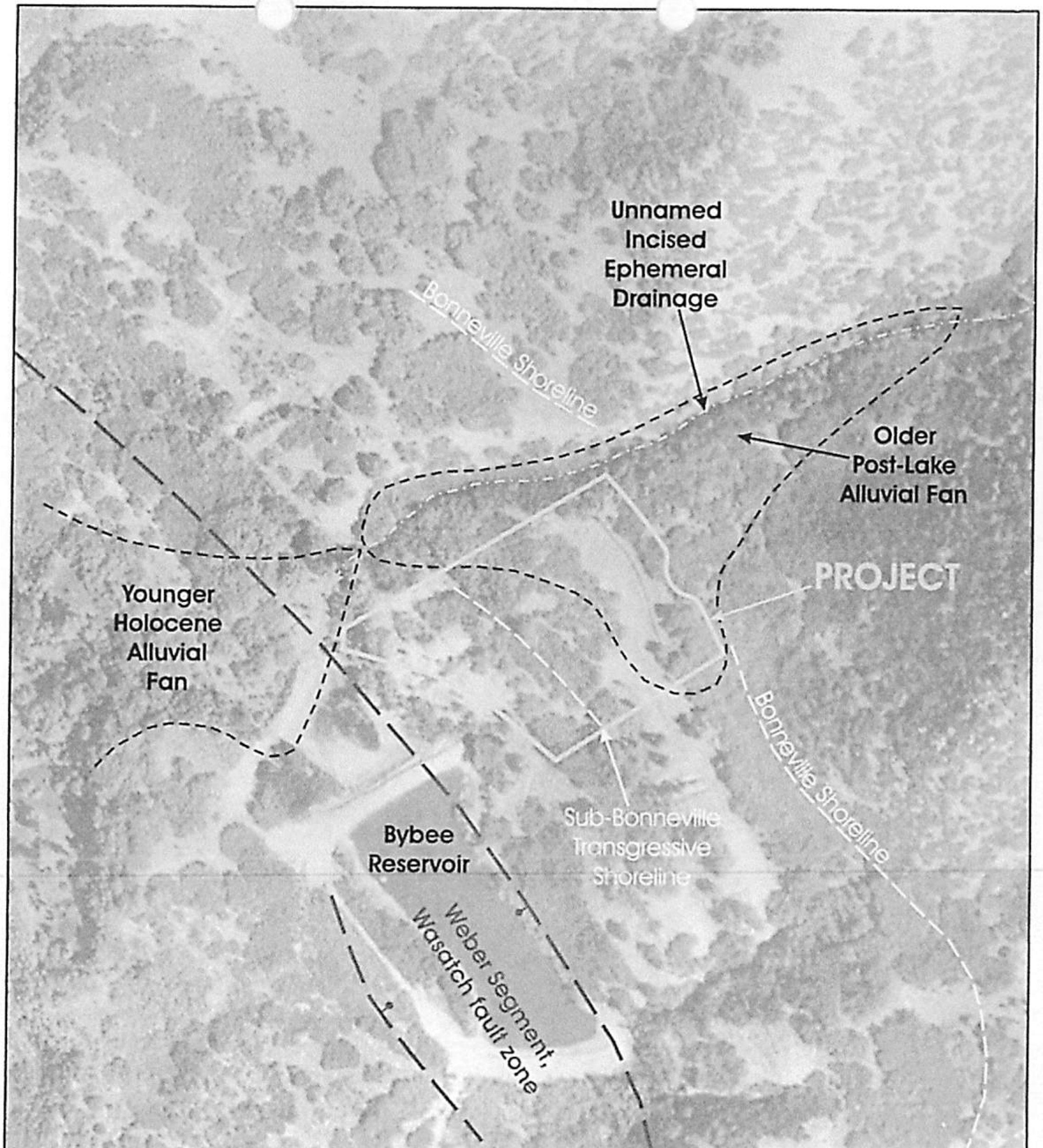
0 50 100 feet

Scale 1:1,200
(1 inch = 100 feet)

DEVELOPMENT PLAN

GEOLOGIC HAZARDS EVALUATION
Eastwood Estates Lots 28 and 29
5973-5995 South 2950 East
Ogden, Weber County, Utah

FIGURE 2



Air photo from U.S. Geological Survey, frame AAJ-3K-203, September 1952.

