Staff Report for Administrative Approval
Hillside Review – Notice of Conditional Approval

Weber County Planning Division

Synopsis

Application Information

Application Request: Consideration and action on a request to approve a Hillside Review for the Trappers Ridge at Wolf Creek Resort PRUD Subdivision Phase 8.
Applicant: Eden Village LLC
Authorized Representative: Rick Everson
File Number: HSR 2016-06

Property Information

Approximate Address: 5800 E Big Horn Parkway
Zoning: RE-15
Existing Land Use: Vacant
Proposed Land Use: Multi-phased residential development
Parcel ID: 22-020-0034
Township, Range, Section: 7N 1E Sec 23

Adjacent Land Use

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

Staff Information

Report Presenter: Ronda Kippen
rkippen@co.weber.ut.us
801-399-8768
Report Reviewer: RG

Applicable Ordinances

- Weber County Land Use Code Title 108 (Standards) Chapter 14 (Hillside Development Review)
- Weber County Land Use Code Title 108 (Standards) Chapter 22 (Natural Hazards Areas)

Background

The subject property has been approved as part of the Trappers Ridge at Wolf Creek Resort PRUD located within the approved Wolf Creek Resort Master Development. The application is restricted to Trappers Ridge at Wolf Creek Subdivision Phase 8 located within the Trappers Ridge at Wolf Creek PRUD. The subdivision has been identified as being located within a potential geologic area; therefore, a geologic and geotechnical investigation have been included as part of the subdivision process to ensure the lots are safe for development.

Earthtec Engineering has performed the required geotechnical investigation and IGES has performed the required geologic hazards assessment, as required in LUC Title 108 Chapter 22, to determine if there is a geologic hazard located on the site and to assess the subsurface soils in order to better design the home for slope stability and safety purposes. Information related to the construction of the subdivisions and the geologic/geotechnical report, have been distributed to the Hillside Review Board for comment. The plans have been reviewed and approved and/or conditionally approved by all applicable review agencies.

Planning Division Review

The Planning Division Staff has determined that the requirements and standards provided by the Hillside Review Chapter have been met. The following submittals were required:

1. Subdivision Plat (see Exhibit A)
2. Geotechnical and Geologic Investigation Report (see Exhibit B)

Weber County Hillside Review Board comments

The Weber County Hillside Review Board, on this particular application, made comments related to the following:

Weber County Engineering Division: The Engineering Division granted approval on August 16, 2016. The approval is subject to the applicant following all recommendations found in the applicable Geotechnical and Geological Investigation Reports including the following conditions:

1. The Engineering Department grants approval of the Hillside Review with a condition that all recommendations and requirements from geologic and geotech reports are to be followed including but not limited to:
    a. IGES staff be on site to observe and test during site preparation and earthwork, prior to installation of footings.
    b. IGES staff be on site to observe and test during site preparation and earthwork of roadway adjacent to barren hillside to the northeast of the property to evaluate and identify a potential risks.

Weber Fire District: The Fire district has granted approval on April 18, 2016 subject to the following:

1. Fire Flow: All dwellings structures over 5000 sq. ft. which do not meet the fire flow requirements, shall be equipped with an NFPA 13D compliant fire sprinkler system or be provided with area separations compliant with the IBC/IRC. For more information regarding fire flow, please contact Fire Marshal Thueson at 801-782-3580.
2. Provide a temporary address marker at the building site during construction.
3. Roads shall have a maximum grade of 10% unless specifically approved as outlined by the International Fire Code.
4. Radius on all corners shall be a minimum of 28'-0".
5. Roads and bridges shall be designed, constructed and maintained to support an imposed load of 75,000 lbs.
6. All roads shall be designed, constructed, surfaced and maintained so as to provide an all-weather driving surface.
7. Fire access roads for this project shall be completed and approved prior to any combustible construction. Temporary roads shall meet the same requirements for height, width and imposed loads as permanent roads.
8. All required fire hydrants and water systems shall be installed, approved and fully functional prior to any combustible construction.

Weber County Building Division: The Building Division has granted approval on March 3, 2017. The approval is subject to the following condition:

1. The Geotech Engineer will need to approve the footing soil prior to placement of footings.

Weber County Planning Division: The Planning Division has granted approval subject to the applicant complying with all Board requirements and conditions. This approval is also subject to the applicant strictly adhering to the recommendations outlined in the geologic hazards assessment report dated June 20, 2016 provided by IGES (Project# 01855-007) and geotechnical investigation report dated March 10, 2016 provided by Earthtec (Project# 167002).

Planning Division Recommendations

Based on site inspections and review agency comments, the Planning Division Staff has determined that it is necessary to impose an additional condition as part of approving HSR 2016-06. The recommendation for approval is subject to adherence to all review agencies conditions and based on the following condition:

1. As a condition it is understood, by the applicant, the geo-technical engineer and engineering geologist that if any geologic hazards are revealed during the excavation and construction phase of the subdivision improvements or during the excavation for the dwelling, work will cease pending the development of appropriate mitigation measures and subsequent approval by the County.

The recommendation is based on the following findings:

1. The application was submitted and with the required conditions, has been deemed complete.
2. The requirements and standards found in the Hillside Development Review Procedures and Standards Chapter have been met or will be met during the excavation and construction phase of the infrastructure and any future dwellings.
3. The Hillside Review Board members reviewed the application individually and have provided their comments.
4. The applicant has met or will meet, as part of the subdivision process and/or during the excavation and construction phase of the improvements and future dwellings, the requirements and conditions set forth by the Hillside Review Board.

Administrative Approval

Administrative approval of the Trappers Ridge at Wolf Creek Subdivision Phase 8 (HRS 2016-06) 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 recommendations, conditions and findings listed in this staff report.

Date of Administrative Approval: ______________________

____
Rick Grover
Weber County Planning Director

Exhibits

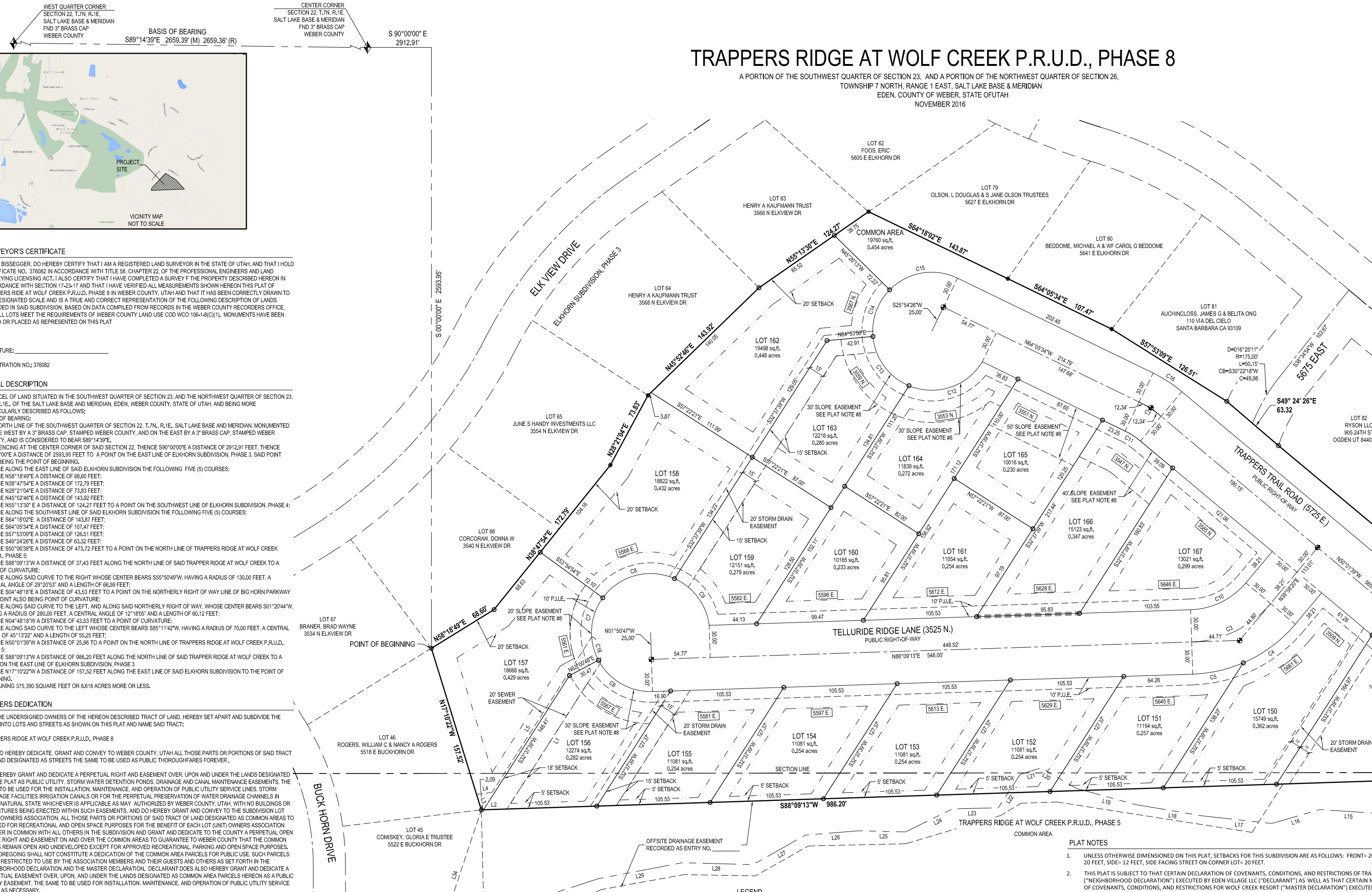
A. Subdivision Plat
B. Geotechnical and Geologic Investigation Report

Map 1

Exhibit A

TRAPPERS RIDGE AT WOLF CREEK P.R.U.D., PHASE 8

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 23, AND A PORTION OF THE NORTHWEST QUARTER OF SECTION 26,
TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
EDEN, COUNTY OF WEBER, STATE OFUTAH
NOVEMBER 2016



LINE TABLE		
LINE	LENGTH	BEARING
L1	161.046	S32° 37' 38.97"W
L2	23.881	S88° 09' 13.00"W
L3	15.055	N17° 10' 22.00"W
L4	14.680	S82° 16' 15.73"W
L5	171.807	S32° 37' 38.97"W
L6	43.372	N31° 23' 07.10"E
L7	27.346	S54° 01' 17.25"W
L8	38.204	N89° 44' 04.38"W
L9	43.069	S74° 36' 16.69"W
L10	44.329	S85° 37' 23.53"W
L11	26.915	S71° 06' 26.23"W
L12	39.506	S74° 43' 14.11"W
L13	34.259	S62° 09' 29.21"W
L14	54.105	S79° 08' 16.19"W
L15	54.395	N86° 12' 07.60"W
L16	46.654	S73° 50' 23.50"W
L17	64.298	N83° 44' 37.14"W

LINE TABLE		
LINE	LENGTH	BEARING
L18	63.890	N80° 24' 32.29"W
L19	57.257	N74° 42' 39.93"W
L20	37.759	N59° 32' 27.03"W
L21	20.686	S72° 18' 53.44"W
L22	37.106	S33° 16' 41.07"W
L23	42.436	S88° 47' 48.92"W
L24	49.120	S63° 56' 38.70"W
L25	43.551	N88° 36' 33.36"W
L26	49.560	S85° 25' 30.40"W
L27	55.954	S60° 32' 40.47"W
L28	65.811	N88° 28' 12.60"W
L29	80.363	S79° 11' 29.84"W
L30	51.681	S71° 56' 23.37"W
L31	39.563	S54° 42' 29.83"W
L32	43.745	S77° 51' 00.29"W
L33	24.548	S75° 01' 14.24"W
L34	125.193	N18° 25' 13.99"E

CURVE TABLE					
CURVE	RADIUS	LENGTH	DELTA	BEARING	CHORD
C1	100.000	24.548	14°03'55"	N57°03'37"W	24.49
C2	100.000	78.928	45°13'22"	N27°24'59"W	76.90
C3	100.000	84.177	48°13'47"	N64°02'19"E	81.71
C4	130.190	60.828	26°46'12"	S53°21'27"W	60.28
C5	130.190	48.536	21°21'37"	S77°25'21"W	48.26
C6	55.000	61.302	63°51'37"	S59°55'01"E	58.18
C7	55.000	61.504	64°04'18"	S04°02'57"W	58.35
C8	55.000	74.749	77°52'09"	S75°01'10"W	69.13
C9	55.000	56.620	58°59'01"	N36°33'15"W	54.15
C10	70.015	58.948	48°14'22"	N64°01'42"E	57.22
C11	70.000	17.184	14°03'55"	N57°03'37"W	17.14
C12	55.000	78.228	81°29'36"	N71°52'11"E	71.80
C13	55.000	59.785	62°16'51"	S36°14'35"E	56.89
C14	55.000	47.676	49°39'57"	S19°43'49"W	46.20
C15	55.000	68.485	71°20'39"	S80°14'07"W	64.15
C16	130.000	31.913	14°03'55"	N57°03'37"W	31.83
C17	130.000	36.018	15°52'28"	N42°05'25"W	35.90
C18	55.000	26.152	27°14'37"	S17°54'27"E	25.91

SURVEYOR'S CERTIFICATE

I, LYLE BISSEGGER, DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR IN THE STATE OF UTAH, AND THAT I HOLD CERTIFICATE NO. 376082 IN ACCORDANCE WITH TITLE 58, CHAPTER 22, OF THE PROFESSIONAL ENGINEERS AND LAND SURVEYING LICENSING ACT. I ALSO CERTIFY THAT I HAVE COMPLETED A SURVEY F THE PROPERTY DESCRIBED HEREON IN ACCORDANCE WITH SECTION 17-23-17 AND THAT I HAVE VERIFIED ALL MEASUREMENTS SHOWN HEREON THIS PLAT OF TRAPPERS RIDE AT WOLF CREEK P.R.U.D. PHASE 8 IN WEBER COUNTY, UTAH AND THAT IT 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 RECORDERS OFFICE, AND ALL LOTS MEET THE REQUIREMENTS OF WEBER COUNTY LAND USE COD WCO 106-1-8(C)(1). MONUMENTS HAVE BEEN FOUND OR PLACED AS REPRESENTED ON THIS PLAT

SIGNATURE: ____________________

REGISTRATION NO.: 376082

LEGAL DESCRIPTION

A PARCEL OF LAND SITUATED IN THE SOUTHWEST QUARTER OF SECTION 23, AND THE NORTHWEST QUARTER OF SECTION 23, T.7N, R.1E., OF THE SALT LAKE BASE AND MERIDIAN, EDEN, WEBER COUNTY, STATE OF UTAH, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BASIS OF BEARING:
THE NORTH LINE OF THE SOUTHWEST QUARTER OF SECTION 22, T.7N., R.1E., SALT LAKE BASE AND MERIDIAN, MONUMENTED ON THE WEST BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND ON THE EAST BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND IS CONSIDERED TO BEAR S89°14'39"E.
COMMENCING AT THE CENTER CORNER OF SAID SECTION 22, THENCE S90°00'00"E A DISTANCE OF 2912.91 FEET, THENCE S00°00'00"E A DISTANCE OF 2593.95 FEET TO A POINT ON THE EAST LINE OF ELKHORN SUBDIVISION, PHASE 3, SAID POINT ALSO BEING THE POINT OF BEGINNING.
THENCE ALONG THE EAST LINE OF SAID ELKHORN SUBDIVISION THE FOLLOWING FIVE (5) COURSES;
THENCE N58°18'49"E A DISTANCE OF 68.60 FEET;
THENCE N38°47'54"E A DISTANCE OF 172.79 FEET;
THENCE N28°21'04"E A DISTANCE OF 73.83 FEET;
THENCE N45°52'46"E A DISTANCE OF 143.92 FEET;
THENCE N55°13'30" E A DISTANCE OF 124.27 FEET TO A POINT ON THE SOUTHWEST LINE OF ELKHORN SUBDIVISION, PHASE 4;
THENCE ALONG THE SOUTHWEST LINE OF SAID ELKHORN SUBDIVISION THE FOLLOWING FIVE (5) COURSES;
THENCE S64°18'02"E A DISTANCE OF 143.87 FEET;
THENCE S64°05'34"E A DISTANCE OF 107.47 FEET;
THENCE S57°53'09"E A DISTANCE OF 126.51 FEET;
THENCE S49°24'26"E A DISTANCE OF 63.32 FEET;
THENCE S50°06'38"E A DISTANCE OF 473.72 FEET TO A POINT ON THE NORTH LINE OF TRAPPERS RIDGE AT WOLF CREEK P.R.U.D., PHASE 5;
THENCE S88°09'13"W A DISTANCE OF 37.43 FEET ALONG THE NORTH LINE OF SAID TRAPPER RIDGE AT WOLF CREEK TO A POINT OF CURVATURE;
THENCE ALONG SAID CURVE TO THE RIGHT WHOSE CENTER BEARS S55°50'49"W, HAVING A RADIUS OF 130.00 FEET, A CENTRAL ANGLE OF 29°20'53" AND A LENGTH OF 66.59 FEET;
THENCE S04°48'18"E A DISTANCE OF 43.53 FEET TO A POINT ON THE NORTHERLY RIGHT OF WAY LINE OF BIG HORN PARKWAY SAID POINT ALSO BEING POINT OF CURVATURE;
THENCE ALONG SAID CURVE TO THE LEFT, AND ALONG SAID NORTHERLY RIGHT OF WAY, WHOSE CENTER BEARS S01°20'44"W, HAVING A RADIUS OF 280.00 FEET, A CENTRAL ANGLE OF 12°18'05" AND A LENGTH OF 60.12 FEET;
THENCE N04°48'18"W A DISTANCE OF 43.53 FEET TO A POINT OF CURVATURE;
THENCE ALONG SAID CURVE TO THE LEFT WHOSE CENTER BEARS S85°11'42"W, HAVING A RADIUS OF 70.00 FEET, A CENTRAL ANGLE OF 45°13'22" AND A LENGTH OF 55.25 FEET;
THENCE N50°01'39"W A DISTANCE OF 25.96 TO A POINT ON THE NORTH LINE OF TRAPPERS RIDGE AT WOLF CREEK P.R.U.D., PHASE 5;
THENCE S88°09'13"W A DISTANCE OF 986.20 FEET ALONG THE NORTH LINE OF SAID TRAPPER RIDGE AT WOLF CREEK TO A POINT ON THE EAST LINE OF ELKHORN SUBDIVISION, PHASE 3
THENCE N17°10'22"W A DISTANCE OF 157.52 FEET ALONG THE EAST LINE OF SAID ELKHORN SUBDIVISION TO THE POINT OF BEGINNING.
CONTAINING 375,390 SQUARE FEET OR 8.618 ACRES MORE OR LESS.