WESTERN GEOLOGIC

N
W E
S

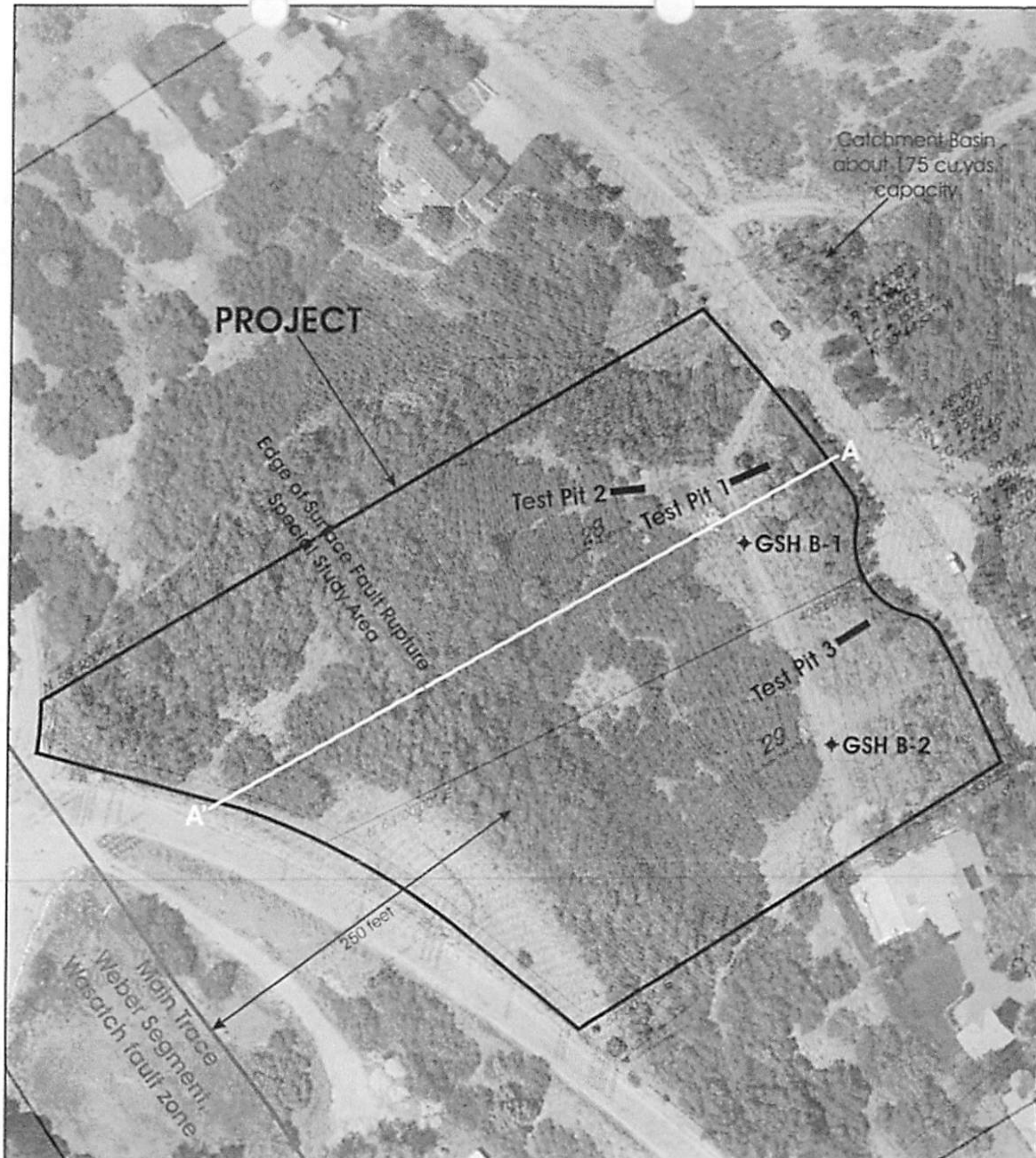
0 125 250 feet

Scale 1:3,000
(1 inch = 250 feet)

AIR PHOTO

GEOLOGIC HAZARDS EVALUATION
Eastwood Estates Lots 28 and 29
5973-5995 South 2950 East
Ogden, Weber County, Utah

FIGURE 4



Base map from Great Basin Engineering Topographic Survey, September 2008; aerial photo from Utah AGRC high-resolution orthophoto, 2012; fault location from Yonkee and Lowe (2004; Figure 2).

WESTERN GEOLOGIC

N W E S

0 50 100 feet

Scale 1:1,200
(1 inch = 100 feet)

SITE PLAN

GEOLOGIC HAZARDS EVALUATION
Eastwood Estates Lots 28 and 29
5973-5995 South 2950 East
Ogden, Weber County, Utah

FIGURE 5

REPORT
GEOTECHNICAL STUDY
PROPOSED SINGLE-FAMILY HOME
LOTS 28 AND 29 EASTWOOD ESTATES NO. 10
ABOUT 5973 SOUTH 2950 EAST
NEAR OGDEN, WEBER COUNTY, UTAH

Submitted To:

Herbert Christian
1368 Eagle Court
Windsor, Colorado

Submitted By:

GSH Geotechnical, Inc.
1596 West 2650 South
Ogden, Utah 84401

September 9, 2015

Job No. 1931-01N-15

September 9, 2015
Job No. 1931-01N-15

Mr. Herbert Christian
1368 Eagle Court
Windsor, Colorado 80550

Re: Report
Geotechnical Study
Proposed Single-Family Home
Lots 28 and 29 Eastwood Estates No. 10
About 5973 South 2950 East
Near Ogden, Weber County, Utah
(41.1537 N; -111.9072 W)

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed for the proposed home on Lots 28 and 29 of the Eastwood Estates No. 10 development located at about 5973 South 2950 East near Ogden in Weber County, Utah. The general location of the site with respect to major roadways, as of 2014, is presented on Figure 1, Vicinity Map. A more detailed aerial view of the site showing the existing roadways and improvements is presented on Figure 2, Site Plan. The locations of the borings drilled in conjunction with this study are also presented on Figure 2.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Herbert Christian, Mr. Mark Babbitt of Great Basin Engineering, and Mr. Andrew Harris of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, and slope stability recommendations as well as geoseismic information to be utilized in the design and construction of the proposed home.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the excavating, logging, and sampling of 3 test pits.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of our Professional Services Agreement No. 15-0644N dated June 24, 2015 and executed July 3, 2015.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2, Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The proposed project consists of constructing a single-family residence on Lots 28 and 29 of the Eastwood Estates No. 10 development located at about 5973 South 2950 East near Ogden in Weber County, Utah. Construction will likely consist of reinforced concrete footings and basement foundation walls supporting 1 to 3 wood-framed levels above grade with some stone, brick, or stucco veneer. Projected maximum column and wall loads are on the order of 10 to 50 kips and 1 to 3 kips per lineal foot, respectively.

Site development will require a moderate amount of earthwork in the form of site grading. We estimate in general that maximum cuts and fills to achieve design grades will be on the order of 2 to 5 feet. Larger fills and cuts may be required at isolated areas and should be engineered accordingly to maintain stability of the slopes at the site.

3. INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 2 borings were drilled to depths of about 52.0 to 102.0 feet below existing grade within the proposed home location. The borings were drilled using a truck-mounted drill rig equipped with air-rotary and a downhole hammer (Odex). Locations of the borings are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3C, Boring Log. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Boring Log (USCS).

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) and a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) were utilized in the subsurface soil sampling. The blow counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, 1.25-inch diameter slotted PVC pipe was installed in Boring B-1 and B-2 in order to provide a means of monitoring potential groundwater fluctuations. The borings were backfilled with auger cuttings.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program included moisture, density, Atterberg limits, full and partial gradation, and direct shear tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density

To provide index parameters and to correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 3A and 3B.