OWNERS DEDICATION

WE, THE UNDERSIGNED OWNERS OF THE HEREON DESCRIBED TRACT OF LAND, HEREBY SET APART AND SUBDIVIDE THE SAME INTO LOTS AND STREETS AS SHOWN ON THIS PLAT AND NAME SAID TRACT:

TRAPPERS RIDGE AT WOLF CREEK P.R.U.D., PHASE 8

AND DO HEREBY DEDICATE, GRANT AND CONVEY TO WEBER COUNTY, UTAH ALL THOSE PARTS OR PORTIONS OF SAID TRACT OF LAND DESIGNATED AS STREETS THE SAME TO BE USED AS PUBLIC THOROUGHFARES FOREVER.

AND HEREBY GRANT AND DEDICATE A PERPETUAL RIGHT AND EASEMENT OVER, UPON AND UNDER THE LANDS DESIGNATED ON THE PLAT AS PUBLIC UTILITY, STORM WATER DETENTION PONDS, DRAINAGE AND CANAL MAINTENANCE EASEMENTS, THE SAME TO BE USED FOR THE INSTALLATION, MAINTENANCE, AND OPERATION OF PUBLIC UTILITY SERVICE LINES, STORM DRAINAGE FACILITIES IRRIGATION CANALS OR FOR THE PERPETUAL PRESERVATION OF WATER DRAINAGE CHANNELS IN THEIR NATURAL STATE WHICHEVER IS APPLICABLE AS MAY AUTHORIZED BY WEBER COUNTY, UTAH, WITH NO BUILDINGS OR STRUCTURES BEING ERECTED WITHIN SUCH EASEMENTS, AND DO HEREBY GRANT AND CONVEY TO THE SUBDIVISION LOT (UNIT) OWNERS ASSOCIATION, ALL THOSE PARTS OR PORTIONS OF SAID TRACT OF LAND DESIGNATED AS COMMON AREAS TO BE USED FOR RECREATIONAL AND OPEN SPACE PURPOSES FOR THE BENEFIT OF EACH LOT (UNIT) OWNERS ASSOCIATION MEMBER IN COMMON WITH ALL OTHERS IN THE SUBDIVISION AND GRANT AND DEDICATE TO THE COUNTY A PERPETUAL OPEN SPACE RIGHT AND EASEMENT ON AND OVER THE COMMON AREAS TO GUARANTEE TO WEBER COUNTY THAT THE COMMON AREAS REMAIN OPEN AND UNDEVELOPED EXCEPT FOR APPROVED RECREATIONAL, PARKING AND OPEN SPACE PURPOSES. THE FOREGOING SHALL NOT CONSTITUTE A DEDICATION OF THE COMMON AREA PARCELS FOR PUBLIC USE, SUCH PARCELS BEING RESTRICTED TO USE BY THE ASSOCIATION MEMBERS AND THEIR GUESTS AND OTHERS AS SET FORTH IN THE NEIGHBORHOOD DECLARATION AND THE MASTER DECLARATION. DECLARANT DOES ALSO HEREBY GRANT AND DEDICATE A PERPETUAL EASEMENT OVER, UPON, AND UNDER THE LANDS DESIGNATED AS COMMON AREA PARCELS HEREON AS A PUBLIC UTILITY EASEMENT, THE SAME TO BE USED FOR INSTALLATION, MAINTENANCE, AND OPERATION OF PUBLIC UTILITY SERVICE LINES, AS NECESSARY.

SIGNED THIS THE ________ DAY OF __________ , 20__

____
EDEN VILLAGE LLC
RUSS WATTS, MANAGING MEMBER

ACKNOWLEDGMENT

STATE OF UTAH)
) SS
COUNTY OF WEBER)

ON THIS DAY OF , 20__

ON THE ______ DAY OF ____________ , 2017, PERSONALLY APPEARED BEFORE ME RUSS WATTS, WHO BEING BY ME DULY SWORN DID SAY THAT HE IS A MANAGING MEMBER OF EDEN VILLAGE, L.L.C. AND THAT SAID INSTRUMENT WAS SIGNED IN BEHALF OF SAID L.L.C. BY A RESOLUTION OF ITS MEMBERS AND RUSS WATTS ACKNOWLEDGED TO ME THAT SAID L.L.C. EXECUTED THE SAME.

____
NOTARY PUBLIC

NARRATIVE

THIS SURVEY AND SUBSEQUENT SUBDIVISION PLAT WERE COMPLETED AT THE REQUEST OF THE "EDEN VILLAGE LLC" FRO THE PURPOSE OF SUBDIVIDING THEIR PROPERTY TO CREATE RESIDENTIAL LOTS.

BASIS OF BEARING:

ALL BEARINGS ARE BASED ON STATE PLANE.

THE NORTH LINE OF THE SOUTHWEST QUARTER OF SECTION 22, T.7N., R.1E., SALT LAKE BASE AND MERIDIAN, MONUMENTED ON THE WEST BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND ON THE EAST BY A 3" BRASS CAP, STAMPED WEBER COUNTY, AND IS CONSIDERED TO BEAR S89°14'39"E.

THE NORTHWESTERLY BOUNDARY LINE WAS SET BY THE SOUTHEASTERLY LINE OF ELKHORN SUBDIVISION PHASE 3, WHICH WAS DETERMINED FROM FOUND CENTERLINE MONUMENTS IN ELK VIEW DRIVE, AND REAR PROPERTY PINS WITH GARDENER ENG. CAPS. THE NORTHEASTERLY BOUNDARY LINE WAS SET BY THE SOUTHWESTERLY LINE OF ELKHORN SUBDIVISION, PHASE 4, WHICH WAS DETERMINED FROM FOUND CENTERLINE MONUMENTS IN ELK HORN DRIVE, AND REAR PROPERTY PINS WITH GARDENER ENG. CAPS. THE SOUTHERLY LINE WAS SET BY THE NORTHERLY LINE OF TRAPPERS RIDE AT WOLF CREEK P.R.U.D., PHASE 5 WHICH WAS DETERMINED FROM FOUND CENTERLINE MONUMENTS IN BIG PINEY DRIVE.

LEGEND

◆	ALIQUOT CORNER (AS DESCRIBED)
●	FOUND MONUMENT 5/8 REBAR AND CAP (GARDENER ENG.)
○	SET MONUMENT 5/8" REBAR AND CAP PLS NO. 38069
⊕	PROPOSED CENTERLINE MONUMENT
━━━	PROPOSED BOUNDARY LIMITS
───	PROPOSED LOT LINE
───	PROPOSED RIGHT OF WAY LINE
— — —	EXISTING BOUNDARY
— — —	PUBLIC UTILITY EASEMENT
— — —	EXISTING RIGHT OF WAY LINE
— · · —	SET BACK LINE
▬ ▬ ▬	NO ACCESS LINE
—— - - ——	SECTION LINE

N

SCALE: 1"=50'

PLAT NOTES

1. UNLESS OTHERWISE DIMENSIONED ON THIS PLAT, SETBACKS FOR THIS SUBDIVISION ARE AS FOLLOWS: FRONT= 20 FEET, REAR= 20 FEET, SIDE= 12 FEET, SIDE FACING STREET ON CORNER LOT= 20 FEET.
2. THIS PLAT IS SUBJECT TO THAT CERTAIN DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS OF TRAPPERS RIDGE, P.R.U.D. ("NEIGHBORHOOD DECLARATION") EXECUTED BY EDEN VILLAGE LLC ("DECLARANT") AS WELL AS THAT CERTAIN MASTER DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS FOR WOLF CREEK RESORT ("MASTER DECLARATION") EXECUTED BY WOLF CREEK PROPERTIES, LC ("MASTER DEVELOPER"). BOTH NEIGHBORHOOD DECLARATION AND MASTER DECLARATION HAVE BEEN RECORDED IN THE OFFICE OF THE WEBER COUNTY RECORDER WHICH SHALL SET FORTH THE RESTRICTIONS AND GENERAL PLAN OF IMPROVEMENT FOR THE PROPERTY DESCRIBED IN THIS PLAT. CERTAIN TERMS NOT OTHERWISE DEFINED IN THIS PLAT SHALL HAVE THE MEANINGS SET FORTH IN THE NEIGHBORHOOD DECLARATION OR MASTER DECLARATION.
3. PURSUANT TO THE NEIGHBORHOOD DECLARATION, THE TRAPPERS RIDGE HOMEOWNERS ASSOCIATION, INC, A UTAH NONPROFIT CORPORATION ("COMMUNITY ASSOCIATION") IS RESPONSIBLE FOR MAINTAINING ALL COMMUNITY AREAS, IF ANY, AND SHALL HAVE A PERPETUAL NON-EXCLUSIVE EASEMENT OVER ALL PARCELS FOR SUCH MAINTENANCE PURPOSES AS FURTHER DESCRIBED IN THE NEIGHBORHOOD DECLARATION.
4. AS FURTHER DESCRIBED IN THE NEIGHBORHOOD DECLARATION, ALL LOTS, AND ALL RESIDENCES AND IMPROVEMENTS CONSTRUCTED THEREON, SHALL COMPLY WITH THE ARCHITECTURAL CONTROL COMMITTEE ("COMMITTEE"). NO CONSTRUCTION, INSTALLATION, OR OTHER WORK WHICH IN ANY WAY ALTERS THE APPEARANCE OF ANY PROPERTY OR LOT WITHIN THE PROJECT, OR ANY RESIDENCES OR IMPROVEMENTS LOCATED THEREON, SHALL BE MADE OR DONE WITHOUT COMPLIANCE WITH THE COMMITTEE AS DESCRIBED IN THE NEIGHBORHOOD DECLARATION.
5. AS FURTHER DESCRIBED IN THE MASTER DECLARATION, ALL LOTS, AND ALL RESIDENCES AND IMPROVEMENTS CONSTRUCTED THEREON, SHALL COMPLY WITH THE DESIGN REVIEW BOARD ("BOARD"). NO CONSTRUCTION, INSTALLATION, OR OTHER WORK WHICH IN ANY WAY ALTERS THE APPEARANCE OF ANY PROPERTY OR LOT WITHIN THE PROJECT, OR ANY RESIDENCES OR IMPROVEMENTS LOCATED THEREON, SHALL BE MADE OR DONE WITHOUT COMPLIANCE WITH THE BOARD AS DESCRIBED IN THE MASTER DECLARATION.
6. THE NEIGHBORHOOD DECLARATION SETS FORTH THE TERMS AND RESTRICTIONS FOR NIGHTLY RENTALS AND LEASING OF LOTS WITHIN THE PROJECT.
7. THE SIDE LOT LINES WILL BE MONUMENTED AT THE INTERSECTION OF THE EXTENSION OF THE SIDE LOT LINES AND BACK OF CURB WITH A COPPER RIVET.
8. DECLARANT HEREBY GRANTS TO WEBER COUNTY A TEMPORARY EASEMENT OF VARYING WIDTH ALONG THE FRONTAGE OF LOTS 156-157 AND 163-166. SUCH SLOPE EASEMENT IS FOR THE BENEFIT OF WEBER COUNTY, ITS EMPLOYEES, AND CONTRACTORS, FOR THE PURPOSE OF STABILIZING, CUTTING SLOPES, AND PERFORMING OTHER CONSTRUCTION AND MAINTENANCE TO PREVENT EROSION ALONG THE ROADS. THE PORTION OF THE SLOPE EASEMENT ON A PLATTED LOT SHALL AUTOMATICALLY TERMINATE AT SUCH TIME AS A CERTIFICATE OF OCCUPANCY IS ISSUED FOR A RESIDENTIAL BUILDING CONSTRUCTED ON SUCH LOT, AT WHICH TIME A SUBSTITUTE EASEMENT MAY BE REQUIRED FOR ONGOING MAINTENANCE AND REPAIR.

Galloway
Planning. Architecture. Engineering.
Trolley Corners Building
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Salt Lake City, UT 84102
303.770.8884 O
www.gallowayUS.com

TRAPPERS RIDGE AT WOLF CREEK P.R.U.D., PHASE 8

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 23, AND A PORTION OF THE NORTHWEST
QUARTER OF SECTION 26, TOWNSHIP 7 NORTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN
EDEN, COUNTY OF WEBER, STATE OF UTAH

DEVELOPER
TRAPPERS RIDGE AT WOLF CREEK LLC
5200 S. HIGHLAND DRIVE STE 101
SALT LAKE CITY, UT 84117

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 ________. , 20______.

____________________.
SIGNATURE

WEBER COUNTY SURVEYOR

I HEREBY CERTIFY THAT THE WEBER COUNTY SURVEYOR'S OFFICE HAS REVIEWED THIS PLAT FOR MATHEMATICAL CORRECTNESS, SECTION CORNER DATA AND FOR HARMONY WITH LINES AND MONUMENTS ON RECORD IN THE COUNTY OFFICES. THE APPROVAL OF THIS PLAT BY THE WEBER COUNTY SURVEYORS DOES NOT RELIEVE THE LICENSED LAND SURVEYOR WHO EXECUTED THIS PLAT FROM RESPONSIBILITIES AND/OR LIABILITIES ASSOCIATED THEREWITH. SIGNED THIS ______. DAY OF ________.,
20 ______.

____________________.
COUNTY SURVEYOR

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 IMPROVEMENT.
SIGNED THIS ________. DAY OF ________. , 20 ______.

____________________.
SIGNATURE

WEBER COUNTY PLANNING COMMISSION APPROVAL

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT WAS DULY APPROVED BY THE WEBER COUNTY PLANNING COMMISSION ON THE DAY OF ____________., 20 ______.

____________________.
CHAIRMAN-WEBER COUNTY PLANNING COMMISSION

WEBER COUNTY COMMISSION ACCEPTANCE

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT, THE DEDICATION OF THE 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 ____________. , 20 ______.

____________________.
CHAIRMAN, WEBER COUNTY COMMISSION

ATTEST: ____________________.
TITLE: ____________________.

WOLF CREEK WATER AND SEWER IMPROVEMENT DISTRICT

THIS IS TO CERTIFY THAT THIS SUBDIVISION PLAT WAS DULY APPROVED BY THE WOLF CREEK WATER AND SEWER DISTRICT ON THE DAY OF ____________., 20 ______.

____________________.
GENERAL MANAGER

RECORDED #

STATE OF UTAH, COUNTY OF WEBER,
RECORDED AND FILED AT THE

REQUEST OF: ____________________.
ENTRY NO: ____________________.
DATE: ________. TIME: ________.
BOOK: ________. PAGE: ________.

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GEOTECHNICAL STUDY
TRAPPERS RIDGE PHASE 8 SUBDIVISION AT WOLF CREEK SOUTH OF INTERSECTION OF ELKVIEW DRIVE AND ELKHORN DRIVE EDEN, UTAH

Project No. 167002
March 10, 2016

Prepared For:

Watts Enterprises
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1.0 EXECUTIVE SUMMARY

This report presents the results of our geotechnical study for the Trappers Ridge Phase 8 Subdivision located in Eden, Utah. We understand the proposed project, as currently planned, will consist of constructing an eighteen (18) lot residential subdivision with a clubhouse and pool on the approximate 7 acre property with two to three story structures founded on spread footings with the possibility of daylight basements. Asphalt paved residential streets will also be constructed.

Our field exploration included the excavation of five (5) test pits to depths of about 11 to 12 feet below the existing ground surface. Groundwater was not encountered during our initial field investigation except for in Test Pit 2 (TP-2). The groundwater encountered in TP-2 may be a perched water table at a depth of approximately 8 feet below ground surface due to its proximity to a nearby creek that runs along the northeast side of the subject property. The subsurface soils encountered generally consisted of topsoil, overlying layers of native Lean Clay with sand (CL), Sandy Lean Clay with gravel (CL), Lean Clay (CL), Lean Clay with sand and gravel (CL), Clayey Sand (SC) with occasional cobbles and boulders, and Clayey Gravel with sand (GC). Topsoil, boulders and any fill material encountered should be removed beneath the entire building footprints, exterior flatwork, and pavement areas.

Based on the results of our field exploration, laboratory testing, and engineering analyses, it is our opinion that the subject site is suitable for the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. Conventional strip and spread footings may be used to support the structures, with foundations placed entirely on uniform, undisturbed, non-moisture sensitive native soils or entirely on a minimum of 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils.

This executive summary provides a general synopsis of our recommendations. Details of our findings, conclusions, and recommendations are provided within the body of this report. Failure to consult with Earthtec Engineering (Earthtec) regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site. We also strongly recommend that

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Earthtec observe the building excavations to verify the adequacy of our recommendations presented herein, and that Earthtec performs materials testing and special inspections for this project to provide continuity during construction.

2.0 INTRODUCTION

The project is located at south of intersection of Elkview Drive and Elkhorn Drive at Wolf Creek in Eden, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map*, at the end of this report.

The purposes of this study were to

- Evaluate the subsurface soil conditions at the site,
- Assess the engineering characteristics of the subsurface soils, and
- Provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, driveways, and miscellaneous concrete flatwork.

The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, geotechnical engineering analysis, and the preparation of this report.