3.2.3 Atterberg Limit Tests

To aid in classifying the soils, Atterberg limit tests were performed on s sample of the onsite soils. Results of the test are tabulated below:

Boring No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
B-2	90.5	33	19	14	SC

3.2.4 Full and Partial Gradation Test

Gradation tests were performed to aid in classifying soils. The tests results are tabulated below:

Boring No.	Depth (feet)	Soil Type	Percent Passing													
			4"	3"	2"	1 ½"	1"	3/4"	1/2"	3/8"	No. 4	No. 10	No. 20	No. 40	No. 100	No. 200
B-1	10.5	SP/SM	---	---	---	---	---	---	100	79	63	42	25	17	9	5.9
B-1	30.5	SP/SM	---	---	---	---	---	---	---	---	---	---	---	---	---	6.6
B-1	40.5	SP/SM	---	---	---	---	---	---	---	---	---	---	---	---	---	9.6
B-2	10.5	GP	---	---	---	---	100	60	--	46	30	20	13	9	5	3.2
B-2	25.5	GP/GM	---	---	---	---	---	---	---	---	---	---	---	---	---	8.6
B-2	40.5	GP/GM	---	---	---	---	100	79	---	45	35	27	19	14	8	5.9
B-2	70.5	SP/SM	---	---	---	---	---	---	---	---	---	---	---	---	---	11.8
B-2	90.5	SC	---	---	---	---	---	---	---	---	---	---	---	---	---	24.8

3.2.5 Laboratory Direct Shear Test

To determine the shear strength of the soils encountered at the site, laboratory direct shear tests were performed on each of 2 remolded samples of the site soils. The results of the tests are tabulated below:

Boring No.	Depth (feet)	Soil Type	Remolded Moisture Content (percent)	Remolded Dry Density (pcf)	Internal Friction Angle (degrees)	Apparent Cohesion (psf)
B-2	75.5	SP	12	89	36	75
B-2	85.5	SC	12	89	36	300

4. SITE CONDITIONS

4.1 GEOLOGIC SETTING

A geologic hazards evaluation study[1] dated September 1, 2015 was prepared for the subject property by Western Geologic, LLC, and a copy of that report is included in the attached Appendix.

4.2 SURFACE

The subject property consist of two vacant, irregular shaped lots located at about 5973 South 2950 East near Ogden in Weber County, Utah. The topography slopes downward to the west/southwest at grades of 1.4H:1V to 8H:1V (Horizontal:Vertical), with an overall change in elevation of about 140 feet across the site. Vegetation at the site consists primarily of native weeds, grasses, and a number of mature trees, particular over the slope area. The site is bordered on north and south residential development, by 2950 East to the east, and by Melanie Lane to the west.

4.3 SUBSURFACE SOIL

Subsurface conditions encountered at the boring locations were relatively consistent across the site. At the boring locations, topsoil and disturbed soils were encountered at the surface to about 2 to 3 inches below existing grades. Natural soils were encountered beneath the topsoil and disturbed soils to the full depth penetrated, about 52.0 to 102.0 feet, and consisted of fine and coarse gravel with fine to coarse sand and varying amounts of silt, fine to coarse sand with varying amounts of fine and coarse gravel and varying amounts of silt and clay, and occasional mixtures of these soils.

The natural sand and gravel soils encountered were medium dense to very dense, slightly moist to moist, brown to reddish brown to gray in color, and will generally exhibit moderately high strength and low compressibility characteristics under the anticipated loading.

For a more detailed description of the subsurface soils encountered, please refer to Figures 3A and 3B, Boring Log. The lines designating the interface between soil types on the test pit logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

4.4 GROUNDWATER

During and subsequent to drilling, groundwater was not encountered at the boring locations to depths of 102.0 feet. Groundwater is anticipated to be at significant depths in the area.

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[1] "Report, Geologic Hazards Evaluation, Eastwood Estates Lots 28 and 29, 5973-5995 South 2950 East, Ogden, Weber County, Utah," Western Geologic, LLC, September 1, 2015.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The results of our analyses indicate that the proposed structure may be supported upon conventional spread and/or continuous wall foundations established upon suitable natural soils or granular structural fill extending to suitable natural soils.

The most significant geotechnical aspect of the site is maintaining stability of the slope at the rear of the property.

All non-engineered fills (if encountered) must be removed to suitable natural soils below building foundations. The existing non-engineered fills may remain in flexible pavement and slab areas if they are properly prepared, as discussed in this report and subsequent overlying site grading fills are no more than 3 feet in total thickness.

The on-site soils may be re-utilized as structural site grading fill if they meet the requirements for such, as stated herein. However, it must be noted that from a handling and compaction standpoint, soils containing high amounts of fines (silts and clays) are very sensitive to changes in moisture content and will require very close moisture control during placement and compaction. <u>This will be very difficult, if not impossible, during wet and cold periods of the year.</u>

A geotechnical engineer from GSH will need to verify that all fill material (if encountered) and topsoil/disturbed soils have been completely removed and/or properly prepared and suitable natural soils encountered prior to the placement of structural site grading fills, floor slabs, footings, foundations, or rigid pavements.

In the following sections, detailed discussions pertaining to earthwork, foundations, lateral pressure and resistance, floor slabs, slope stability, and the geoseismic setting of the site are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the removal of surface vegetation (if encountered), topsoil (if encountered), loose surficial fill piles, and any other deleterious materials from beneath an area extending out at least 3 feet from the perimeter of the proposed building and 2 feet beyond pavements and exterior flatwork areas.

All non-engineered fills must be removed below all foundations. In situ, non-engineered fills may remain below floor slabs and pavements if free of debris and deleterious materials, less than 4 feet in thickness, and if properly prepared. Proper preparation will consist of the scarification of the upper 12 inches below asphalt concrete (flexible pavement) and 24 inches below rigid pavement/floor slabs followed by moisture preparation and re-compaction to the requirements of structural fill. The thicker sequence of prepared soils below slabs/rigid pavements would require the temporary removal of 12 inches of fill soils, scarifying, moisture conditioning, and recompacting the underlying 12 inches and backfilling with 12 inches of compacted suitable fills.

Even with proper preparation, pavements/slabs established overlying non-engineered fills may encounter some long-term movements unless the non-engineered fills are completely removed. Installing reinforcement in slabs over fills may help reduce potential displacement cracking.

It must be noted that from a handling and compaction standpoint, onsite soils containing high amounts of fines (silts and clays) are inherently more difficult to rework and are very sensitive to changes in moisture content requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year.

Subsequent to stripping and prior to the placement of structural site grading fill, pavements, driveway, and parking slabs on grade, the prepared subgrade must be proofrolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or loose soils are encountered, they must be removed to a maximum depth of 2 feet and replaced with structural fill. Beneath footings, all loose and disturbed soils must be totally removed. Fill soils must be handled as described above.

Surface vegetation, construction/demolition debris, and other deleterious materials shall generally be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

A representative of GSH must verify that suitable natural soils and/or proper preparation of existing fills have been encountered/met prior to placing site grading fills, footings, slabs, and pavements.

5.2.2 Excavations

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, shall be no steeper than one-half horizontal to one vertical (½H:1V). For excavations up to 10 feet, in granular soils and above the water table, the slopes shall be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing and dewatering. Excavations deeper than 8 feet are not anticipated at the site.

Temporary excavations up to 10 feet deep in fine-grained cohesive soils (if encountered), above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical (½H:1V).

To reduce disturbance of the natural soils during excavation, it is recommended that smooth edge buckets/blades be utilized.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill will be required as site grading fill, as backfill over foundations and utilities, and possibly as replacement fill beneath some footings. All structural fill must be free of sod, rubbish, construction debris, frozen soil, and other deleterious materials.

Structural site grading fill is defined as fill placed over fairly large open areas to raise the overall site grade. The maximum particle size within structural site grading fill should generally not exceed 4 inches; although, occasional particles up to 6 to 8 inches may be incorporated provided that they do not result in "honeycombing" or preclude the obtainment of the desired degree of compaction. In confined areas, the maximum particle size should generally be restricted to 2.5 inches.

On-site granular soils may be re-utilized as structural site grading fill if they do not contain construction debris or deleterious material and meet the requirements of structural fill. However, due to the percentage of rock larger than 3/4 –inches in the gravelly soils at the site, placement and compaction would have to be verified by full time observation as inplace density testing with a nuclear densometer would be unfeasible. <u>Fine-grained soils (clays/silts) are not recommended as structural fill.</u>

Only granular soils are recommended in confined areas such as utility trenches, below footings, etc. Generally, we recommend that all imported granular structural fill consist of a well-graded mixture of sands and gravels with no more than 20 percent fines (material passing the No. 200 sieve) and less than 30 percent retained on the 3/4 inch sieve. The plasticity index of import fine-grained soil shall not exceed 18 percent.

To stabilize soft subgrade conditions or where structural fill is required to be placed closer than 1.0 foot above the water table at the time of construction, a mixture of coarse gravels and cobbles and/or 1.5- to 2.0-inch gravel (stabilizing fill) should be utilized. It may also help to utilize a stabilization fabric, such as Mirafi 600X or equivalent, placed on the native ground if 1.5- to 2.0-inch gravel is used as stabilizing fill.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

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5.2.4 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the ASTM[2] D-1557 (AASHTO[3] T-180) compaction criteria in accordance with the table below:

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 5 feet beyond the perimeter of the structure	0 to 10	95
Site Grading Fills outside area defined above	0 to 5	90
Site Grading Fills outside area defined above	5 to 10	95
Trench Backfill	--	96
Pavement granular base/subbase	--	96

Structural fills greater than 10 feet thick are not anticipated at the site.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation shall consist of the removal of all loose or disturbed soils.

If utilized for stabilizing fill, coarse gravel and cobble mixtures should be end-dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a

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2 American Society for Testing and Materials
3 American Association of State Highway and Transportation Officials

backfilled trench. Proofrolling may be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they must be removed (to a maximum depth of 2 feet below design finish grade) and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1-a/A-1-b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

The natural or imported silt/clay soils are not recommended for use as trench backfill, particularly in structurally loaded areas.

5.3 SLOPE STABILITY

5.3.1 Parameters

The properties of the sand soils at this site were estimated using the results of our laboratory testing, published correlations, and our experience with similar soils. Based on tests performed by the Bureau of Reclamation[4], poorly graded clean sands and sand-gravel mixtures have an internal friction angle ranging from 36 to 38 degrees and clayey sands have an internal friction angle ranging from 28 to 34 degrees and a cohesion varying from 120 to 360 pounds per square foot. Accordingly, we estimated the following parameters for use in the stability analyses:

Accordingly, we estimated the following parameters for use in the stability analyses:

Material	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Unit Weight (pcf)
Sand/Gravel	35	75	120
Clayey Sand	36	250	115

For the seismic (pseudostatic) analysis, a peak horizontal ground acceleration of 0.495g after adjusting for Site Class C was obtained for site (grid) locations of 41.1537 degrees latitude (north) and 111.9072 degrees longitude (west). To model sustained accelerations at the site, one-half of this value is typically employed. Accordingly, a value of 0.25g was used as the pseudostatic coefficient for the stability analysis.

4 U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

GSH

5.3.2 Stability Analyses

We evaluated the global stability of the existing slope using the computer program *SLIDE*. This program uses a limit equilibrium (Simplified Bishop) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated. We analyzed the following configuration based on cross-sections provided in the referenced geologic study (see appendix for cross-section information and locations):

- A relatively flat roadway followed by an approximately 15-foot high slope inclined at approximately 1V:2H (Vertical:Horizontal) grading to an approximately 40-foot high slope inclined at approximately 1V:1.4H (Vertical:Horizontal) grading to an approximately 10-foot high slope inclined at about 1V:7.5H (Vertical:Horizontal) grading to an approximately 10-foot high slope inclined at about 1V:4.5H (Vertical:Horizontal) grading to an approximately 25-foot high slope inclined at about 1V:1.8H (Vertical:Horizontal) grading to an approximately 22-foot high slope inclined at about 1V:2.5H (Vertical:Horizontal) grading to an approximately 23-foot high slope inclined at about 1V:8H (Vertical:Horizontal) where the proposed home will be located grading to a relatively flat area for the upper roadway. To simulate the load imposed on the slope by the proposed home, a load of 2,000 pounds per square foot was modeled at 15 feet from the crest of the slope.