3.0 PROPOSED CONSTRUCTION

We understand that the proposed project consists of constructing an eighteen (18) lot residential subdivision with a clubhouse and a pool. We anticipate that the future homes will be conventionally framed and be two to three stories in height. The homes will likely be founded on spread footings with the possibility of daylight basements. We have based our recommendations in this report on the assumption that foundation loads for the proposed structures will not exceed 3,000 pounds per linear foot for bearing walls, 15,000 pounds for column loads, and 100 pounds per square foot for floor slabs. If structural loads will be greater Earthtec should be notified so that we may review our recommendations and make modifications, if necessary.

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In addition to the construction described above, we anticipate that

- Utilities will be installed to service the proposed residences,
- Exterior concrete flatwork will be placed in the form of curb, gutter, driveways, and sidewalks, and
- Asphalt paved residential streets will be constructed.

4.0 GENERAL SITE DESCRIPTION

At the time of our subsurface investigation, the subject property was vacant, covered with snow and was vegetated with weeds, grasses, and a few trees and boulders. The ground surface had an average of approximately 20% slope across the site with a gentle slope towards south in most of the site, and a steeper slope at the northeastern edge. A creek ran near the south edge and outside of the property. The property was bounded on all directions with residential lots, some of which currently containing an existing residences.

5.0 SUBSURFACE EXPLORATION

5.1 Soil Exploration

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on January 27, 2016 by excavating five (5) exploratory test pits to depths of about 11 to 12 feet below the existing ground surface using a track-mounted excavator. The approximate locations of the test pits are shown on Figure No. 2, *Aerial Photograph Showing Location of Test Pits.* The conceptual layout was provided by Watts Enterprises. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 7, *Test Pit Log,* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 8, *Legend.*

Disturbed bag samples and relatively undisturbed block samples were collected at various depths in each test pit. The soil samples collected were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The

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samples were transported to our Ogden, Utah laboratory where they will be retained for 30 days following the date of this report and then discarded, unless a written request for additional holding time is received prior to the 30 day limit.

6.0 LABORATORY TESTING

Representative soil samples collected during our field exploration were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Tests performed included natural moisture content, liquid and plastic limits determinations, dry density, mechanical (partial) gradation analyses, and one-dimensional consolidation tests. The table below summarizes the laboratory test results, which are also included on the attached test pit logs at the respective sample depths and on Figure Nos. 9 and 10, *Consolidation-Swell Test.*

Table 1: Laboratory Test Results

TEST HOLE NO.	DEPTH (ft.)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			SOIL TYPE
				LIQUID LIMIT	PLASTICITY INDEX*	GRAVEL (+ #4)	SAND	SILT/ CLAY (- #200)	
TP-1	6	24	---	39	14	1	51	48	SC
TP-2	6	37	90	41	16	0	9	91	CL
TP-3	8	17	114	43	17	28	33	39	SC
TP-4	2	22	---	37	15	27	24	49	GC
TP-5	10	18	---	---	---	8	63	29	SC

As part of the consolidation test procedure, water was added to the samples to assess moisture sensitivity when the samples were loaded to an equivalent pressure of approximately 1,000 psf. The consolidation test indicated the native soils have a slight to moderate potential for compressibility and a negligible potential for compressibility (collapse) under increased moisture contents and anticipated load conditions.

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

On the surface of the site, we encountered topsoil which is estimated to extend up to 12 inches in depth at the test pit locations. Below the topsoil we encountered layers of native Lean Clay with sand (CL), Sandy Lean Clay with gravel (CL), Lean Clay (CL), Lean Clay

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with sand and gravel (CL), Clayey Sand (SC) with occasional cobbles and boulders, and Clayey Gravel with sand (GC) extending to the maximum depths explored of about 11 to 12 feet below the existing ground surface. Based on our experience and observations during field exploration, the clay soils appeared to be soft to stiff, and clayey sand and gravel soils appeared to be medium dense to dense in consistency.

7.2 Groundwater Conditions

Groundwater was encountered at depth of approximately 8 feet below ground surface at TP-2, the nearest test pit to the creek located near the site, during our field investigation. Note that groundwater levels will fluctuate in response to the season, precipitation, snow melt, irrigation, and other on and off-site influences. Quantifying these fluctuations would require long term monitoring, which is beyond the scope of this study. The contractor should be prepared to dewater excavations as needed.

8.0 SITE GRADING

8.1 General Site Grading

All surface vegetation and unsuitable soils (such as topsoil, organic soils, soils with pinholes, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials) should be removed from below foundations, floor slabs, and exterior concrete flatwork. We encountered topsoil on the surface of the site which we estimated to extend up to about 12 inches below the existing ground surface. All topsoil encountered (including soil with roots larger than about ¼ inch in diameter), any soil with pinholes, and fill material encountered should be completely removed, even if found to extend deeper than 2 feet, along with any other unsuitable soils that may be encountered. If the topsoil is left below the floor slabs and pavement sections, an increased in maintenance costs over time should be anticipated.

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils resulting in settlement of the fill. If more than 3 feet of grading fill will be placed above the existing surface (to raise site grades), Earthtec should be notified so that we may provide additional recommendations, if required. Such recommendations will likely include placing the fill several weeks (or possibly more) prior to construction to allow settlement to occur.

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8.2 Temporary Excavations

Temporary excavations that are less than 4 feet in depth and above groundwater should have side slopes no steeper than ½H:1V (Horizontal:Vertical). Temporary excavations where water is encountered in the upper 4 feet or that extend deeper than 4 feet below site grades should be sloped or braced in accordance with OSHA[1] requirements for Type C soils.

8.3 Fill Material Composition

The native soils are not suitable for use as structural fill. Excavated soils, including the topsoil, may be stockpiled for use as fill in landscape areas.

Structural fill is defined as fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc. We recommend that a professional engineer or geologist verify that the structural fill to be used on this project meets the requirements, stated below. We recommend that structural fill consist of imported sandy/gravelly soils meeting the following requirements in the table below:

Table 2: Structural Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
4 inches	100
3/4 inches	70 – 100
No. 4	40 – 80
No. 40	15 – 50
No. 200	0 – 20
Liquid Limit	35 maximum
Plasticity Index	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, but would likely make compaction more difficult and/or significantly reduce the possibility of successful compaction testing. Consequently, more strict quality control measures than normally used may be required, such as using thinner lifts and increased or full time observation of fill placement.

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[1] OSHA Health And Safety Standards, Final Rule, CFR 29, part 1926.

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We recommend that utility trenches below any structural load be backfilled using structural fill. Note that most local governments and utility companies require Type A-1-a or A-1-b (AASHTO classification) soils (which overall is stricter than our recommendations for structural fill) be used as backfill above utilities in certain areas. In other areas or situations, utility trenches may be backfilled with the native soil, but the contractor should be aware that native clay/silty soils may be time consuming to compact due to potential difficulties in controlling the moisture content needed to obtain optimum compaction. All backfill soil should have a maximum particle size of 4 inches, a maximum Liquid Limit of 35 and a maximum Plasticity Index of 15.

If required (i.e. fill in submerged areas), we recommend that free draining granular material (clean sand and/or gravel) meet the following requirements in the table below:

Table 3: Free-Draining Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
3 inches	100
No. 10	0 – 25
No. 40	0 – 15
No. 200	0 – 5
Plasticity Index	Non-plastic

Three inch minus washed rock (sometimes called river rock or drain rock) and pea gravel materials usually meet these requirements and may be used as free draining fill. If free draining fill will be placed adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free draining fill. Such precautions should include either placing a filter fabric between the free draining fill and the adjacent soil material, or using a well graded, clean filtering material approved by the geotechnical engineer.

8.4 Fill Placement and Compaction

Fill should be placed on level, horizontal surfaces. Where fill will be placed on slopes steeper than 5H:1V, the existing ground should be benched prior to placing fill. We recommend bench heights of 1 to 4 feet, with the lowest bench being a minimum 3 feet below adjacent grade and at least 10 feet wide.

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The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness prior to compaction of 4 inches for hand operated equipment, 6 inches for most "trench compactors" and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

• In landscape and other areas not below structurally loaded areas:	90%
• Less than 5 feet of fill below structurally loaded areas:	95%
• Between 5 and 10 feet of fill below structurally loaded areas:	98%

Generally, placing and compacting fill at moisture contents within ±2 percent of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content deviates from optimum the more difficult it will be to achieve the required compaction.

Fill should be tested frequently during placement and we recommend early testing to demonstrate that placement and compaction methods are achieving the required compaction. The contractor is responsible to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.5 Stabilization Recommendations

The native soils may rut and pump during grading and construction. The likelihood of rutting and/or pumping, and the depth of disturbance, is proportional to the moisture content in the soil, the load applied to the ground surface, and the frequency of the load. Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the ground surface by using lighter equipment, partially loaded equipment, tracked equipment, by working in dry times of the year, and/or by providing a working surface for equipment.

During grading the soil in any obvious soft spots should be removed and replaced with granular material. If rutting or pumping occurs traffic should be stopped in the area of concern. The soil in rutted areas should be removed and replaced with granular material.

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In areas where pumping occurs the soil should either be allowed to sit until pore pressures dissipate (several hours to several days) and the soil firms up, or be removed and replaced with granular material. Typically, we recommend removal to a minimum depth of 24 inches. For granular material, we recommend using angular well-graded gravel, such as pit run, or crushed rock with a maximum particle size of four inches. We suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor. A finer granular material such as sand, gravelly sand, sandy gravel or road base may also be used. Materials which are more angular and coarse may require thinner lifts in order to achieve compaction. We recommend that the fines content (percent passing the No. 200 sieve) be less than 15%, the liquid limit be less than 35, and the plasticity index be less than 15.

Using a geosynthetic fabric, such as Mirafi 600X or equivalent, may also reduce the amount of material required and avoid mixing of the granular material and the subgrade. If a fabric is used, following removal of disturbed soils and water, the fabric should be placed over the bottom and up the sides of the excavation a minimum of 24 inches. The fabric should be placed in accordance with the manufacturer's recommendations, including proper overlaps. The granular material should then be placed over the fabric in compacted lifts. Again, we suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor.

9.0 SEISMIC AND GEOLOGIC CONSIDERATIONS

9.1 Seismic Design

The residential structures should be designed in accordance with the International Residential Code (IRC). The IRC designates this area as a seismic design class D_1. The site is located at approximately 41.323 degrees north latitude and -111.813 degrees west longitude from the approximate center of the site. The IRC site value for this property is 0.74g. The design spectral response acceleration parameters are given below.

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Table 4: Design Acceleration for Short Period

S_S	F_a	Site Value (S_{DS})
		2/3 S_S*F_a
1.01 g	1.10	0.74 g

S_S = Mapped spectral acceleration for short periods
F_a = Site coefficient from Table 1613.5.3(1)
S_{DS} = ⅔S_{MS}= ⅔ (F_a·S_s) = 5% damped design spectral response acceleration for short periods

9.2 Faulting

The subject property is located within the Intermountain Seismic Belt where the potential for active faulting and related earthquakes is present. Based upon published geologic maps[2], faults may traverse through or immediately adjacent to the site.

9.3 Liquefaction Potential

According to current liquefaction maps[1] for Weber County, liquefaction potential at the site has not determined. Liquefaction can occur when saturated subsurface soils below groundwater lose their inter-granular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be near saturation for liquefaction to occur.

Loose, saturated sands are most susceptible to liquefaction, but some loose, saturated gravels and relatively sensitive silt to low-plasticity silty clay soils can also liquefy during a seismic event. Subsurface soils were composed of stiff clays and loose silty sands. The soils encountered at this project do not appear liquefiable, but the liquefaction susceptibility of underlying soils (deeper than our explorations) is not known and would require deeper explorations to quantify.

9.4 Geologic Setting

The subject lot is located on the lower slopes of the northeast sloping foothills of the Ogden Valley located on the east flank of Wasatch Mountain Range in North-Central Utah. These

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[1] Utah Geological Survey, Liquefaction-Potential Map For A Part Of Weber County, Utah, Public Information Series 28, August 1994.

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foothills start from the southwestern margin of the Ogden Valley, a northwest to southeast trending valley located between the Wasatch Mountains to the west and the southern end of the Bear River Range to the east. The Ogden Valley is part of the Wasatch Hinterlands Section of the Middle Rocky Mountain Physiographic Province. Stokes describes the Wasatch Hinterlands as a belt of mixed, moderately rugged topography located on the east side of the Wasatch Range that has varied topography, with hilly areas dominating valley areas. The Ogden Valley is currently occupied by Pineview Reservoir, a manmade lake formed by damming the Ogden River and several of its tributaries, as well as the towns of Huntsville, Eden, and Liberty.

Structurally the Ogden Valley is a down-faulted block bound on the northeast by the northwest to southeast oriented Northeastern Margin Fault and on the southwest by the northwest to southeast oriented Southwestern Margin Fault, as described by Hecker. The northwest to southeast oriented North Fork Fault also runs below the central portion of the Ogden Valley. None of these faults are mapped by Hecker to be active (showing evidence of movement during Holocene (past 10,000 years) time).

The Ogden Valley was prehistorically occupied by an arm of Lake Bonneville, a Pleistocene age, fresh water lake that covered most of northwestern Utah and parts of northeastern Nevada. Sediment deposited by the lake are still present within portions of the valley and at places within the foothills surrounding the valley below the elevation of the high stand of the lake which was between approximately 5,170 and 5,200 feet above sea level. The Great Salt Lake of northwestern Utah is a remnant of ancient Lake Bonneville.

The geology at the location of the subject lot and surrounding area has been mapped by Sorenson and Crittenden 1979[2]. The geology at the location of the subject site (Trappers Ridge & Fairways Subdivisions) as shown on the referenced map is described as boulder, colluvium and slopewash deposits chiefly along eastern margin of Ogden Valley; in part lag from Tertiary units (Map Unit Qcs, Holocene) overlying Holocene age silt deposits (Qs) and older gravel and cobble deposits of the Pleistocene age (Qog)that predates high stands of

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[2] Geologic Map of the Huntsville Quadrangle, Weber and Cash Counties, Utah, by Martin L. Sorensen and Max D. Crittenden, Jr, 1979, USGS GQ-1503.

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Lake Bonneville and the Norwood Formation (Map Unit Tn, lower Oligocene and upper Eocene). As shown on Figure No. 1, *Vicinity Map*, the topography of the site and surrounding area generally slopes down to the west-northwest at less than 2 percent grades.

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered during our field exploration, the results of laboratory testing of samples of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions and assumptions related to foundations are significantly different, Earthtec should be notified so that we can re-evaluate our design parameters and estimates (higher loads may cause more settlement), and to provide additional recommendations if necessary.

Conventional strip and spread footings may be used to support the proposed structures after appropriate removals as outlined in Section 8.1. Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, organic soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction they should be removed or recompacted.

10.2 Strip/Spread Footings

Conventional strip and spread footings may be used to support the structures, with foundations placed entirely on uniform, undisturbed, non-moisture sensitive native soils or entirely on a minimum of 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils. For foundation design we recommend the following:

- Footings founded on native soils may be designed using a maximum allowable bearing capacity of 1,500 pounds per square foot. Footings founded on a minimum 36 inches of structural fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot. The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2012 International Building Code.

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- Continuous and spot footings should be uniformly loaded and should have a minimum width of 20 and 30 inches, respectively.

- Exterior footings should be placed below frost depth which is determined by local building codes. In general 30 inches of cover is adequate for most sites; however local code should be verified by the end design professional. Interior footings, not subject to frost (heated structures), should extend at least 18 inches below the lowest adjacent grade.

- Foundation walls and footings should be properly reinforced to resist all vertical and lateral loads and differential settlement.

- The bottom of footing excavations should be compacted with at least 4 passes of an approved non-vibratory roller prior to erection of forms or placement of structural fill to densify soils that may have been loosened during excavation and to identify soft spots. If soft areas are encountered, they should be stabilized as recommended in Section 8.5.

- Footing excavations should be observed by the geotechnical engineer prior to beginning footing construction to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.

- Due to shallow groundwater encountered at the site at approximately 8 feet below ground surface in TP-2, basement floor slab depths should be limited to 5 feet below existing site grades. This is intended to provide a minimum of 3 feet of separation between the observed groundwater condition and the bottom of the floor slab. However, due to seasonal fluctuation of the water table, floor slab depth should be adjusted according to the highest groundwater elevation found at the site.

- Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.

10.3 Estimated Settlements

If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate that total settlements should not exceed one inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for non-earthquake conditions. Additional settlement could occur during a seismic event due to ground shaking, if more than 3 feet of grading fill is placed above the existing ground surface, and/or if foundation soils are allowed to become wetted.

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10.4 Lateral Earth Pressures

Below grade walls act as soil retaining structures and should be designed to resist pressures induced by the backfill soils. The lateral pressures imposed on a retaining structure are dependent on the rigidity of the structure and its ability to resist rotation. Most retaining walls that can rotate or move slightly will develop an active lateral earth pressure condition. Structures that are not allowed to rotate or move laterally, such as subgrade basement walls, will develop an at-rest lateral earth pressure condition. Lateral pressures applied to structures may be computed by multiplying the vertical depth of backfill material by the appropriate equivalent fluid density. Any surcharge loads in excess of the soil weight applied to the backfill should be multiplied by the appropriate lateral pressure coefficient and added to the soil pressure. For static conditions the resultant forces is applied at about one-third the wall height (measured from bottom of wall). For seismic conditions, the resultant forces are applied at about two-third times the height of the wall both measured from the bottom of the wall. The lateral pressures presented in the table below are based on drained, horizontally placed native soils (as outlined in this report) as backfill material using a 30° friction angle and a dry unit weight of 120 pcf.

Table 5: Lateral Earth Pressures (Static and Dynamic)

Condition	Case	Lateral Pressure Coefficient	Equivalent Fluid Pressure (pcf)
Active	Static	0.33	40
	Seismic	0.46	55
At-Rest	Static	0.50	60
	Seismic	0.69	82
Passive	Static	3.00	360
	Seismic	4.10	491

*Seismic values combine the static and dynamic values

These pressure values do not include any surcharge, and are based on a relatively level ground surface at the top of the wall and drained conditions behind the wall. It is important that water is not allowed to build up (hydrostatic pressures) behind retaining structures. Retaining walls should incorporate drainage behind the walls as appropriate, and surface water should be directed away from the top and bottom of the walls.

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Lateral loads are typically resisted by friction between the underlying soil and footing bottoms. Resistance to sliding may incorporate the friction acting along the base of foundations, which may be computed using a coefficient of friction of soils against concrete of 0.30 for native clays, 0.45 for native sand and gravel, and 0.55 for structural fill meeting the recommendations presented herein. For allowable stress design, the lateral resistance may be computed using Section 1807 of the 2012 International Building Code and all sections referenced therein. Retaining wall lateral resistance design should further reference Section 1807.2.3 for reference of Safety Factors. Retaining systems are assumed to be founded upon and backfilled with granular structural fill. The values for lateral foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806.1 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2012 International Building Code.

The pressure and coefficient values presented above are ultimate; therefore an appropriate factor of safety may need to be applied to these values for design purposes. The appropriate factor of safety will depend on the design condition and should be determined by the project structural engineer.

11.0 FLOOR SLABS AND FLATWORK

Due to shallow groundwater encountered at the site, basement floor slab depths should be limited to 5 feet below existing site grades. This is intended to provide a minimum of 3 feet of separation between the observed groundwater condition and the bottom of the floor slab.

Concrete floor slabs and exterior flatwork may be supported on the native soils after appropriate removals and grading as outlined in Section 8.1 are completed. We recommend placing a minimum 4 inches of free-draining fill material (see Section 8.3) beneath floor slabs to facilitate construction, act as a capillary break, and aid in distributing floor loads. For exterior flatwork, we recommend placing a minimum 4 inches of roadbase material. Prior to placing the free-draining fill or roadbase materials, the native subgrade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

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For slab design, we recommend using a modulus of subgrade reaction of 110 pounds per cubic inch. A 6-mil polyethylene vapor retarder shall be applied over the porous layer with the basement the basement floor constructed over the polyethylene, as per Section R405 of the 2012 International Residential Code. To help control normal shrinkage and stress cracking, we recommend that floor slabs have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints, frequent crack control joints, and non-rigid attachment of the slabs to foundation and bearing walls. Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 DRAINAGE

12.1 Surface Drainage

As part of good construction practice, precautions should be taken during and after construction to reduce the potential for water to collect near foundation walls. Accordingly, we recommend the following:

- The contractor should take precautions to prevent significant wetting of the soil at the base of the excavation. Such precautions may include: grading to prevent runoff from entering the excavation, excavating during normally dry times of the year, covering the base of the excavation if significant rain or snow is forecast, backfill at the earliest possible date, frame floors and/or the roof at the earliest possible date, other precautions that might become evident during construction.
- Adequate compaction of foundation backfill should be provided i.e. a minimum of 90% of ASTM D-1557. Water consolidation methods should not be used.
- The ground surface should be graded to drain away from the building in all directions. We recommend a minimum fall of 8 inches in the first 10 feet.
- Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.
- Sprinkler nozzles should be aimed away, and all sprinkler components kept at least 5 feet, from foundation walls. Also, sprinklers should not be placed at the top or on the face of slopes. Sprinkler systems should be designed with proper drainage and well maintained. Over-watering should be avoided.

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- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Section R405.1 of the 2012 International Residential Code states, "Drains shall be provided around all concrete and masonry foundations that retain earth and enclose habitable or usable spaces located below grade." Section R310.2.2 of the 2012 International Residential Code states, "Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system." An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils, which include those defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. The majority of the soils observed in the explorations consisted of clay soils; therefore foundation drains are required if footings are founded on clay soils. If foundation drains are installed, the recommendations presented below should be followed during design and construction of the foundation drains:

- A perforated 4-inch minimum diameter pipe should be enveloped in at least 12 inches of free-draining gravel and placed adjacent to the perimeter footings. The perforations should be oriented such that they are not located on the bottom side of the pipe, as much as possible. The free-draining gravel should consist of primarily ¾- to 2-inch size gravel having less than 5 percent passing the No. 4 sieve, and should be wrapped with a separation fabric such as Mirafi 140N or equivalent.

- The highest point of the perforated pipe bottom should be equal to the bottom elevation of the footings. The pipe should be uniformly graded to drain to an appropriate outlet (storm drain, land drain, other gravity outlet, etc.) or to one or more sumps where water can be removed by pumping.

- A perforated 4-inch minimum diameter pipe should be installed in all window wells and connected to the foundation drain.

- To facilitate drainage beneath basement floor slabs we recommend that the minimum thickness of free-draining fill beneath the slabs be increased to at least 10 inches (approximately equal to the bottom of footing elevations). A separation fabric such as Mirafi 140N or equivalent should be placed beneath the free-draining gravel. Connections should be made to allow any water beneath the slabs to reach the perimeter foundation drain.

- The drain system should be periodically inspected and clean-outs should be installed for the foundation drain to allow occasional cleaning/purging, as needed. Proper drain operation depends on proper construction and maintenance.

Exhibit B

13.0 PAVEMENT RECOMMENDATIONS

We understand that asphalt paved residential roads will be constructed as part of the project. The native soils encountered beneath the during our field exploration were predominantly composed of clay, sand, and gravel. We assumed a California Bearing Ratio (CBR) value of 3 for these soils for the pavement design.

We anticipate the traffic volume will be about 200 vehicles a day or less for the road, consisting of mostly cars and pickup trucks, with a daily delivery truck and a weekly garbage truck. Based on these traffic parameters, the measured CBR given above, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (1998), we recommend the minimum asphalt pavement section presented below.

Table 6: Pavement Section Recommenations

Asphalt Thickness (in)	Compacted Roadbase Thickness (in)	Compacted Subbase Thickness (in)
3	12*	0
3	6	6*

* Stabilization may be required

If the pavement will be required to support construction traffic, more than an occasional semi-tractor or fire truck, or more traffic than listed above, our office should be notified so that we can re-evaluate the pavement section recommendations. The following also apply:

- The subgrade should be prepared by proof rolling to a firm, non-yielding surface, with any identified soft areas stabilized as discussed above.
- Site grading fills below the pavements should meet structural fill composition and placement recommendations described above.
- Asphaltic concrete, aggregate base and sub-base material composition should meet local, APWA or UDOT requirements.
- Aggregate base and sub-base is compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D 1557).
- Asphaltic concrete is compacted to local or UDOT requirements, or to at least 96 percent of the laboratory Marshall density (ASTM D 6927).

Exhibit B

14.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The explorations may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the test pits may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, Earthtec should be advised immediately so that the appropriate modifications can be made.

The findings and recommendations presented in this geotechnical report were prepared in accordance with generally accepted geotechnical engineering principles and practice in this area of Utah at this time. No warranty or representation is intended in our proposals, contracts, letters, or reports.

This geotechnical report is based on relatively limited subsurface explorations and laboratory testing. Subsurface conditions may differ in some locations of the site from those described herein, which may require additional analyses and possibly modified recommendations. Thus we strongly recommend consulting with Earthtec regarding any changes made during design and construction of the project from those discussed herein. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

To maintain continuity, Earthtec should also perform materials testing and special inspections for this project. The recommendations presented herein are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and specifications to verify that our conclusions and recommendations are incorporated and remain appropriate (based on the actual design). Earthtec should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Earthtec also should be retained to

Exhibit B

provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact Earthtec at your convenience.

Respectfully;
EARTHTEC ENGINEERING

Frank F.

Frank F. Namdar, P.G., E.I.T.
Geotechnical Engineer

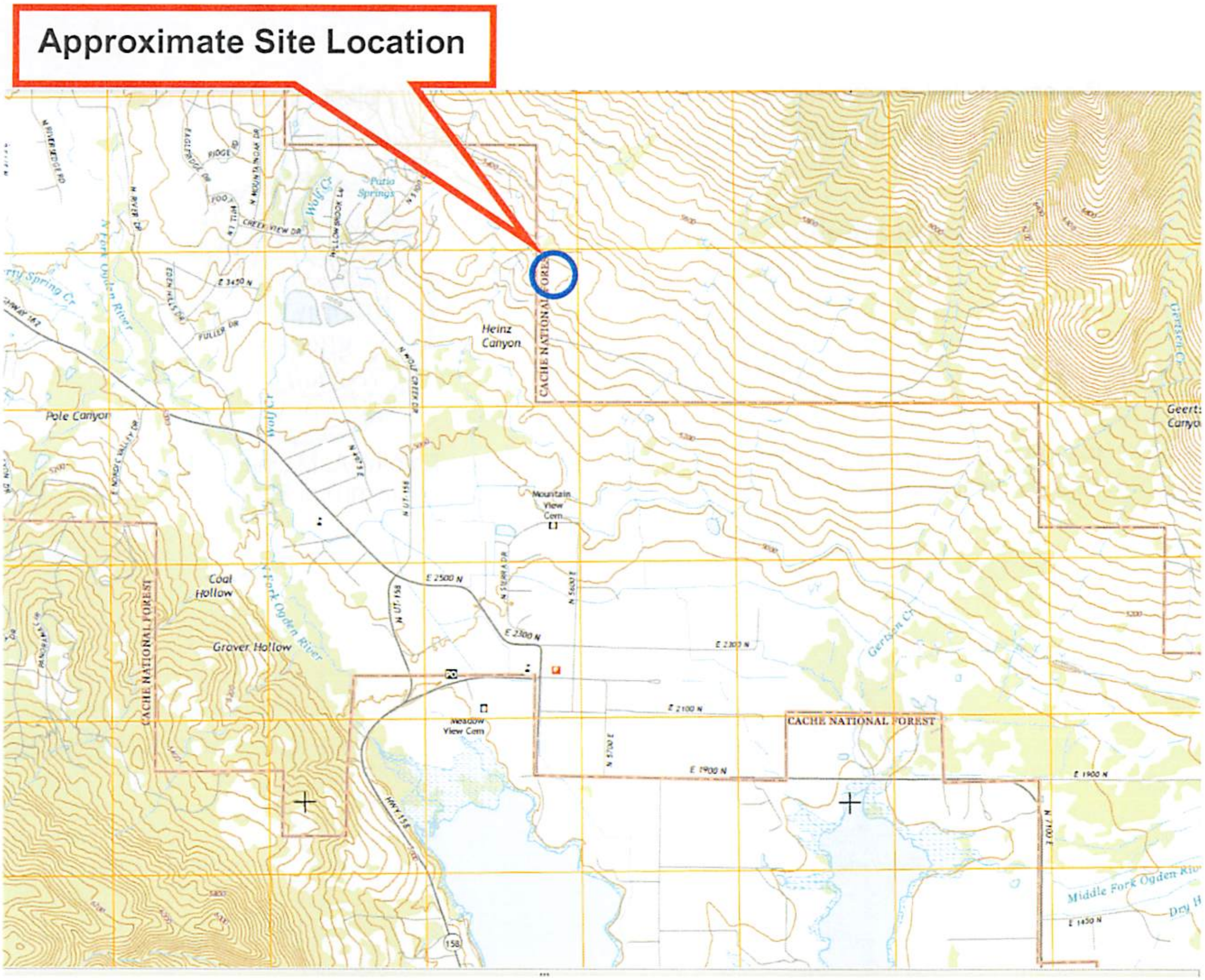
PROFESSIONAL ENGINEER
No. 5367049-2202
TIMOTHY ALLAN
MITCHELL
3/10/16
STATE OF UTAH

Timothy A. Mitchell, P.E.
Geotechnical Engineer

Exhibit B

VICINITY MAP

TRAPPERS RIDGE PHASE 8 SUBDIVISION AT WOLF CREEK SOUTH OF INTERSECTION OF ELKVIEW AND ELKHORN DRIVE EDEN, UTAH



(cida.usgs.gov)

N

Not to Scale

PROJECT NO.: 167002

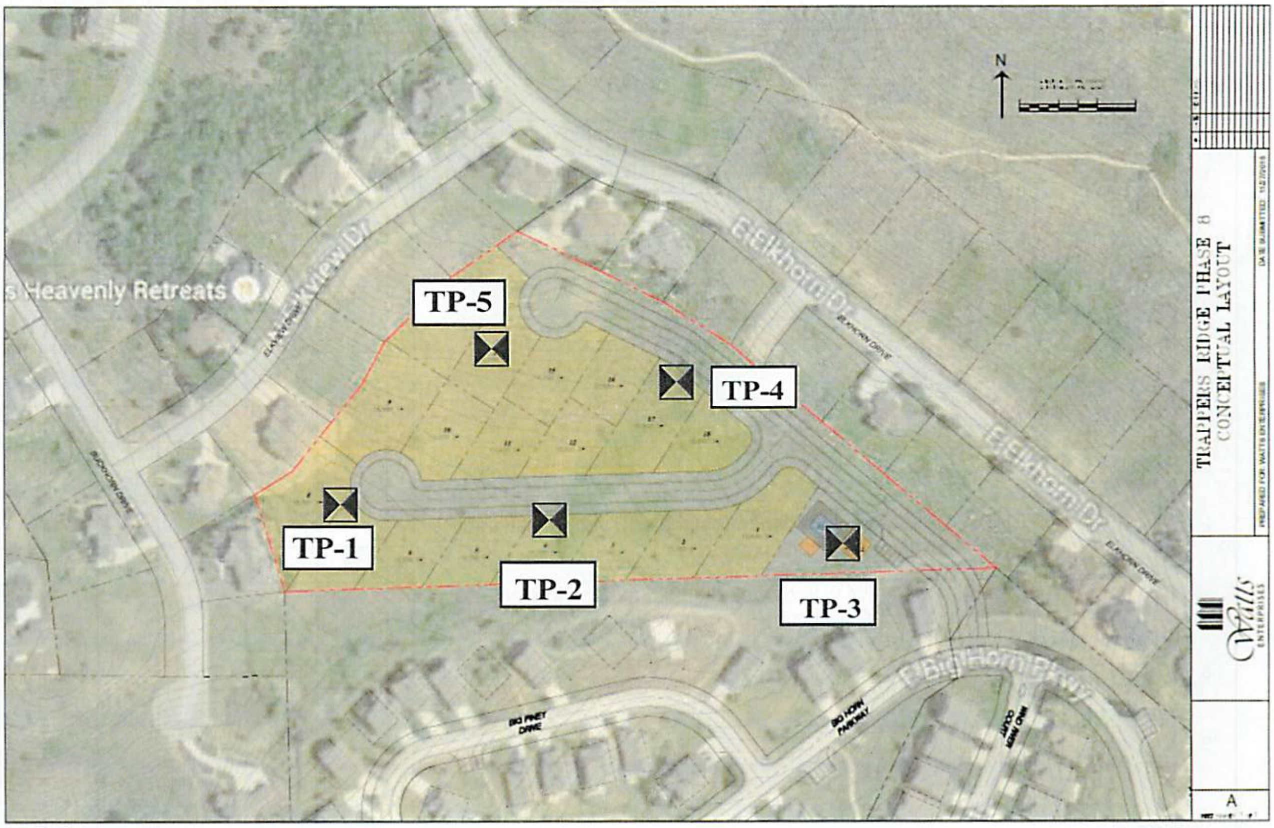
Earthtec Engineering

FIGURE NO.: 1

Exhibit B

AERIAL PHOTOGRAPH SHOWING LOCATION OF TEST PITS

TRAPPERS RIDGE PHASE 8 SUBDIVISION AT WOLF CREEK
SOUTH OF INTERSECTION OF ELKVIEW AND ELKHORN DRIVE
EDEN, UTAH



☒ Approximate Location of Test Pits

· · · — · · — Approximate Boundary

(Aerial photograph provided by Watts Enterprises)

N

Not to Scale

PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 2

Exhibit B

TEST PIT LOG

NO.: TP-1

PROJECT: Trappers Ridge Phase 8 Subdivision
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters Construction
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 167002
DATE: 01/27/16
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, clay, very moist, dark brown, organic rich									
1			Sandy Lean CLAY, medium stiff (estimated), very moist, red, occasional cobbles									
2				☒								
3		CL										
4				☒								
5												
6		SC	Clayey SAND, medium dense (estimated), very moist, light brown, occasional cobble	☒	24		39	14	1	51	48	
7			Sandy Lean CLAY with gravel, medium stiff (estimated), very moist, red, occasional cobbles, more cobbles from 10 feet down									
8				☒								
9		CL										
10				☒								
11												
12			MAXIMUM DEPTH EXPLORED APPROXIMATELY 12 FEET									
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 3

LOG OF TESTPIT 167002.GPJ EARTHTEC.GDT 2/29/16

Exhibit B

TEST PIT LOG

NO.: TP-2

PROJECT: Trappers Ridge Phase 8 Subdivision
PROJECT NO.: 167002
CLIENT: Watts Enterprises
DATE: 01/27/16
LOCATION: See Figure 2
ELEVATION: Not Determined
OPERATOR: C.E. Butters Construction
LOGGED BY: F. Namdar
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ▽ : 8 ft.
AT COMPLETION ▼ :

					TEST RESULTS							
Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, clay, very moist, dark brown, organic rich									
1			Lean CLAY, soft to medium stiff (estimated), very moist, dark brown to gray									
2				☒								
3												
4				☒								
5												
6		CL		☒	37	90	41	16	0	9	91	C
7												
8		▽		☒								
9												
10				☒								
11												
12			MAXIMUM DEPTH EXPLORED APPROXIMATELY 12 FEET									
13												
14												
15												

Notes: Groundwater encountered at 8 feet bolw the ground surface.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 4