Typically, the required minimum factors of safety are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate that the existing slope configuration with the addition of the proposed home will meet both these requirements provided our recommendations are followed. The slope stability data are included as Figure 5 and 6, attached.

Note that slope movements or even failure can occur if the slope soils are undermined or become saturated. Therefore, we recommend that irrigation lines not be placed on the slope. Surface drainage at the bottom and top of the slope must also be directed to prevent ponding at the toe or crest of the slope. The property owner and the owner's representatives must be made aware of the risks should these or other conditions occur that could saturate or erode/undermine the slope soils.

5.4 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.4.1 Design Data

The proposed structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils and/or structural fill extending to suitable natural soils. For design, the following parameters are provided.

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 16 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Pressure for Real Load Conditions	- 2,000 pounds per square foot
Bearing Pressure Increase for Seismic Loading	- 50 percent

The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.4.2 Installation

Footings shall not be installed upon soft or disturbed soils, non-engineered fill, construction debris, frozen soil, or within ponded water. If the granular structural fill upon which the footings are to be established become disturbed, it shall be recompacted to the requirements for structural fill or be removed and replaced with structural fill.

The width of structural fill, where placed below footings, shall extend laterally at least 6 inches beyond the edges of the footings in all directions for each foot of fill thickness beneath the footings. For example, if the width of the footing is 2 feet and the thickness of the structural fill beneath the footing is 2.0 feet, the width of the structural fill at the base of the footing excavation would be a total of 4.0 feet, centered below the footing.

5.4.3 Settlements

Maximum settlements of foundations designed and installed in accordance with recommendations presented herein and supporting maximum anticipated loads as discussed in Section 2, Proposed Construction, are anticipated to be 1 inch or less.

Approximately 40 percent of the quoted settlement should occur during construction.

5.5 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.30 should be utilized for foundations placed over natural soils and 0.40 for foundations placed over structural fill. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.6 LATERAL PRESSURES

The lateral pressure parameters, as presented within this section, are for backfills which will consist of drained granular soil placed and compacted in accordance with the recommendations presented herein. The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), granular backfill may be considered equivalent to a fluid with a density of 35 pounds per cubic foot in computing lateral pressures. For more rigid walls (moderately yielding), generally not exceeding 8 feet in height, granular backfill may be considered equivalent to a fluid with a density of 45 pounds per cubic foot. The above values assume that the surface of the soils slope behind the wall is no steeper than 4 horizontal to 1 vertical and that the granular fill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading, a uniform pressure shall be added. The uniform pressures based on different wall heights are provided in the following table:

Wall Height (feet)	Seismic Loading Active Case (psf)	Seismic Loading Moderately Yielding (psf)
4	25	55
6	40	85
8	55	115

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5.7 FLOOR SLABS

Floor slabs may be established upon suitable natural soils and/or upon structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established over non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. In order to provide a capillary break and facilitate curing of the concrete, it is recommended that floor slabs be directly underlain by 4 inches of "free-draining" fill, such as "pea" gravel or three-quarters- to one-inch minus clean gap-graded gravel.

Settlement of lightly loaded floor slabs (average uniform pressure of 200 pounds per square foot or less) is anticipated to be less than 1/4 inch.

5.8 SUBDRAINS

5.8.1 General

Groundwater was not encountered at the site, however we recommend that the perimeter foundation subdrains be installed as indicated below.

5.8.2 Foundation Subdrains

Foundation subdrains should consist of a 4-inch diameter perforated or slotted plastic or PVC pipe enclosed in clean gravel. The invert of a subdrain should be at least 2 feet below the top of the lowest adjacent floor slab. The gravel portion of the drain should extend 2 inches laterally and below the perforated pipe and at least 1 foot above the top of the lowest adjacent floor slab. The gravel zone must be installed immediately adjacent to the perimeter footings and the foundation walls. To reduce the possibility of plugging, the gravel must be wrapped with a geotextile, such as Mirafi 140N or equivalent. Above the subdrain, a minimum 4-inch-wide zone of "free-draining" sand/gravel should be placed adjacent to the foundation walls and extend to within 2 feet of final grade. The upper 2 feet of soils should consist of a compacted clayey cap to reduce surface water infiltration into the drain. As an alternative to the zone of permeable sand/gravel, a prefabricated "drainage board," such as Miradrain or equivalent, may be placed adjacent to the exterior below-grade walls. Prior to the installation of the footing subdrain, the below-grade walls should be dampproofed. The slope of the subdrain should be at least 0.3 percent. The gravel placed around the drain pipe should be clean 0.75-inch to 1.0-inch minus gap-graded gravel and/or "pea" gravel. The foundation subdrains can be discharged into the area subdrains, storm drains, or other suitable down-gradient location.

We recommend final site grading slope away from the structures at a minimum 2 percent for hard surfaces (pavement) and 5 percent for soil surfaces within the first 10 feet from the structures.

5.9 GEOSEISMIC SETTING

5.9.1 General

Utah municipalities have adopted the International Building Code (IBC) 2012. The IBC 2012 code determines the seismic hazard for a site based upon 2008 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2012 edition.

5.9.2 Faulting

Based upon our review of available literature, no active faults are known to pass through the site. The nearest active fault is the Wasatch Fault Zone Weber Section, approximately 600 feet west of the proposed building area.

5.9.3 Soil Class

For dynamic structural analysis, the Site Class C – Very Dense Soil and Soft Rock Profile as defined in Chapter 20 of ASCE 7 (per Section 1613.3.2, Site Class Definitions, of IBC 2012) can be utilized.

5.9.4 Ground Motions

The IBC 2012 code is based on 2008 USGS mapping, which provides values of short and long period accelerations for the Site Class B boundary for the Maximum Considered Earthquake (MCE). This Site Class B boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class C soil profile. Based on the site latitude and longitude (41.5265 degrees north and -111.8022 degrees west, respectively), the values for this site are tabulated on the following page.