Exhibit B

TEST PIT LOG

NO.: TP-3

PROJECT: Trappers Ridge Phase 8 Subdivision
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters Construction
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 167002
DATE: 01/27/16
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL, clay, very moist, dark brown, organic rich									
1	▨	CL	Lean CLAY with sand and gravel, medium stiff to stiff (estimated), very moist, brown									
2				☒								
3												
4				☒								
5												
6	▨	SC	Clayey SAND with gravel and cobbles, medium dense to dense (estimated), moist, brown to gray	☒								
7												
8				☒	17	114	43	17	28	33	39	C
9												
10				☒								
11												
12			MAXIMUM DEPTH EXPLORED APPROXIMATELY 12 FEET									
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 5

LOG OF TESTPIT 167002.GPJ EARTHTEC.GDT 3/9/16

Exhibit B

TEST PIT LOG

NO.: TP-4

PROJECT: Trappers Ridge Phase 8 Subdivision
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters Construction
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 167002
DATE: 01/27/16
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0	░		TOPSOIL, clay, very moist, dark brown, organic rich									
1	▨		Clayey GRAVEL with sand and gravel, loose to dense (estimated), very moist, brown, occasional cobbles									
2	▨			☒	22		37	15	27	24	49	
3	▨											
4	▨			☒								
5	▨											
6	▨	GC		☒								
7	▨											
8	▨			☒								
9	▨											
10	▨			☒								
11			MAXIMUM DEPTH EXPLORED APPROXIMATELY 12 FEET									
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 6

Exhibit B

TEST PIT LOG

NO.: TP-5

PROJECT: Trappers Ridge Phase 8 Subdivision
CLIENT: Watts Enterprises
LOCATION: See Figure 2
OPERATOR: C.E. Butters Construction
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 167002
DATE: 01/27/16
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Tests
					TEST RESULTS							
0			TOPSOIL, clay, very moist, dark brown, organic rich									
1			Lean CLAY with sand and gravel, medium stiff to stiff (estimated), very moist, brown, occasional cobbles									
2				☒								
3												
4				☒								
5		CL										
6				☒								
7												
8				☒								
9												
10		SC	Clayey SAND with occasional cobble and boulder, medium dense (estimated) moist, brown	☒	18				8	63	29	
11			MAXIMUM DEPTH EXPLORED APPROXIMATELY 11 FEET									
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 7

LOG OF TESTPIT 167002.GPJ EARTHTEC.GDT 3/9/16

Exhibit B

LEGEND

PROJECT: Trappers Ridge Phase 8 Subdivision
CLIENT: Watts Enterprises
DATE: 01/27/16
LOGGED BY: F. Namdar

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS			USCS SYMBOL		TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	░	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			░	GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	░	GM	Silty Gravel, May Contain Sand
			▨	GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	░	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			░	SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	▥	SM	Silty Sand, May Contain Gravel
			▨	SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		▨	CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			▥	ML	Silt, Inorganic, May Contain Gravel and/or Sand
			▤	OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		▨	CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			▥	MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			▤	OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			⁂	PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

◩	SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
⧗	MODIFIED CALIFORNIA SAMPLER (2 inch outside diameter)
▥	SHELBY TUBE (3 inch outside diameter)
▮	BLOCK SAMPLE
☒	BAG/BULK SAMPLE

WATER SYMBOLS

▽	Water level encountered during field exploration
▼	Water level encountered at completion of field exploration

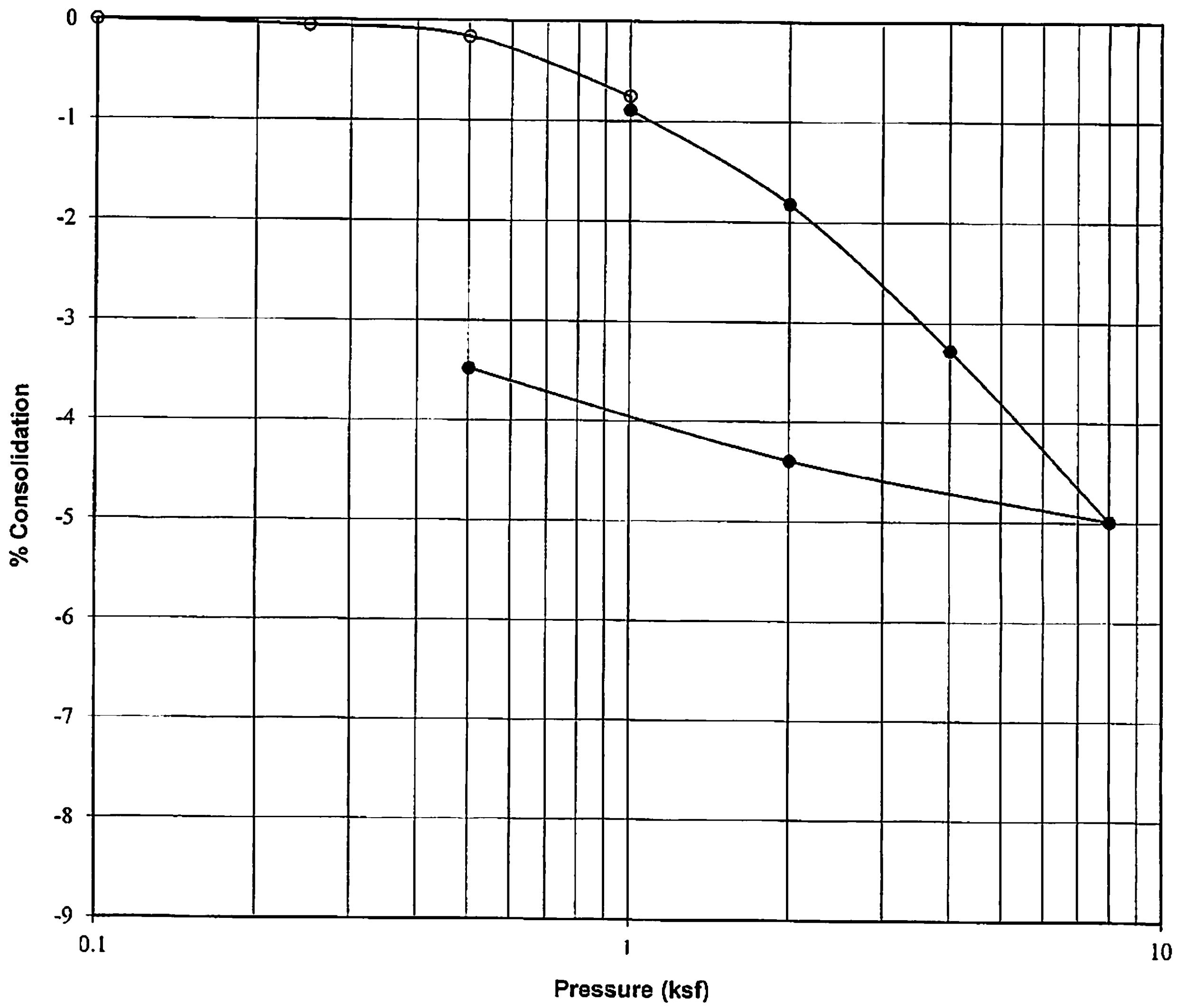
NOTES:
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

PROJECT NO.: 167002	Earthtec Engineering	**FIGURE NO.:** 8

LEGEND 167002.GPJ EARTHTEC.GDT 3/9/16

Exhibit B

CONSOLIDATION - SWELL TEST



Project:	Trappers Ridge Phase 8
Location:	TP-2
Sample Depth, ft:	6
Description:	Block
Soil Type:	Lean CLAY (CL)
Natural Moisture, %:	37
Dry Density, pcf:	90
Liquid Limit:	41
Plasticity Index:	16
Water Added at:	1 ksf
Percent Collapse:	0.1

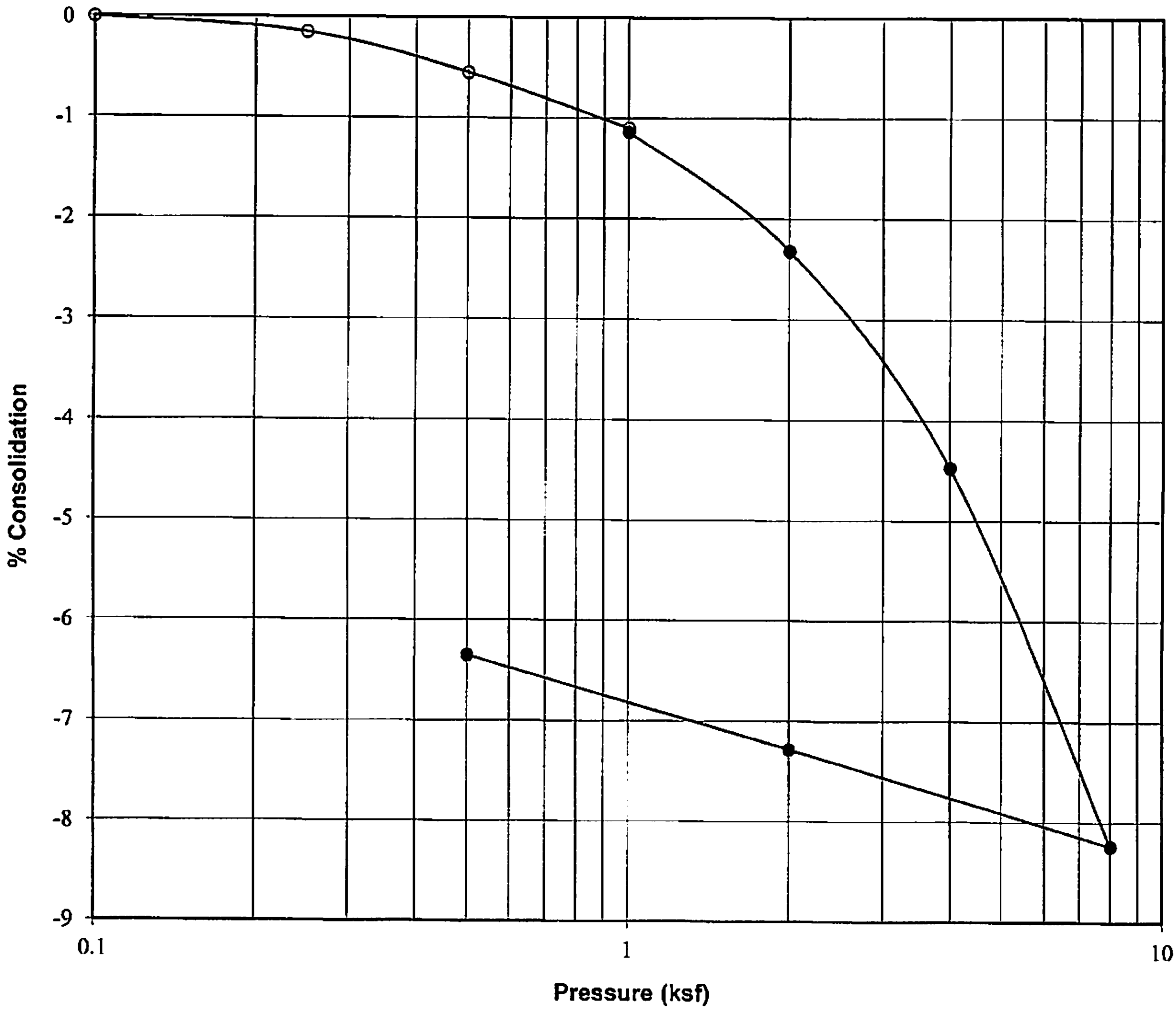
PROJECT NO.: 167002

Earthtec Engineering

FIGURE NO.: 9

Exhibit B

CONSOLIDATION - SWELL TEST



Project:	Trappers Ridge Phase 8
Location:	TP-3
Sample Depth, ft:	10
Description:	Block
Soil Type:	Clayey SAND with gravel (SC)
Natural Moisture, %:	17
Dry Density, pcf:	114
Liquid Limit:	43
Plasticity Index:	17
Water Added at:	1 ksf
Percent Collapse:	0.0

PROJECT NO.: 167002	Earthtec Engineering	**FIGURE NO.:** 10

Exhibit B

IGES®
Intermountain GeoEnvironmental Services, Inc.
12429 South 300 East, Suite 100, Draper, Utah 84020
T: (801) 748-4044 ~ F: (801) 748-4045

4153 South Commerce Drive, SLC, UT 84107
T: (801) 270-9400 ~ F: (801) 270-9401

June 20, 2016

Watts Enterprises
5200 South Highland Drive #101
Salt Lake City, Utah 84117
Attn: Mr. Rick Everson

IGES Project No. 01855-007

Subject: Reconnaissance Geologic Hazards Assessment
Trappers Ridge Phase 8 Subdivision at Wolf Creek
Eden, Utah

Mr. Everson:

At your request, IGES has performed a reconnaissance-level geologic hazard assessment for the Trappers Ridge Phase 8 Subdivision at Wolf Creek, located in the city of Eden in Weber County, Utah (Figure A-1). This letter report identifies the nature and associated risk of the applicable geologic hazards associated with the property, based upon the results of the literature review and site reconnaissance conducted as part of this assessment.

INTRODUCTION

It is our understanding that the Trappers Ridge Phase 8 Subdivision at Wolf Creek project will involve the development of 18 lots with conventionally-framed, two to three-story residences, a clubhouse, and a pool across an area covering approximately 8.5 acres in Eden, Utah. The property is located within parts of the northwestern and southwestern quarters of Section 23 of Township 7 North, Range 1 East, approximately 2 miles north of Pineview Reservoir. The property is bound on all sides by partially completed residential neighborhoods containing intermittent developed and undeveloped lots.

PURPOSE AND SCOPE

This study was performed as a reconnaissance-level geologic hazards assessment to identify any surficial or subsurface geologic hazards that may be extant on the property or have the capability to adversely impact the property. Specifically, this study was conducted to:

- Analyze the existing geologic conditions present on the property and relevant adjacent areas;
- Assess the geologic hazards that pose a risk to development across the property, and determine an associated risk for each hazard; and

Exhibit B

- Identify the most significant geologic hazard risks, and provide recommendations for appropriate additional studies and/or mitigation practices, if necessary.

In order to achieve the purpose and scope outlined above, the following services were performed as part of this investigation:

- Review of available published geologic reports and maps for the subject property and surrounding areas;
- Stereoscopic review of aerial photographs and analysis of additional available aerial imagery, including LiDAR;
- Site reconnaissance by an engineering geologist licensed in the state of Utah to map the surficial geology, determine site conditions, and assess the property for geologic hazards; and
- Preparation of this report, based upon the data reviewed and collected in this investigation.

REVIEW OF GEOLOGIC LITERATURE

A number of pertinent publications were reviewed as part of this assessment. Sorensen and Crittenden, Jr. (1979) provides the most recent published 1:24,000 scale geologic mapping that covers the area in which the property of interest is located. Coogan and King (2016) provide more recent geologic mapping of the area, but at a 1:62,5000 scale; this map is an updated version of a previous map by the same authors (Coogan and King, 2001) that had long been used as the most recent geologic map of the area. A United States Geological Survey (USGS) topographic map for the Huntsville Quadrangle (2014) provides physiographic and hydrologic data for the project area. Two Federal Emergency Management Agency (FEMA) flood maps (both effective in 2015) that cover the project area were reviewed. Regional-scale geologic hazard maps pertaining to landslides (Elliott and Harty, 2010; Colton, 1991), faults (Christenson and Shaw, 2008a; USGS and Utah Geological Survey (UGS), 2006), debris-flows (Christenson and Shaw, 2008b), liquefaction (Christenson and Shaw, 2008c; Anderson et al., 1994), and radon (Solomon, 1996) that cover the project area were also reviewed. More site-specific, the EarthTec Engineering (EarthTec) geotechnical report (2016) for the subject property was reviewed.

General Geologic Setting

The Trappers Ridge Phase 8 at Wolf Creek property is situated along the eastern margin of the northern part of the Ogden Valley, along the foothills of the Wasatch Mountains and approximately 415 feet east of the Heinz Canyon drainage. Ogden Valley separates the western

Exhibit B

part of the Wasatch Range from the Bear River Range to the east, a subgroup of mountains that are part of the parent Wasatch Range. The Wasatch Mountains contain a broad depositional history of thick Precambrian and Paleozoic sediments that have been subsequently modified by various tectonic episodes that have included thrusting, folding, intrusion, and volcanics, as well as scouring by glacial and fluvial processes (Stokes, 1987). The uplift of the Wasatch Mountains occurred relatively recently during the Late Tertiary Period (Miocene Epoch) between 12 and 17 million years ago (Milligan, 2000). Since uplift, the Wasatch Front has seen substantial modification due to such occurrences as movement along the Wasatch Fault and associated spurs, the development of the numerous canyons that empty into the current Salt Lake Valley and Utah Valley and their associated alluvial fans, erosion and deposition from Lake Bonneville, and localized mass movement events (Hintze, 1988). The Wasatch Mountains, as part of the Middle Rocky Mountains Province (Milligan, 2000), were uplifted as a fault block along the Wasatch Fault (Hintze, 1988). Ogden Valley itself is a fault-bounded trough that was occupied by Lake Bonneville (Sorensen and Crittenden, Jr, 1979) before being cut through by the Ogden River and subsequently dammed to form the Pineview Reservoir.

Surficial Geology

According to Sorensen and Crittenden, Jr. (1979), the property is located entirely on Holocene-aged (~11,700 years ago to the present) colluvium and slopewash (Qcs) deposits (Figure A-2). The unit is likely underlain by the Norwood Tuff (Tn), as several small exposures of the Norwood Tuff is present within a one-mile radius of the property. Coogan and King (2016; Figure A-3) denote the approximately eastern half of the property as Qac (alluvium and colluvium deposits), which are described as including “stream and fan alluvium, colluvium, and, locally, mass-movement deposits too small to show at map scale.” The approximately western half of the property is mapped as Qms (landslide deposits), which are described as including “slides, slumps, and locally flows and floods; generally characterized by hummocky topography, main and internal scarps, and chaotic bedding in displaced blocks.” Two landslide scarps are mapped off the property upslope to the northeast within approximately 700 feet of the northeastern property margin.

In contrast to Sorensen and Crittenden, Jr. (1979), Coogan and King (2016) mapped the adjacent Heinz Canyon drainage approximately 0.1 mile upslope to the northwest as Qafy, younger (Holocene and uppermost Pleistocene) alluvial fan deposits on fans that are “active, impinge on present-day floodplains, divert active streams, overlie low terraces, and/or cap alluvial deposits related to the Provo and regressive shorelines.” Neither of the aforementioned geologic maps show any faults on the property, though Sorensen and Crittenden, Jr. (1979) show two faults that straddle the property and several additional faults that potentially project onto the property, all of which are cutting across the Holocene-aged colluvium. The faults that straddle the property trend northwest to southeast, and may be pass as close as 60 feet to the respective margins of the property (see Figure A-2). It should be noted that these faults are absent from the more recent (Coogan and King, 2016) publication, though two of the faults mapped to the northeast of the property in Sorensen and Crittenden, Jr. (1979) have been reinterpreted in Coogan and King (2016) as landslide headscarps.

Exhibit B

Hydrology

The USGS topographic map for the Huntsville Quadrangle (2014) shows that the Trappers Ridge Phase 8 at Wolf Creek project area is situated within the broad northwest-southeast trending Ogden Valley and near the northeast-southwest trending Heinz Canyon drainage. Multiple generally northeast-southwest trending ephemeral stream drainages are found on the property, which were found to contain flowing water at least in part during the site visit. The largest of these ephemeral stream drainages forms the boundary between the property and the residential development to the south, and the other ephemeral drainages flow into this larger ephemeral drainage. No springs are known to occur on the property, though it is possible that springs may occur on various parts of the property during peak runoff.

Baseline groundwater depths for the Trappers Ridge Phase 8 at Wolf Creek property are currently unknown, but are anticipated to fluctuate both seasonally and annually. Groundwater was encountered in only one test pit (the southernmost test pit and therefore the closest to the main ephemeral stream drainage) excavated by EarthTec (2016) at a depth of approximately 8 feet below existing ground level in late January and early February. Groundwater flow from snowmelt is dependent upon the nature of the surface and subsurface materials, including the degree and orientation of fracturing of the bedrock. Given that the topography slopes generally downhill to the southwest, groundwater flow paths are anticipated to be generally to the southwest. Daylighting of this groundwater can be expected in the various ephemeral drainages and generally flat, low-lying parts of the property, especially during times of peak runoff as was encountered during the site visit.

The FEMA flood maps that covers the Trappers Ridge Phase 8 at Wolf Creek project area show that the property is outside of the 500-year flood floodplain for the Heinz Canyon drainage (FEMA, 2015a and 2015b).

Geologic Hazards

Based upon the available geologic literature, regional-scale geologic hazard maps that cover the Trappers Ridge Phase 8 at Wolf Creek project area have been produced for landslide, fault, debris-flow, liquefaction, and radon hazards. The following is a summary of the data presented in these regional geologic hazard maps.

Landslides

Two regional-scale landslide hazard maps have been produced that cover the project area. Colton (1991) shows the property to be located within a large area that is queried as a possible landslide deposit. More recent mapping by Elliott and Harty (2010) refined the area queried by Colton (1991) and show the property to be located within an area classified as “Landslide and/or landslide undifferentiated from talus, colluvial, rockfall, glacial, or soil-creep deposits.” As noted above, the most recent geologic map of the area (Coogan and King, 2016; see Figure A-3) displays mapped landslide deposits on the approximately western half of the property and adjacent to the property on the north, east, and south.

Exhibit B

Faults
Neither Christensen and Shaw (2008a) nor the Quaternary Fault and Fold Database of the United States (USGS and UGS, 2006) show any Quaternary-aged (~2.6 million years ago to the present) faults to be present on or projecting towards the subject property. The closest Quaternary-aged fault to the property is the Ogden Valley Northeastern Margin Fault, located approximately 1.25 miles to the northeast of the property (USGS and UGS, 2006). The Weber County Natural Hazards Overlay Districts defines an active fault to be "a fault displaying evidence of greater than four inches of displacement along one or more of its traces during Holocene time (about 11,000 years ago to the present)" (Weber County, 2015). The closest active fault to the property is the Weber Segment of the Wasatch Fault Zone, located approximately 6.15 miles west of the western margin of the property (USGS and UGS, 2006).

Debris-Flows
Christensen and Shaw (2008b) do not show the project area to be located within a debris-flow hazard special study area, and Coogan and King (2016) do not show any mapped alluvial fan deposits on the property.

Liquefaction
Anderson, et al (1994) and Christensen and Shaw (2008c) both show the project area to be located in an area with very low potential for liquefaction.

Radon
Solomon (1996) has part of the project area located in an area with moderate radon levels.

REVIEW OF AERIAL IMAGERY

A series of aerial photographs that cover project area were taken from the UGS Aerial Imagery Collection (UGS, 2016) and analyzed stereoscopically for the presence of adverse geologic conditions across the property. This included a review of photos collected from the years 1946 and 1963 which were all taken prior to the development of the nearby residences and their neighborhoods. A table displaying the details of the aerial photographs reviewed can be found in the *References* section at the end of this report.

No geologic lineaments, fault scarps, landslide headscarps, or landslide deposits were observed in the aerial photography on the subject property.

Google Earth imagery of the property from between the years of 1993 and 2015 were also reviewed. No landslide or other geological hazard features were noted in the imagery. The property was observed to contain abundant surficial gravel, cobbles, and boulders, as well as the several ephemeral drainages discussed above. Most of the project area was found to be covered in various forms of vegetation, with no bedrock exposures anywhere on the property.

Utah Geological Survey 1 meter LiDAR data (UGS, 2011) for the project area was reviewed. The southern half of the property was observed to be significantly gullied. No landslide or other geologic hazard features were readily identified on the property, though a couple lineaments

Exhibit B

potentially corresponding to the mapped landslide scarps in Coogan and King (2016) were observed on the slope to the northeast of the property.

SITE RECONNAISSANCE

Mr. Peter E. Doumit, P.G., C.P.G., of IGES conducted reconnaissance of the site and the immediate adjacent properties on May 13, 2016. The site reconnaissance was conducted with the intent to assess the general geologic conditions present across the property, with specific interest in those areas identified in the geologic literature and aerial imagery reviews as potential geologic hazard areas. Additionally, the site reconnaissance provided the opportunity to geologically map the surficial geology of the area. Figure A-4 is a site-specific geologic map of the Trappers Ridge Phase 8 at Wolf Creek property and adjacent areas.

Variously-sized boulders and cobbles were found scattered across the property. These were typically subangular to subrounded, and were found to be as large as 5 feet in diameter. The rock clasts were found to be comprised of three distinct lithologies:

1. White to very light gray, finely laminated quartzite with occasional rounded pebbles
2. An orange-brown clast-supported conglomerate with subrounded to rounded quartzite pebble clasts
3. An orange to reddish-orange fine to medium-grained sandstone; well-indurated and gradational to quartzite; contains occasional rounded quartzite pebbles

In general, the proportion of these lithologies was fairly consistent across the property, with approximately 70% of the clasts comprised of quartzite, approximately 25% comprised of conglomerate, and approximately 5% comprised of sandstone. Where present, minor to moderate oxidation of the sandstone boulders was observed.

The presence or absence and setting within which these boulders were encountered provided the means by which the surficial geology was able to be mapped across the property. Three largely gradational geologic units were differentiated on the property, as well as areas that have been modified by human activity. Each of these units are discussed in turn below.

Qac (Quaternary alluvium and colluvium)

This unit was mapped in generally low-lying areas and straddling the multiple ephemeral stream drainages where there was a significantly greater proportion of alluvial (running water-deposited) material present than colluvial (gravity-deposited with the aid of rain; slopewash) material. This unit underlies much of the southern and eastern portions of the property where the property is highly gullied, and consists predominantly of an area in which relatively few boulders were encountered.

Qca (Quaternary colluvium and alluvium)

This unit was generally mapped in areas with gentle slopes, and represents a transitional unit between the predominantly alluvial deposits of the Qac unit and the almost exclusive colluvial deposits of the Qc unit. The unit was gradational in terms of the proportion of alluvial and

Exhibit B

colluvial material, with some areas having slightly more alluvial material than colluvial material, and vice versa. Much of the central and western parts of the property is underlain by the Qca unit.

Qc (Quaternary colluvium)

This unit was mapped in areas with steeper slopes with concentrated boulder fields and relatively few fines. The unit comprises the higher elevation knob found in the northern part of the property immediately southwest of the existing residences along Elkhorn Drive. Boulders in the boulder fields in this unit were commonly subangular to subrounded, and were as much as 5 feet in diameter, though the mode average boulder size was generally 1 to 1.5 feet in diameter.

Surface Water/Groundwater

At the time of the site visit, the ephemeral stream drainage that runs along the south margin of the property was found to be flowing with water, with a larger volume of water and stronger current further to the west. The low-lying south-central and southwestern portion of property contained several small gullies with flowing water and also ponded, marshy conditions associated with cattails and other hydrophilic plants (see Figure A-4).

No springs were identified on the property, though a shallow water table was found to be present across much of the south-central and southwestern parts of the property. The presence of the hydrophilic plants in these areas suggests that shallow groundwater conditions in this area are a common condition and not simply the product of being near the time of peak runoff.

Geologic Hazards

No mass-movement deposits, faults, or any additional geologic hazards were observed on the property during the site reconnaissance. However, two linear (northwest to southeast-trending) breaks in slope were noted on the hillslope to the northeast of the property, consistent with what was observed in the LiDAR and what is mapped as landslide scarps in Coogan and King (2016).

GEOLOGIC HAZARD ASSESSMENT

Geologic hazard assessments are necessary to determine the potential risk associated with particular geologic hazards that are capable of adversely affecting a proposed development area. As such, they are essential in evaluating the suitability of an area for development and provide critical data in both the planning and design stages of a proposed development. The geologic hazard assessment discussion below is based upon a qualitative assessment of the risk associated with a particular geologic hazard, based upon the data reviewed and collected as part of this investigation.

A “low” hazard rating is an indication that the hazard is either absent, is present in such a remote possibility so as to pose limited or little risk, or is not anticipated to impact the project in an adverse way. Areas with a low-risk determination for a particular geologic hazard generally do not require additional site-specific studies or associated mitigation practices with regard to the geologic hazard in question. A “moderate” hazard rating is an indication that the hazard has the capability of adversely affecting the project at least in part, and that the conditions necessary for the geologic hazard are present in a significant, though not abundant, manner. Areas with a moderate-risk determination for a particular geologic hazard may require additional site-specific studies and associated mitigation practices in the areas that have been identified as the most prone to susceptibility to the particular geologic hazard. A "high" hazard rating is an indication that the hazard is very capable of adversely affecting the project, that the geologic conditions pertaining to the particular hazard are present in abundance, and/or that there is geologic evidence of the hazard having occurred at the area in the historic or geologic past. Areas with a high-risk determination generally always require additional site-specific hazard investigations and associated mitigation practices. For areas with a high-risk geologic hazard, simple avoidance is often considered.

The following are the results of the reconnaissance-level geologic hazard assessment for the Trappers Ridge Phase 8 at Wolf Creek property.

Landslides/Mass Movement/Slope Stability

The surficial geology of the property and adjacent areas have been interpreted in several ways. Sorensen and Crittenden, Jr. (1979) initially mapped the property as all Holocene-aged colluvium and slopewash, though had they showed several surficial faults cutting across this colluvium adjacent to the property. These faults were later interpreted as shallow landslide scarps (Black and Hecker, 1999), though these features (whether faults or landslide scarps) were not included in subsequent geologic mapping of the area (Coogan and King, 2001), which also mapped the units underlying the property entirely as alluvium and colluvium. Most recently, Coogan and King (2016) have reintroduced some of these features as headscarps adjacent to the property, and reinterpreted the approximately western half of the property as landslide deposits. Additionally, these surficial deposits are believed to be underlain by the Norwood Tuff, a geologic unit known to be landslide-prone (Ashland, 2010).

However, the aerial imagery evaluation and site reconnaissance did not identify landslide deposits on the property, though two possible landslide scarps were observed on the slope to the northeast of the property consistent with the Coogan and King (2016) geologic map. Also, the steepest slopes on the property are found to be greater than 5:1 (horizontal:vertical), which do not warrant site-specific slope stability analyses. Given this information, the risk associated with landslide/mass movement and slope stability hazards on the property is considered to be low to moderate.

Rockfall

No bedrock is exposed upslope of the property, and it is approximately 270 feet to the northeast of the northeastern property margin before there is a significant increase in slope with sizable boulders exposed at the surface. As such, the rockfall hazard associated with the property is considered to be low.

Exhibit B

Surface-Fault-Rupture and Earthquake-Related Hazards

No faults are known to be present on or projecting towards the property, and the closest active fault to the property is the Weber Segment of the Wasatch Fault Zone, located approximately 6.15 miles to the west of the property (USGS and UGS, 2006). Given this information, the risk associated with surface-fault-rupture on the property is considered low.

The entire property is subject to earthquake-related ground shaking from a large earthquake generated along the active Wasatch Fault. Given the distance from the Wasatch Fault, the hazard associated with ground shaking is considered to be moderate. Proper building design according to appropriate building code and design parameters can assist in mitigating the hazard associated with earthquake ground shaking.

Liquefaction

Given the generally very coarse and likely relatively thin nature of the surficial materials, and consistent with the existing geologic literature for the area, the risk associated with earthquake-induced liquefaction is expected to be low. However, both shallow groundwater and granular soils are likely to be present on the property; therefore, we cannot preclude the possibility for liquefaction to occur onsite. A liquefaction study, which would include borings and/or CPT soundings to a depth of at least 50 feet, was not performed for this project and is not a part of our scope of work.

Debris-Flows and Flooding Hazards

Young alluvial fan deposits (Qafy) have been mapped approximately 0.1 mile north of the property by Coogan and King (2016) in association with the Heinz Canyon drainage. However, no part of the property is within this alluvial fan deposit, the Heinz Canyon drainage at its closest is approximately 415 feet to the west of the property, and the property is not located on the Heinz Canyon floodplain. Given this situation, the debris-flow hazard associated with the property is considered to be low.

The ephemeral stream drainages found on the property are generally small (generally 2 to 5 feet wide by 1 to 3 feet deep), though water was flowing within the main ephemeral drainage that forms the southern border of the property at the time of the site reconnaissance. Most of the property is located at an elevation at least 5 feet above the bank of the main ephemeral drainage, such that only the southernmost proposed lots are potentially capable of being adversely impacted by a cloudburst flooding event. Given this data, the flooding hazard for the property is considered to be low for all but the southernmost proposed lots adjacent to the main ephemeral stream drainage. This is consistent with the FEMA flood maps that covers the area (FEMA, 2015a and 2015b). The flooding hazard for the southernmost lots is considered low to moderate, though this could be reduced to low by way of appropriate grading and the installation of land-drains.

Exhibit B

Shallow Groundwater

Groundwater was encountered in only one (the southernmost) of the five tests geotechnical test pits excavated on the property, located at approximately 8 feet below ground level (EarthTec, 2016). These test pits were excavated in late January and early February, and the groundwater level observed in the test pit is likely to be at or near seasonal lows. With the site reconnaissance occurring in mid-May near the expected peak runoff and seasonal high for groundwater, shallow groundwater was noted to be prevalent on the property. Extensive shallow groundwater was observed via the presence of abundant hydrophilic plants in the southern part of the property in areas of gentle topography and near the multiple ephemeral stream drainages and gullies found in the area, though no springs were observed.

Given the existing data, it is expected that groundwater levels will fluctuate both seasonally and annually in the southern part of the property between approximately 8 feet below the existing ground surface and ground level. As such, the risk associated with shallow groundwater hazards near the southern margin of the property is considered high, moderate for the eastern one-third of the property (between two ephemeral drainages), and low for the rest of the property, However, shallow groundwater issues can be easily mitigated through appropriate grading measures and/or the avoidance of the construction of residences with basements, or through the use of land-drains.

Radon

Limited data is available to address the radon hazard across the property. However, at least one study (Solomon, 1996) shows the site situated within an area designated as having a moderate radon hazard, though this study only covered a portion of the property. To be conservative, the radon hazard associated with the property is considered to be moderate. A site-specific radon hazard assessment is recommended to adequately address radon concerns across the property.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the data collected and reviewed as part of this assessment, IGES makes the following reconnaissance-level conclusions regarding the geological hazards present at the Trappers Ridge Phase 8 at Wolf Creek project area:

- **From a reconnaissance-level perspective, the Trappers Ridge Phase 8 at Wolf Creek project area does not appear to have major geological hazards that would adversely affect significant portions of the development as currently proposed. As such, no subsurface geologic hazards investigative methods are considered to be necessary for the property preceding development.**

- Earthquake ground shaking and radon are the only hazards that may potentially affect all parts of the project area, while other hazards have the potential to affect only limited portions of the project area, or pose minimal risk.

Exhibit B

- Shallow groundwater is considered to be a high hazard for those lots that are adjacent to the main ephemeral stream drainage that flows along the southern border of the property, moderate for the eastern one-third of the property, and low for the remainder of the property.

- Rockfall, surface-fault-rupture, and debris-flow hazards are considered to be low for the property.

- Landslide hazards are considered to be low to moderate for the property. Though no landslide deposits were observed on the property during the site reconnaissance, possible landslide scarps present upslope to the northeast of the property may indicate the possibility of material moving downslope and adversely impacting the Trappers Ridge Phase 8 property at a later date.

- Published literature and the site-specific geotechnical report (EarthTec, 2016) indicate that the liquefaction potential for the site is expected to be low. However, due to the likely presence of granular soils and shallow groundwater and the unknown character of the soils underlying those examined in the geotechnical report, the potential for liquefaction occurring at the site cannot be ruled out.