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Spectral Acceleration Value, T	Site Class B Boundary [mapped values] (% g)	Site Coefficient	Site Class C [adjusted for site class effects] (% g)	Design Values (% g)
Peak Ground Acceleration	49.5	F_a = 1.000	49.5	33.0
0.2 Seconds (Short Period Acceleration)	S_S = 123.8	F_a = 1.000	S_{MS} = 123.8	S_{DS} = 82.5
1.0 Second (Long Period Acceleration)	S_1 = 47.0	F_v = 1.330	S_{M1} = 62.5	S_{D1} = 41.7

5.9.5 Liquefaction

The site is located in an area that has been identified by the Utah Geologic Survey as having "very low" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clay soils, even if saturated, will generally not liquefy.

Liquefaction of the site soils is not anticipated during the design seismic event due to the medium dense to very dense and unsaturated nature of the granular soils observed at the site.

5.10 SITE OBSERVATIONS

As stated previously, prior to placement of foundations, floor slabs, pavements, and site grading fills, a geotechnical engineer from GSH must verify that all non-engineered fill materials, topsoil, and disturbed soils have been removed and/or properly prepared and suitable subgrade conditions encountered. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

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5.11 CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 393-2012.

Respectfully submitted,

GSH Geotechnical, Inc.

Andrew M. Harris, P.E.
State of Utah No. 740456
Senior Geotechnical Engineer

Reviewed by:

Michael S. Huber, P.E.
State of Utah No. 343650
Vice President/Senior Geotechnical Engineer

AMH/MSH:mmh

Encl.	Figure	1,	Vicinity Map
	Figure	2,	Site Plan
	Figures	3A	and 3B, Boring Logs
	Figure	4,	Key to Boring Log (USCS)
	Figures	5	and 6, Stability Results
	Appendix		

Addressee (Email)

Staff Report for Administrative Subdivision Approval

Weber County Planning Division

Synopsis

Application Information

Application Request:	Consideration and action on final plat approval of Hidden Spring Ridge Subdivision, a one lot subdivision consisting of approximately 5.57 acres.
Type of Decision:	Administrative
Agenda Date:	TBD
Applicant:	Donald & Renee Bingham
File Number:	UVH051418

Property Information

Approximate Address:	4437 N 2900 E, Liberty, UT, 84310
Project Area:	5.57 Acres
Zoning:	FV-3 Zone
Existing Land Use:	Vacant Residential
Proposed Land Use:	Residential
Parcel ID:	22-008-0076
Township, Range, Section:	Township 7 North, Range 1 East, Section 18

Adjacent Land Use

North:	Residential	**South:**	Agricultural
East:	2900 East	**West:**	Agricultural

Staff Information

Report Presenter:	**Tammy Aydelotte** taydelotte@co.weber.ut.us 801-399-8794
Report Reviewer:	RG

Applicable Ordinances

- Weber County Land Use Code Title 106, Subdivisions, Chapter 1-8 as applicable
- Weber County Land Use Code Title 104 (Zones) Chapter 14 (FV-3 Zone)
- Weber County Land Use Code Title 108, Natural Hazard Areas, Chapter 22

Development History

- 5/21/2018: Submitted application for Hidden Spring Ridge Subdivision

Background and Summary

The Planning Division recommends final approval of the Hidden Spring Ridge Subdivision, a small subdivision consisting of one lot (see Exhibit A). The proposed subdivision is located at approximately 4437 N 2900 E, Liberty, UT, and is in the FV-3 zone.

The proposed subdivision will consist of 5.57 acres. The proposed subdivision and lot configuration meets all other applicable subdivision requirements as required in the Uniform Land Use Code of Weber County (LUC).

Analysis

General Plan: The proposal conforms to the Ogden Valley General Plan by encouraging development within the existing areas.

Zoning: The subject property is located in the Ogden Valley Forest Valley Zone more particularly described as the FV-3 zone. The purpose and intent of the FV-3 zone is identified in the LUC §104-14-1 as:

> *"The purpose of the Forest Valley Zone, FV-3 is to provide area for residential development in a forest setting at a low density, as well as to protect as much as possible the naturalistic environment of the development."*

As part of the subdivision process, the proposal has been reviewed against the current subdivision ordinance in LUC §106, and the standards in the FV-3 zone in LUC §104-14. Small subdivisions as defined in LUC §101-7 can be administratively approved per LUC §106-1-5(b)(1). The proposal has been reviewed against the adopted zoning and subdivision ordinances to ensure that the regulations and standards have been adhered to. The proposed subdivision is in conformance with county code. The following is a brief synopsis of the review criteria and conformance with the LUC.

Lot area, frontage/width and yard regulations: The FV-3 Zone has a minimum lot area or a minimum lot width requirement per LUC §104-14-5 for a single family residential dwelling. The following development standards will be reviewed upon submittal for a building permit:

- Minimum lot area: 3 acres
- Minimum lot width: 150 feet
- Front yard setback: 30 feet
- Side yard setback: 20 feet
- Rear yard setback: 30 feet
- Maximum building height: 35 feet

The proposed lot configuration meets the area and width standards in the FV-3 Zone.

Natural Hazards: This subdivision is located in a natural hazards area. A geologic Hazards Screening Assessment (dated December 2017) has been submitted with this application. The report addresses a one lot subdivision. The following are potential hazards identified, as well as their likelihood of occurrence (medium to high occurrence): All of the following hazards come with the recommendation that a geotechnical engineering evaluation be conducted prior to construction and recommendations for mitigation be provided.

Shallow Groundwater: this hazard risk was not assessed. According to the submitted report, further study is recommended.

Problem soils: this hazard risk was not assessed. According to the submitted report, further study is recommended.

Radon: this hazard risk was not assessed.

Karst and sink hole: this hazard risk was not assessed.

Slope Stability: this hazard risk was not assessed.

Landslides: this hazard is rated as a moderate risk. As such, it is recommended that no mass grading, cuts or fills, and construction of retaining structures be conducted as part of the development of the lot (page 15 of submitted report). It is also recommended that native, drought resistant vegetation be used in the landscape design and that minimal irrigation water be introduced to the subject site.

The following are recommendations found in the submitted report:

GeoStrata recommends that the area of development be restricted to relatively flat areas within the subject site. Site design should be engineered to facilitate surface water runoff and to ensure that no water be introduced into the hillside through infiltration.

Review Agencies: To date, the following review agencies have reviewed, but not yet approved, the proposed three lot subdivision: Weber County Addressing, Weber County Surveyor's Office. The following agencies have yet to review this project: Weber County Engineering, and Weber Fire District.

Additional design standards and requirements: There may be additional site preparation in conjunction with an approved building permit. With the exception of the recommended conditions identified in this staff report additional standards and requirements may be required at a later time.

Tax clearance: The 2017 property taxes have been paid in full. The 2018 property taxes will be due in full on November 30, 2018.

Public Notice: The required noticing for the final subdivision plat approval has been mailed to all property owners of record within 500 feet of the subject property regarding the proposed small subdivision per noticing requirements outlined in LUC §106-1-6(c).

Staff Recommendation

Staff recommends final plat approval of Hidden Spring Ridge Subdivision, a one lot subdivision consisting of approximately 5.57 acres. This recommendation for approval is subject to all applicable review agency requirements and is subject to the following condition(s):

1. All review agency requirements must be met prior to recording the final mylar.
2. All recommendations contained in all, most current, submitted geotechnical and geological reports must be followed prior to and during further development.

Recommendation for approval is based on the following findings:

1. The proposed subdivision conforms to the Ogden Valley General Plan.
2. With the recommended conditions, the proposed subdivision complies with all previous approvals and the applicable County ordinances.

Administrative Approval

Administrative final plat approval of Hidden Spring Ridge Subdivision, a one lot subdivision consisting of approximately 5.57 acres, is hereby granted based upon its compliance with the Weber County Land Use Code. This approval is subject to the requirements of applicable review agencies and is based on the findings listed in this staff report.

Date of Administrative Approval: ____________________________

____

Rick Grover
Weber County Planning Director

Exhibits:

1. Subdivision Application
2. Feasibility Letters
3. Proposed Plat

Map 1

Exhibit 1 Subdivision Application

Weber County Subdivision Application

All subdivisions submittals will be accepted by appointment only. (801) 399-8791. 2380 Washington Blvd. Suite 240, Ogden, UT 84401

Date Submitted / Completed	Fees (Office Use)	Receipt Number (Office Use)	File Number (Office Use)

Subdivision and Property Information

Subdivision Name: HIDDEN SPRING RIDGE		Number of Lots: 1
Approximate Address: 4437 N 2900E LIBERTY, UT 84310		Land Serial Number(s): 22-008-0076
Current Zoning: FV-3 /GREENBELT	Total Acreage: 5.57 acres	
Culinary Water Provider:	Secondary Water Provider:	Wastewater Treatment:

Property Owner Contact Information

Name of Property Owner(s): DONALD AND RENEE BINGHAM		Mailing Address of Property Owner(s): 4102 B CHARLESTOWN LOOP HAFB, UT 84056
Phone: 801-644-3779	Fax:	
Email Address: polaradon@gmail.com		Preferred Method of Written Correspondence: [X] Email [ ] Fax [ ] Mail

Authorized Representative Contact Information

Name of Person Authorized to Represent the Property Owner(s):		Mailing Address of Authorized Person:
Phone:	Fax:	
Email Address:		Preferred Method of Written Correspondence: [ ] Email [ ] Fax [ ] Mail

Surveyor/Engineer Contact Information

Name or Company of Surveyor/Engineer: TYLER KNIGHT LANDMARK SURVEYING, INC		Mailing Address of Surveyor/Engineer: 4646 S 3500 W #A3 WEST HAVEN, UT 84401
Phone: 801-731-4075	Fax:	
Email Address: tyler@landmarksurveyutah.com		Preferred Method of Written Correspondence: [X] Email [ ] Fax [ ] Mail

Property Owner Affidavit

I (We), _______________________________, depose and say that I (we) am (are) the owner(s) of the property identified in this application and that the statements herein contained, the information provided in the attached plans and other exhibits are in all respects true and correct to the best of my (our) knowledge. I (we) acknowledge that during the subdivision review process, it may be determined that additional requirements, covenants and/or agreements may be required to be constructed or entered into.

_______________________ (Property Owner)

_______________________ (Property Owner)

Subscribed and sworn to me this ________ day of _______________, 20______.

_______________________ (Notary)

BRIAN W. BENNION, M.P.A., L.E.H.S.
Health Officer/Executive Director

WEBER-MORGAN
HEALTH DEPARTMENT

October 24, 2017

Donald Bingham
4433 W 1650 N
Plain City, UT 84404

RE: Wastewater Site and Soils Evaluation #14589
Approximately 2900 E 4400 N, Eden UT
Parcel # 22-008-0076

An evaluation of the site and soils at the above-referenced address was completed by staff of this office on October 23, 2017. The exploration pit is located on the enclosed plat developed during the site evaluation along with the assigned numerical code for each exploration pit. The soil horizons, required percolation depths, actual and anticipated maximum ground water tables have been logged as follows:

Exploration Pit #1 (UTM Zone 12 Nad 83 0426419 E 4576762 N)

0–12"	Sandy loam, granular structure, 5% gravel
12-108"	Gravelly sandy clay loam, massive structure, 40% gravel

Exploration pits should be backfilled immediately upon completion of percolation testing to prevent a hazardous environment that may cause death or injury to people or animals.

Conduct the required percolation test so that the bottom of the percolation test holes are at **36 inches** deep from the original grade.

Percolation tests may be completed by any individual on the enclosed list. The stabilized percolation test results are to be submitted to this office for review prior to the recommendation for further development to the appropriate planning agency or prior to the issuance of a wastewater disposal permit.

Monitoring of the maximum ground water table is required in the location of the above listed exploration pits. Please complete the enclosed application of maximum ground water table monitoring and return it along with the appropriate fees. The wells should be constructed in accordance with the enclosed diagram in order to provide the most accurate water table readings possible. Each group of monitoring wells can be for an area not exceeding 600 feet or approximately a 3 acre area.

If you have any further questions, contact this office at your convenience.