Given the conclusions listed above, IGES makes the following recommendations:

- The prevalence of shallow groundwater across the property makes necessary mitigation practices to adequately address this potential hazard. Appropriate grading measures in low-lying areas susceptible to near-surface groundwater conditions is recommended, as is the construction of the proposed residences without basements.

- To adequately address the radon hazard for the property, a site-specific radon assessment is recommended. This could be conducted either on a property-wide basis or a lot-by-lot basis.

- Though no landslide features were observed on the property, the alluvial and colluvial deposits present on the property are likely underlain by the Norwood Tuff, which is a known landslide-producing unit. Additionally, features interpreted as landslide scarps have been noted on nearby properties and are present on the barren hillslope upslope to the northeast of the property. Therefore, it is recommended that an IGES engineering geologist observe the lot foundation excavations to confirm the absence of landslide evidence on the property. It is also recommended that landslide and slope stability analyses be conducted on the barren hillslope to the northeast of the property preceding any development on the hillslope to identify the risk that development on the hillslope would have on the Trappers Ridge Phase 8 development.

Exhibit B

LIMITATIONS

The conclusions and recommendations presented in this report are based on limited geologic literature review and site reconnaissance, and our understanding of the proposed construction. It should be noted that these conclusions are based solely upon the geological hazards investigated for this report, and do not pertain to other potential geologic hazards that may be present on the property. Additional geologic hazards may be present that may not be identified until construction activities expose adverse geologic conditions. Therefore, the geologic hazard classifications as denoted in this report are potentially subject to change with data collected from site-specific excavations across the property. This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No warranty, expressed or implied, is made.

CLOSURE

We appreciate the opportunity to provide you with our services. If you have any questions, please contact the undersigned at your convenience at (801) 748-4044.

Respectfully Submitted,
IGES, Inc.

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Attachments:
References
Figure A-1: General Location Map
Figure A-2: Regional Geology Map 1
Figure A-3: Regional Geology Map 2
Figure A-4: Local Geology Map

Exhibit B

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Utah Geological Survey, 2016, Utah Geological Survey Aerial Imagery Collection https://geodata.geology.utah.gov/imagery/

AERIAL PHOTOGRAPHS

Data Set	Date	Flight	Photographs	Scale
1947 AAJ	August 10, 1946	2B	46, 47, 48	1:20,000
1963 ELK	June 25, 1963	2	82, 169, 170	1:15,840

*https://geodata.geology.utah.gov/imagery/

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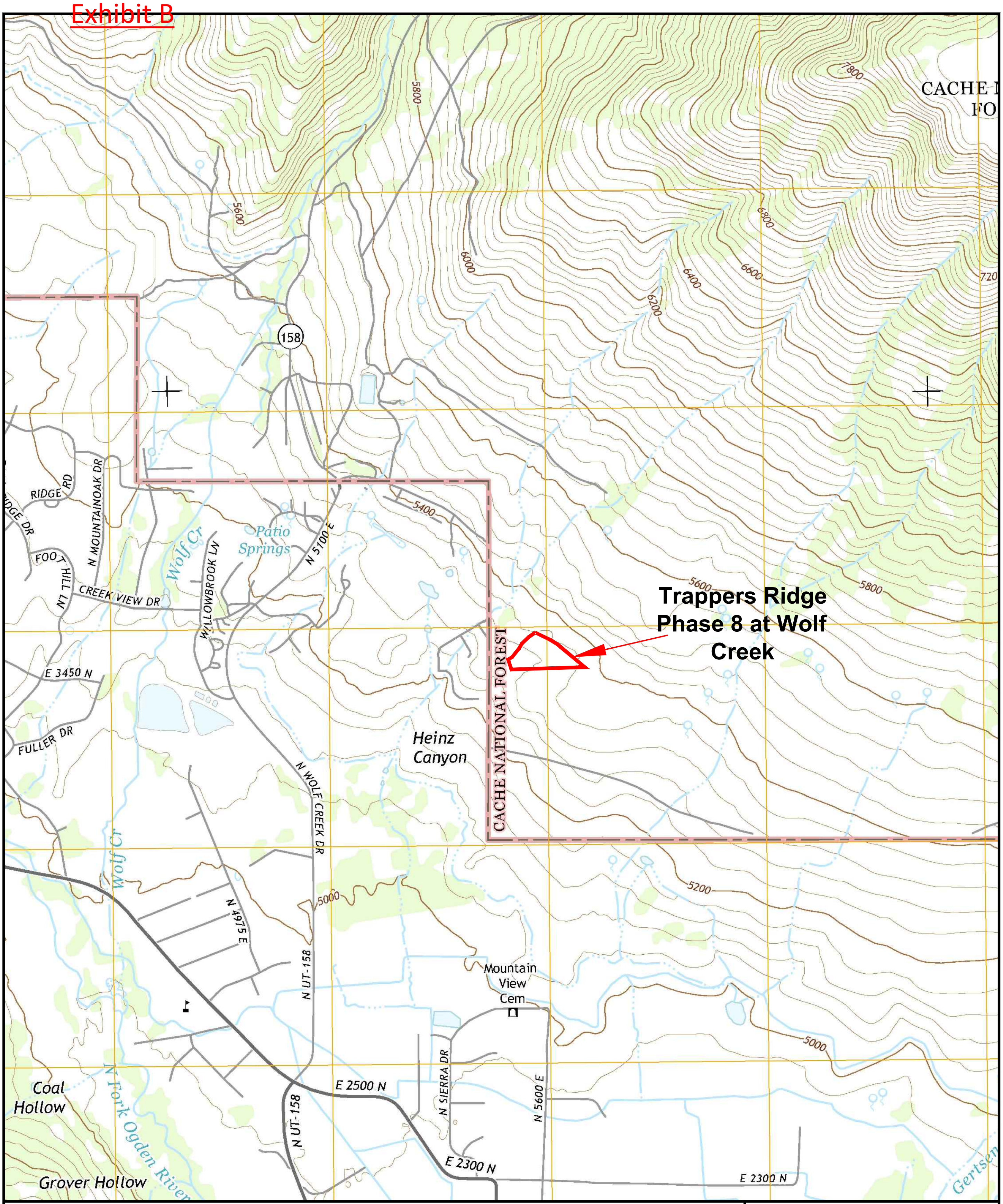
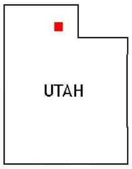
Exhibit B



BASE MAP:

USGS Huntsville 7.5-Minute Topographic Quadrangle Map (2014)



QUADRANGLE LOCATION

N

0 1000 2000 3000

FEET

FIGURE A-1

GENERAL LOCATION MAP

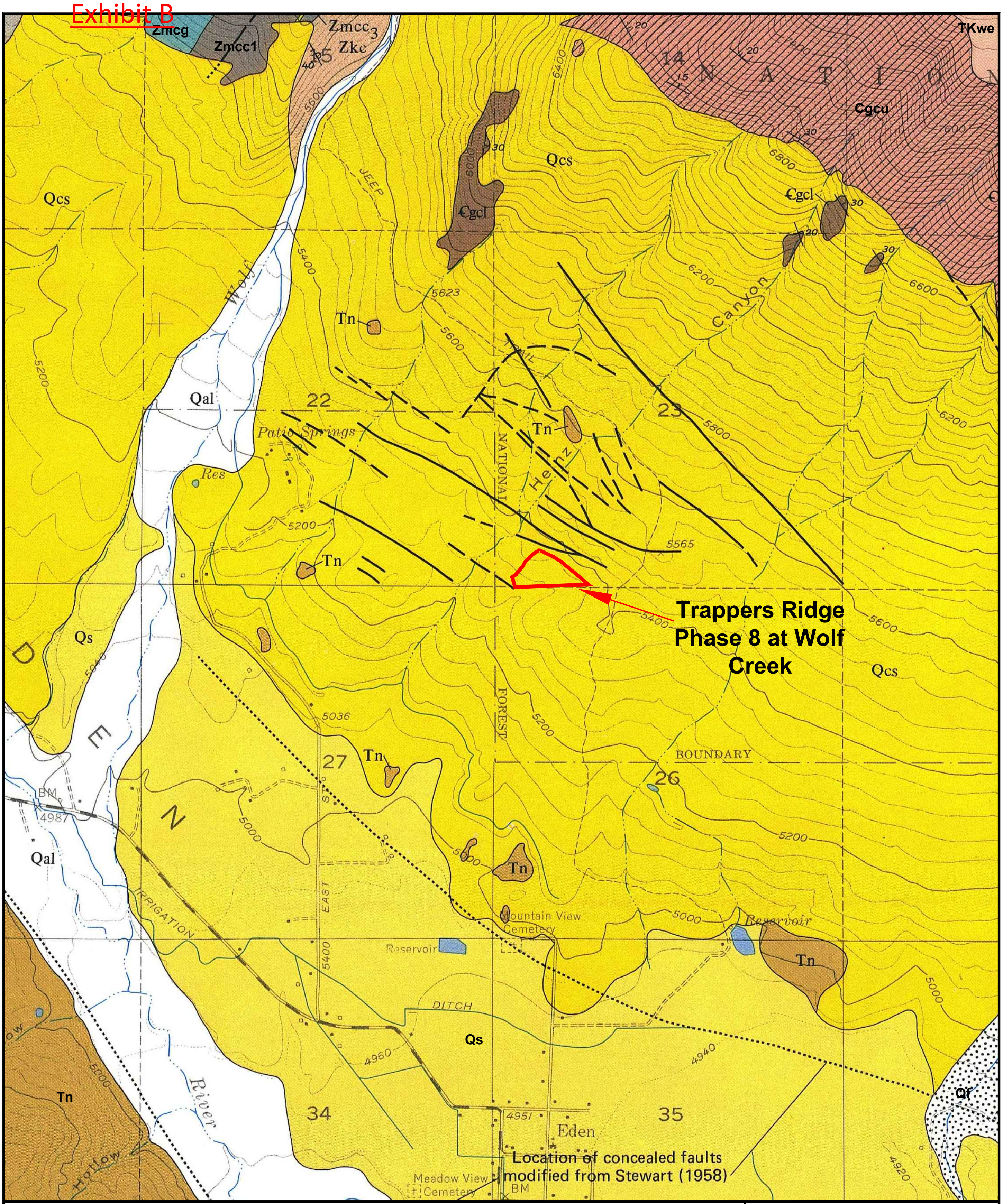
TRAPPERS RIDGE AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/18/2016
PROJECT:01855–007

SCALE:
1"=2,000'

IGES

Exhibit B

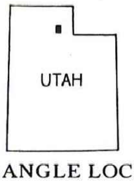


Trappers Ridge Phase 8 at Wolf Creek

Location of concealed faults modified from Stewart (1958)

BASE MAP:

USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

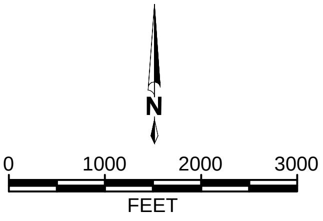


FIGURE A-2a

REGIONAL GEOLOGY MAP 1

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASES 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/18/2016
PROJECT:01855–007

SCALE:
1"=2,000'

IGES

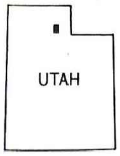
Exhibit B

MAP LEGEND

Qal	ALLUVIAL DEPOSITS, UNDIFFERENTIATED (Holocene) – Unconsolidated gravel, sand, and silt deposits in presently active stream channels and floodplains; thickness 0-6 m
Qcs	COLLUVIUM AND SLOPEWASH (Holocene) – Bouldery colluvium and slopewash chiefly along eastern margin of Ogden Valley; in part, lag from Tertiary units; thickness 0-30 m
Qf	ALLUVIAL FAN DEPOSITS (Holocene) – Alluvial fan deposits; postdate, at least in part, time of highest stand of former Lake Bonneville; thickness 0-30 m
Qls	LANDSLIDE DEPOSITS (Holocene) – thickness 0-6 m
Qs	SILT DEPOSITS (Pleistocene) – Tan silt and sand forming extensive flats in Ogden Valley; deposited during high stands of Lake Bonneville, but may include older alluvial units; thickness 0-60 m
Tn	NORWOOD TUFF (lower Oligocene and upper Eocene) – Fine- to medium-bedded, fine-grained, friable, white- to buff-weathering tuff and sandy tuff, probably waterlain and in part reworked; thickness 0-450+(?) m
TKwe	WASATCH AND EVANSTON(?) FORMATIONS, UNDIVIDED (Eocene, Paleocene, and Upper Cretaceous?) – Unconsolidated pale-reddish-brown pebble, cobble, and boulder conglomerate; forms boulder-covered slopes. Clasts are mainly Precambrian quartzite and are tan, gray, or purple; matrix is mainly poorly consolidated sand and silt; thickness 0-150 m
	BRIGHAM GROUP (Crittenden and others, 1971) – Includes: GEERTSEN CANYON QUARTZITE (Lower Cambrian) – Includes:
€gcu	Upper member – Pale-buff to white or flesh-pink quartzite, locally streaked with pale red or purple. Coarse-grained; small pebbles occur throughout unit and increase in abundance downward. Base marked by zone 30-60 m thick of cobble conglomerate in beds 30 cm to 2 m thick; clasts, 5-10 cm in diameter, are mainly reddish vein quartz or quartzite, sparse gray quartzite, or red jasper; thickness 730-820 m
€gcl	Lower member – Pale-buff to white and tan quartzite with irregular streaks and lenses of cobble conglomerate decreasing in abundance downward. Lower 90-120 m strongly arkosic, streaked greenish or pinkish. Feldspar clasts increase in size to 0.6-1.3 cm in lower part of unit; thickness 490-520 m

BASE MAP:

USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

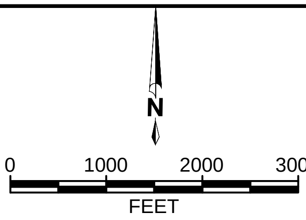


FIGURE A-2b

REGIONAL GEOLOGY MAP 1

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/18/2016
PROJECT:01855–007
SCALE: 1"=2,000'
IGES

Exhibit B

MAP LEGEND

MAPLE CANYON FORMATION (Precambrian Z) – Includes:

Zmcc Conglomerate member – Total thickness 30-150 m. Includes:

Zmcc$_3$ Upper conglomerate – Coarse-grained, locally conglomeratic, white quartzite

Zmcc$_2$ Argillite – Olive-drab to silvery-gray laminated argillite

Zmcc$_1$ Lower conglomerate – White to pale-gray conglomeratic quartzite, with pebble- to cobble-size clasts of white quartz and white, gray, or pale-pink quartzite

Zmcg Green arkose member – Massively bedded pale-green arkosic sandstone, with K-feldspar content locally to 40 percent. Zone of siliceous arkosic quartzite locally present approximately 60 m below top of unit; intercalated quartzitic conglomerates locally present near base of unit; thickness 150-300 m

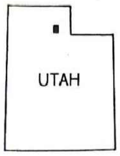
Zmca Argillite member – Olive-drab, locally gray, thin-bedded siltstone and silty argillite, with a medial zone of greenish-gray arkosic sandstone. Argillite commonly shows small-scale folding and marked schistosity. May include rocks of Precambrian Y age near base of unit; thickness 150 m

Recently active normal fault – Dashed where inferred. Ticks on downthrown side

Pre-Tertiary normal fault – Dotted where concealed
Bar and ball on downthrown side

Thrust fault – Dashed where inferred
Sawteeth on upper plate

BASE MAP:
USGS Huntsville 7.5-Minute Geologic Quadrangle Map (GQ-1503), Sorensen and Crittenden, Jr. (1979)



QUADRANGLE LOCATION

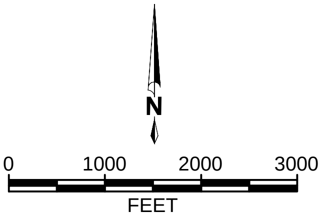


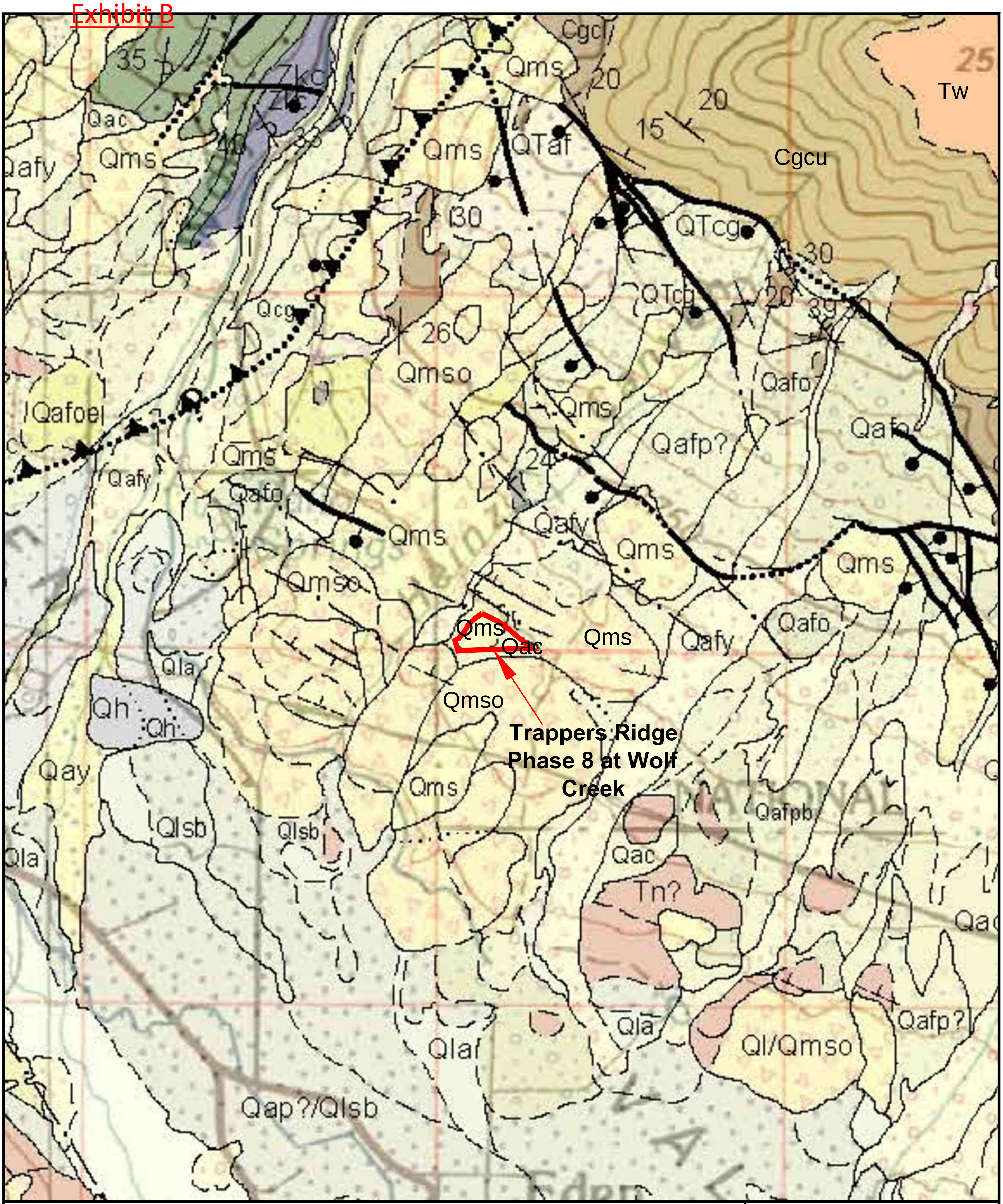
FIGURE A-2c

REGIONAL GEOLOGY MAP 1

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 05/18/2016
PROJECT:01855–007
SCALE: 1"=2,000'
IGES

Exhibit B



BASE MAP:
UGS Ogden 30' x 60' Interim Geologic Quadrangle Map (OFR-653), Coogan and King (2016)

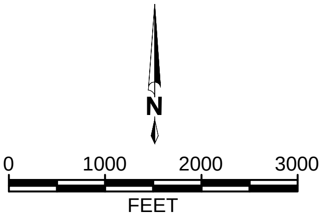


FIGURE A-3a

REGIONAL GEOLOGY MAP 2

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASES 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 06/20/2016
PROJECT:01855–007
SCALE: 1"=2,000'
IGES

Exhibit B

MAP LEGEND

Qaf, Qaf?

Alluvial-fan deposits, undivided (Holocene and Pleistocene) – Mostly sand, silt, and gravel that is poorly bedded and poorly sorted and is near late Pleistocene Lake Bonneville and is geographically in the Ogden and Weber River, and lower Bear River drainages; variably consolidated; includes debris flows, particularly in drainages and at drainage mouths (fan heads); generally less than 60 feet (18 m) thick; in subsurface, about 100 feet (30 m) thick in section 22, T. 9 N., R. 1 W. northwest of Mantua, and about 150 feet (45 m) thick beneath Qac in sections 9 and 16, T. 9 N., R. 1 W. (Utah Division of Water Rights website). Qaf with no suffix used where age uncertain or for composite fans where portions of fans with multiple ages cannot be shown separately at map scale; toes of some fans have been removed by human disturbances, so their age cannot be determined, for example in Upper Weber Canyon. Qaf queried where relative age uncertain, generally due to height not fitting into ranges in table 1 and/or typical order of surfaces contradicts height-derived age (see following paragraphs).

Where possible, subdivided into relative ages, indicated by letter and number suffixes (like Qa and Qat suffixes). These alluvial fans near Lake Bonneville (Qaf1, Qaf2, Qafy, Qafp, Qafpb, Qafb, Qafm, Qafo, Qafoe) are listed and described separately below. Relative ages of these fans are partly based on heights above present drainages in Morgan Valley area, in this case at drainage-eroded edge of fan. This height-based subdivision apparently works in and is applied in Ogden, Henefer, and Lost Creek Valleys and above the North, Middle and South Forks of Ogden River (see tables 1 and 2) (note revisions from Coogan and King, 2006; King and others, 2008; Coogan, 2010a-b). Despite the proximity to Lake Bonneville, alluvial fans along and near Box Elder Creek in the northwest corner of the map area (Mantua quadrangle) do not fit into table 1 and overall appear to be higher than comparable fans in Morgan Valley. Their relative ages are queried where the age is uncertain, generally due to the height not fitting into the ranges in table 1 and/or the typical order of surfaces contradicts height-derived age.

Qaf1, Qaf2, Qaf2?, Qafy, Qafy?

Younger alluvial-fan deposits (Holocene and uppermost Pleistocene) – Like undivided alluvial fans, but all of these fans are unconsolidated and should be considered active; height above present drainages is low and is within certain limits; generally less than 40 feet (12 m) thick; near former Lake Bonneville, fans are shown as Qafy where Qaf1 and Qaf2 cannot be separated, and all contain well-rounded recycled Lake Bonneville gravel. Younger alluvial fan deposits are queried where relative age is uncertain (see Qaf for details).

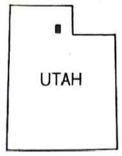
Qaf1 fans are active because they impinge on and deflect present-day drainages. Qaf2 fans appear to underlie Qaf1 fans but may be active. Qafy fans are active, impinge on present-day floodplains, divert active streams, overlie low terraces, and/or cap alluvial deposits (Qap) related to the Provo and regressive shorelines. Therefore, Qafy fans are younger than the Provo shoreline and likely mostly Holocene in age, but may be as old as latest Pleistocene and may be partly older than Qaf1 fans.

Qafp, Qafp?, Qafb, Qafb?, Qafpb, Qafpb?

Lake Bonneville-age alluvial-fan deposits (upper Pleistocene) – Like undivided alluvial fans, but height above present drainages appears to be related to shorelines of Lake Bonneville and is within certain limits (see table 1); these fans are inactive, unconsolidated to weakly consolidated, and locally dissected; fans

BASE MAP:

UGS Ogden 30' x 60' Interim Geologic Quadrangle Map (OFR-653), Coogan and King (2016)



QUADRANGLE LOCATION

N

0 1000 2000 3000

FEET

FIGURE A-3b

REGIONAL GEOLOGY MAP 2

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 06/20/2016
PROJECT:01855–007
SCALE: 1"=2,000'

IGES

Exhibit B

MAP LEGEND

Mass-movement deposits

Qmdf, Qmdf?

Debris- and mud-flow deposits (Holocene and upper and middle? Pleistocene) – Very poorly sorted, clay- to boulder-sized material in unstratified deposits characterized by rubbly surface and debris-flow levees with channels, lobes, and mounding; variably vegetated; in drainages typically form mounds, an indication of more viscous Qmdf, rather than being flat like unit Qac; Qmdf queried where may not be mostly debris- and mud-flow deposits; many debris flows cannot be shown separately from alluvial fans at map scale; 0 to 40 feet (0-12 m) thick. Age(s) uncertain; deposits in drainages likely post-date the Provo shoreline of Lake Bonneville, while deposits above drainages, like north of the Right Hand Fork Peterson Creek, are likely as old as Bull Lake glaciation, but could pre-date Bull Lake glaciation and be middle Pleistocene.

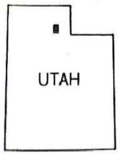
Qms, Qms?, Qmsy, Qmsy?, Qmso, Qmso?

Landslide deposits (Holocene and upper and middle? Pleistocene) – Poorly sorted clay- to boulder-sized material; includes slides, slumps, and locally flows and floods; generally characterized by hummocky topography, main and internal scarps, and chaotic bedding in displaced blocks; composition depends on local sources; morphology becomes more subdued with time and amount of water in material during emplacement; Qms may be in contact with Qms when landslides are different/distinct; thickness highly variable, up to about 20 to 30 feet (6-9 m) for small slides, and 80 to 100 feet (25-30 m) thick for larger landslides. Qmsy and Qmso queried where relative age uncertain; Qms queried where classification uncertain. Numerous landslides are too small to show at map scale and more detailed maps shown in the index to geologic mapping should be examined.

Qms without a suffix is mapped where the age is uncertain (though likely Holocene and/or late Pleistocene), where portions of slide complexes have different ages but cannot be shown separately at map scale, or where boundaries between slides of different ages are not distinct. Estimated time of emplacement is indicated by relative-age letter suffixes with: Qmsy mapped where landslides deflect streams or failures are in Lake Bonneville deposits, and scarps are variably vegetated; Qmso typically mapped where deposits are "perched" above present drainages, rumpled morphology typical of mass movements has been diminished, and/or younger surficial deposits cover or cut Qmso. Lower perched Qmso deposits are at Qao heights above drainages (95 ka and older) and the higher perched deposits may correlate with high level alluvium (QTa_) (likely older than 780 ka) (see table 1). Suffixes y and o indicate probable Holocene and Pleistocene ages, respectively, with all Qmso likely emplaced before Lake Bonneville transgression. These older deposits are as unstable as other slides, and are easily reactivated with the addition of water, be it irrigation or septic tank drain fields.

BASE MAP:

UGS Ogden 30' x 60' Interim Geologic Quadrangle Map (OFR-653), Coogan and King (2016)



QUADRANGLE LOCATION

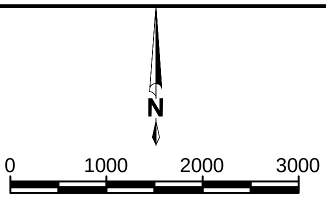


FIGURE A-3c

REGIONAL GEOLOGY MAP 2

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 06/20/2016
PROJECT:01855–007
SCALE: 1"=2,000'
IGES

Exhibit B

MAP LEGEND

Mixed deposits

Qac **Alluvium and colluvium (Holocene and Pleistocene)** – Unsorted to variably sorted gravel, sand, silt, and clay in variable proportions; includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits too small to show at map scale; typically mapped along smaller drainages that lack flat bottoms; more extensive east of Henefer where Wasatch Formation (Tw) strata easily weather to debris that "chokes" drainages; 6 to 20 feet (2-6 m) thick.

Tn, Tn? **Norwood Formation (lower Oligocene and upper Eocene)** – Typically light-gray to light-brown altered tuff (claystone), altered tuffaceous siltstone and sandstone, and conglomerate; unaltered tuff, present in type section south of Morgan, is rare; locally colored light shades of red and green; variable calcareous cement and zeolitization; involved in numerous landslides of various sizes; estimate 2000-foot (600 m) thick in exposures on west side of Ogden Valley (based on bedding dip, outcrop width, and topography). Norwood Formation queried where poor exposures may actually be surficial deposits. For detailed Norwood Formation information see description under heading "Sub-Willard Thrust - Ogden Canyon Area" since most of this unit is in and near Morgan Valley and covers the Willard thrust, Ogden Canyon, and Durst Mountain areas.

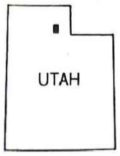
Tnf, Tnf?

Norwood and Fowkes Formation equivalent strata, undivided (Oligocene? and Eocene) – Light-colored, altered tuffaceous fine-grained rocks (claystone and mudstone) with at least local conglomerate, limestone, and sandstone as exposed in southern Cache Valley; extensive altered tuff (claystone), tuff, and tuffaceous sandstone higher in section may or may not be in these equivalent strata (see Tsl notes above); estimate 600 to 1250 feet (180-380 m) thick or may be less than 600 feet (180 m) thick adjacent to Ogden map area, since contact with underlying Wasatch Formation and overlying Salt Lake Formation uncertain; about 500 feet (150 m) exposed below angular unconformity in James Peak quadrangle east of Davenport Creek (from topography, bedding dip and contacts). When the angular unconformity between Tsl and Tnf is not visible the strata have been mapped as Salt Lake Formation over Norwood and Fowkes equivalent strata (Tsl/Tnf). Unit Tnf queried where it may be tuffaceous Salt Lake Formation (Tsl). This combined unit (Tnf) is prone to slope failures.

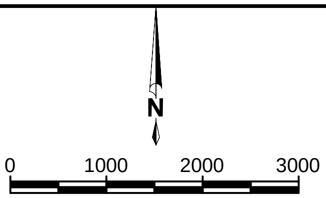
North of the Ogden map area, Williams (1962) showed his tuff unit (Fowkes-Norwood strata of this report) as an irregular band next to Paleozoic rocks on the west side of Cache Valley, and described these strata as 1200 feet (360 m) of earthy gray tuff (actually altered, so claystone or mudstone), with two distinctive limestone beds near the base and a minor amount of pebble conglomerate. He described the upper limestone as stromatolitic (oncolitic, see Adamson, 1955, figure 11). Smith (1997) placed these limestones in her Norwood-Fowkes strata (Tfnx), while Oaks and others (1999) placed them in their Wasatch Formation (Twx) based on oncolites that are similar to those in the Wasatch Formation to the east in the Bear River Range (Oaks and Runnells, 1992). In the Pole Creek valley, east of Cache Valley, we mapped similar oncolitic limestones as undivided Tertiary rocks (Tu, see above).

BASE MAP:

UGS Ogden 30' x 60' Interim Geologic Quadrangle Map (OFR-653), Coogan and King (2016)



QUADRANGLE LOCATION



FEET

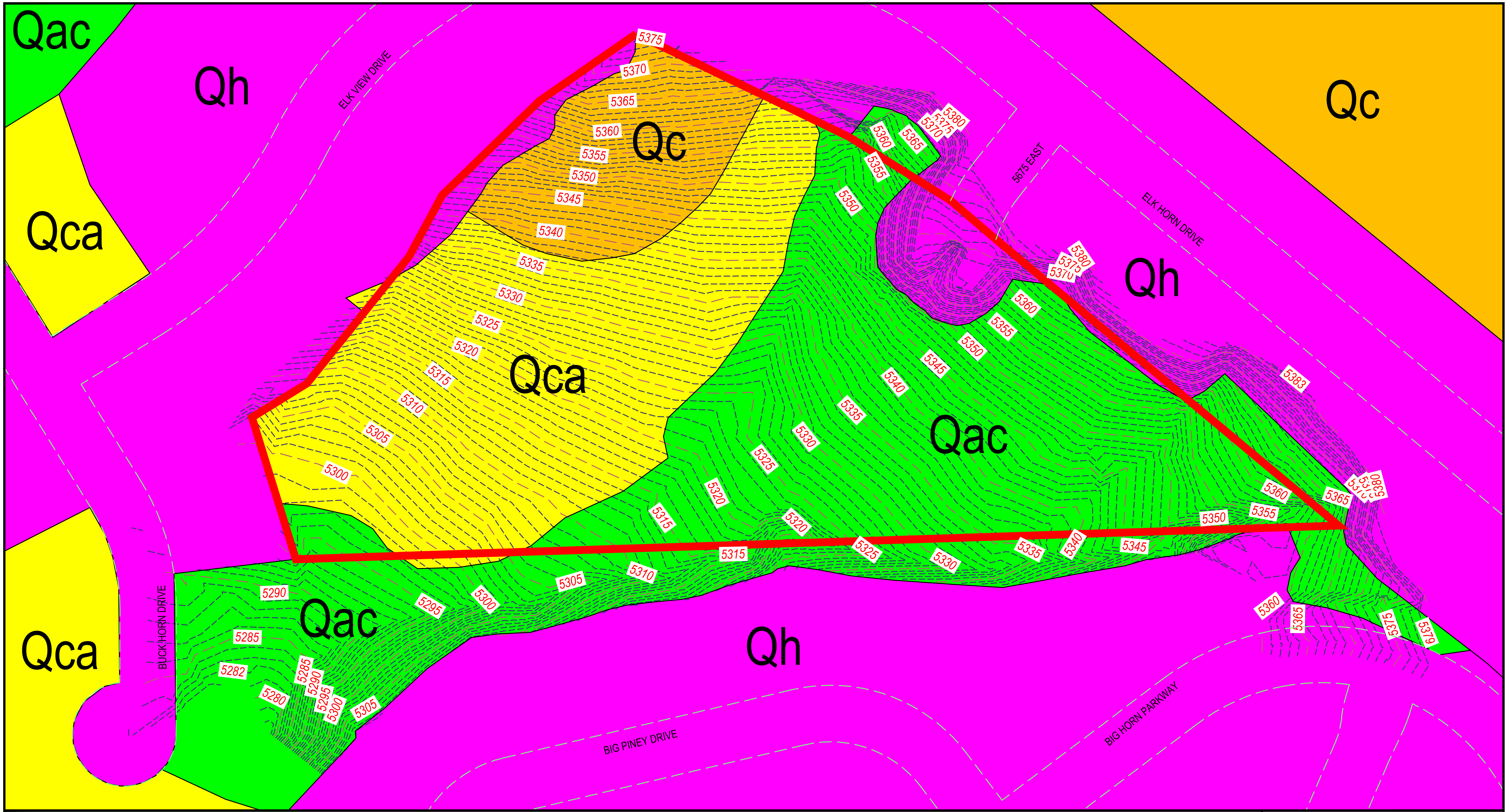
FIGURE A-3d

REGIONAL GEOLOGY MAP 2

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 06/20/2016
PROJECT:01855–007
SCALE: 1"=2,000'

Exhibit B



GEOLOGY LEGEND:

🟪	Qh	HUMAN DISTURBED
🟨	Qca	COLLUVIUM AND ALLUVIUM; GRADATIONAL
🟧	Qc	BOULDERY COLLUVIUM
🟩	Qac	ALLUVIUM AND COLLUVIUM

PROPERTY BOUNDARY

N

0 200
FEET

FIGURE A-4

LOCAL GEOLOGY MAP

TRAPPERS AT WOLF CREEK
SUBDIVISION PHASE 8
GEOLOGIC HAZARDS ASSESSMENT

DATE: 06/15/2016
FILE: 01855–007
SCALE: 1"=100'

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