Sincerely,

Summer Day, LEHS
Environmental Health Division
801-399-7160

SD/gk

EDUCATE | ENGAGE | EMPOWER

Carl R. Shupe

DOPL Licensed Environmental Health Scientist 5630685-2001
DWQ Certified Onsite Wastewater Level 3 00464-OSP-3

Mailing Address
P. O. Box 199
Huntsville, Utah 84317

Electronic Contact Information
cshupe001@gmail.com
801-814-3036

PERCOLATION TEST CERTIFICATE

PROPERTY INFORMATION

~4500 N 2900 East St
SITUS ADDRESS OF PROPERTY

22-008-0076
PARCEL ID NUMBER (TAX NUMBER)

Liberty — Utah — 84310
CITY — STATE — ZIP

5.38 acres
LOT SIZE

SE4 Sec18 T7N R1E SLBM
ADDITIONAL INFORMATION (SUBDIVISION NAME, LOT #, ETC.)

VERIFICATION NOTIFICATION

☒ **Contacted Health Department Prior to Testing**

Summer Day --> Not witnessed
NAME OF PERSON CONTACTED

PERCOLATION TEST

TESTING DEPTH AND LOCATION

36 inches
DEPTH FROM EXISTING GRADE

Within Soil Test Pit
LOCATION

TESTING DATE

2017-10-27 1700-2100 hours
DATE AND TIME OF SATURATION AND SWELLING PERIOD

2017-10-28
DATE OF PERCOLATION TEST

The time of the percolation test must start within sixteen to thirty hours after the saturation and swelling period.

	Start Time	Reference Point	End Time	End Point	Amount Dropped	Elapsed Time	Percolation MPI	Other Factors Affecting Test Results
Start	1455	8 9/16	1525	8 7/8	5/16	30	**96.0**	
2	1528	8 5/8	1558	8 7/8	1/4	30	**120.0**	
3								
4								
5								
6								
7								
8								

By signing below, I certify that the above test was conducted in accordance with UAC § R317-4-14 Appendix D.

CERTIFIED TESTER

Carl Shupe
NAME

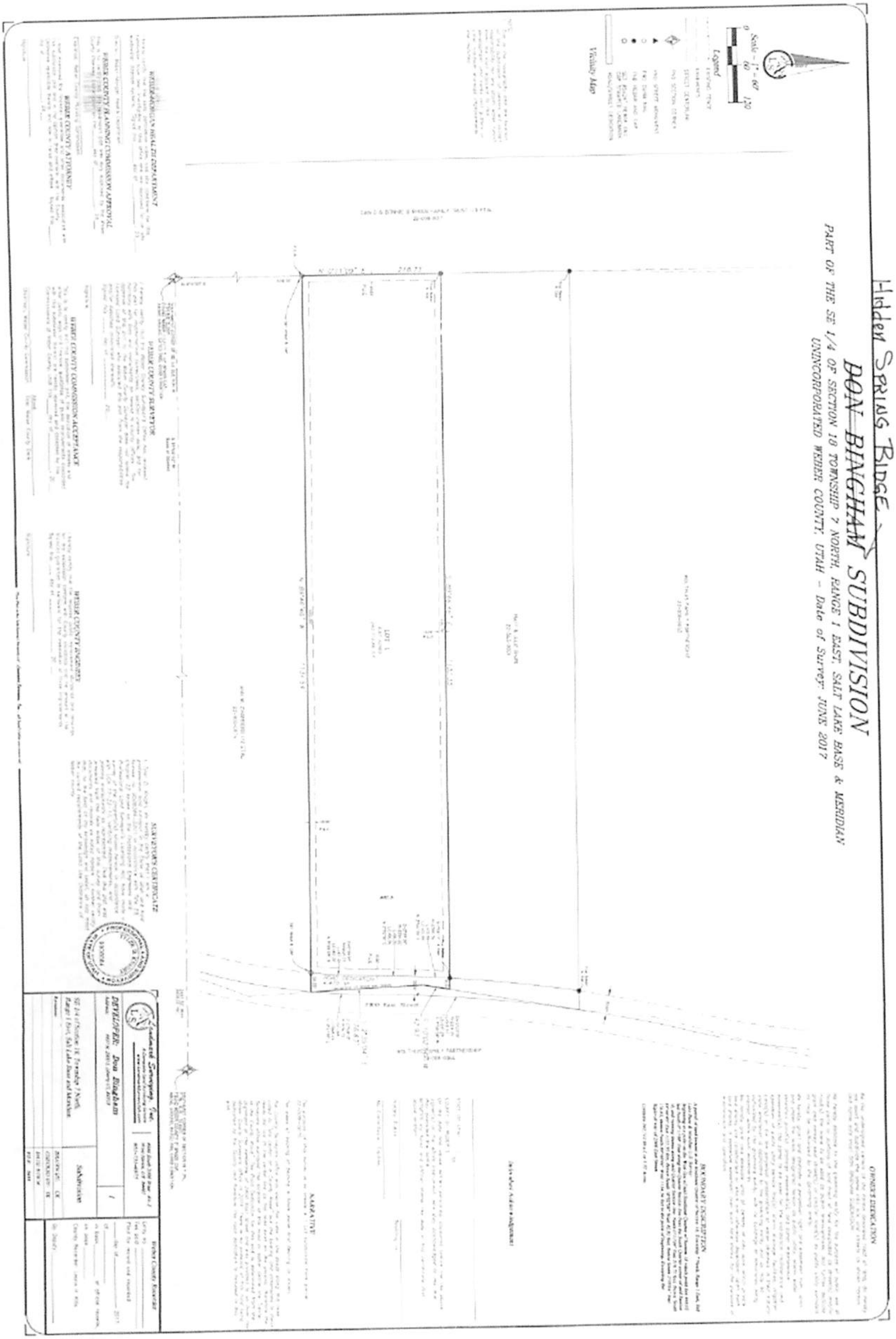
801-814-3036 cshupe001@gmail.com
PHONE NUMBER AND EMAIL

00464-OSP-3
CERTIFICATION NUMBER

2018-12-31
EXPIRATION DATE

Carl R Shupe
SIGNATURE OF CERTIFIED TESTER

2017 Oct 30
DATE OF SIGNATURE


Hidden Spring Ridge
~~DON BINGHAM~~ SUBDIVISION
PART OF THE SE 1/4 OF SECTION 18 TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
UNINCORPORATED WEBER COUNTY, UTAH - Date of Survey: JUNE 2017
DEVELOPER: Don Bingham