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

Weber County Planning Division

Synopsis

Application Information

Application Request:	Consideration and action on a request to approve a Hillside Review for the Rules Residence on Lot 3-R of Blake Holley Subdivision
Applicant:	William Rules
File Number:	HSR 2017-05

Property Information

Approximate Address:	4033 E Nordic Valley Drive, Liberty
Project Area:	1.03 acres
Zoning:	FV-3
Existing Land Use:	Vacant
Proposed Land Use:	Single Family Residence
Parcel ID:	22-071-0003
Township, Range, Section:	7N 1E Sec 28

Adjacent Land Use

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

Staff Information

Report Presenter:	Steve Burton sburton@co.weber.ut.us 801-399-8766
Report Reviewer:	RK

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 lot is located in Blake Holley Subdivision which was recorded with the Weber County Recorder's office on August 3, 1977. The average slope of the lot exceeds 25 percent, as such, plans for development are required to be reviewed by the Hillside Development Review Board, as outlined in the Uniform Land Use Code of Weber County (LUC) Title108 Chapter 14.

Earthtec Engineering has performed the geotechnical report and Geostrata has perfomed the geologic hazards assessment. Information related to the construction of the dwelling as outlined in the geologic and geotechnical report, have been distributed to the Hillside Review Board for comment. The reports have been reviewed by all applicable review agencies.

Planning Division Review

The Planning Division Staff has determined that, in compliance with review agency conditions, the requirements and standards provided by the Hillside Review Chapter have been met for the excavation and construction of the dwelling. The following submittals were required:

1. Engineered Plans.
2. Geotechnical Investigation Report (see Exhibit A).
3. Geologic Investigation Report (see Exhibit B).
4. Utah Pollution Discharge Elimination system (UPDES) Permit with Storm water Pollution Prevention Plan. A condition of approval from the Planning Division is that the applicant provides the UPDES Permit and SWPPP with the building permit application.
5. Landscaping plan. The applicant has stated that no additional landscaping will be included on the lot.

Weber County Hillside Review Board comments

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

Weber County Engineering Division: The Engineering Division granted approval on October 16, 2017. The approval is subject to the following comments as conditions of approval:

1. Have a geologist from Geo Stata inspect the footing excavations prior to pouring the footings to confirm the findings of the geologic hazard assessment and address any differences found and assure all recommendations of the hazard assessment have been met.

Weber Fire District: The Fire district has granted an approval on October 23, 2017 subject to the following conditions:

1. Fire Hydrant(s): If there is a waterline that will support a hydrant, a hydrant must be provided within 400 feet of the furthest most portion of a building or facility (see IFC 507.5.1). The maximum spacing between hydrants in a residential area is 500 ft.
2. The property location and structure is within the Wildland Urban Interface and is therefore subject to the requirements of the 2006 Utah Wildland-Urban Interface Code. Provide the following documentation with the building plan submittal:
    a. Completed "Fire Hazard Severity Form" (Appendix C).
    b. Statement of conformance signed by the architect.
    c. Any applicable alterations to comply the WUI code.
3. Provide a temporary address marker at the building site during construction.
4. Fire Access via Driveways: Driveways serving no more than 5 residences shall have a minimum clear width of 16 feet with a minimum of 12 feet of drive-able surface (measured from face of curb to face of curb) and a vertical clearance of 13 foot 6 inches and shall be capable of supporting a 75,000 pound load. Driveways in excess of 150 feet shall be provided with turn-arounds. Driveways exceeding 200 feet in length and less than 20 feet in width shall be provided with turnouts in addition to turnarounds. (See driveways- 2006 Wildland Urban Interface Code used as a reference for residential driveway requirements exceeding 150 feet in length). Roads and driveways shall also comply with City/County standards as applicable. In cases of differing requirements, contact the Fire Marshal for clarification.
5. Roads shall have a maximum grade of 10% unless specifically approved as outlined by the International Fire Code.

General Requirements:

- Roads and bridges shall be designed, constructed and maintained to support an imposed load of 75,000 lbs.
- All roads shall be designed, constructed, surfaced and maintained so as to provide an all-weather driving surface.
- 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.
- All required fire hydrants and water systems shall be installed, approved and fully functional prior to any combustible construction.

Weber County Building Inspection Department: The Building Official, on December 6, 2017, completed an initial review of this project and will require the following items to be addressed.

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

2. Compaction tests are required for any structural fill used.

Weber-Morgan Health Department: The Health Department, on December 8, 2017, has given the following comments regarding this application:

The property has been reviewed and found to meet the minimum lot size and slope requirement of 20,000 square feet of contiguous building area with a 25% or less slope. A letter of feasibility has been issued by this office for the property. The letter has been added to the file tab for this project.

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 developing Lot 3-R according to approved plans and in compliance with the geologic and geotechnical investigation reports which outline specific recommendations for the site development.

Planning Division Findings

Based on site inspections and review agency comments, the Planning Division Staff is recommending approval subject to the following conditions:

1. Development of the lot must comply with the excavating, grading, and filling standards outlined in LUC §108-14-8 as well as the recommendations outlined in the geologic and geotechnical reports that were provided with the application.
2. The applicant shall provide the UPDES Permit and SWPPP with the building permit application.

The recommendation for approval is based on the following findings:

1. The application was submitted and 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 dwelling.
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 building permit process and/or during the excavation and construction phase of the dwelling, the requirements and conditions set forth by the Hillside Review Board. As a condition it is understood, by the applicant and his geo-technical engineer and geologist, that if any geologic hazards are revealed during the excavation and construction phase of the dwelling, work on Lot 3-R will cease pending the development of appropriate mitigation measures and subsequent approval by the County and the County's contracted geo-technical and/or geological consultant.

Administrative Approval

Administrative approval of Lot 3-R, Rules Cabin Hillside Review (HSR2017-05), is hereby granted based upon its compliance with the Weber County Land Use Code. This approval is subject to the requirements of applicable review agencies and is based on the findings listed in this staff report.

Date of Administrative Approval: _____

_____
Rick Grover
Weber County Planning Director

Exhibits

A. Approved Plans
B. Geotechnical Investigation Report
C. Geologic Report

Map 1


3960
4034
4083
3901
Nordic Valley Dr
NORDIC VALLEY DR
4033
3995
4059
4089

Exhibit A
Page 1 of 20

Rules Cabin

The owner / builder are responsible for acquiring an engineer to size structural members. If engineering is not done then the owner / builder is liable for the structural members.

These plans are to be used only for the people and place stated. These plans may not be used without the written permission from :
Yellowstone Log Homes L.L.C.

These plans were prepared by a designer who is not an engineer and expressly disclaims any liability for errors or omissions of any kind which may exist herein. The user of these plans assumes all liability for the accuracy, including verification of all dimensions, compliances with any and all governing codes, and covenants having jurisdiction over the site of construction and determining any modifications necessary to meet actual site conditions. The selection of correct structural materials and the application of architectural principles is a precise art, the responsibility for which rests with the builder, the owner, and or the user of these plans.

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Draftsman:
#CAD Technician Full Name

Project Info:
Bill and Lisa Rules
(Modified 8 Inch Hillside)
(3rd Edition)

Revisions:

Plot Date: 8/29/17

Sheet:
T-1

Exhibit A
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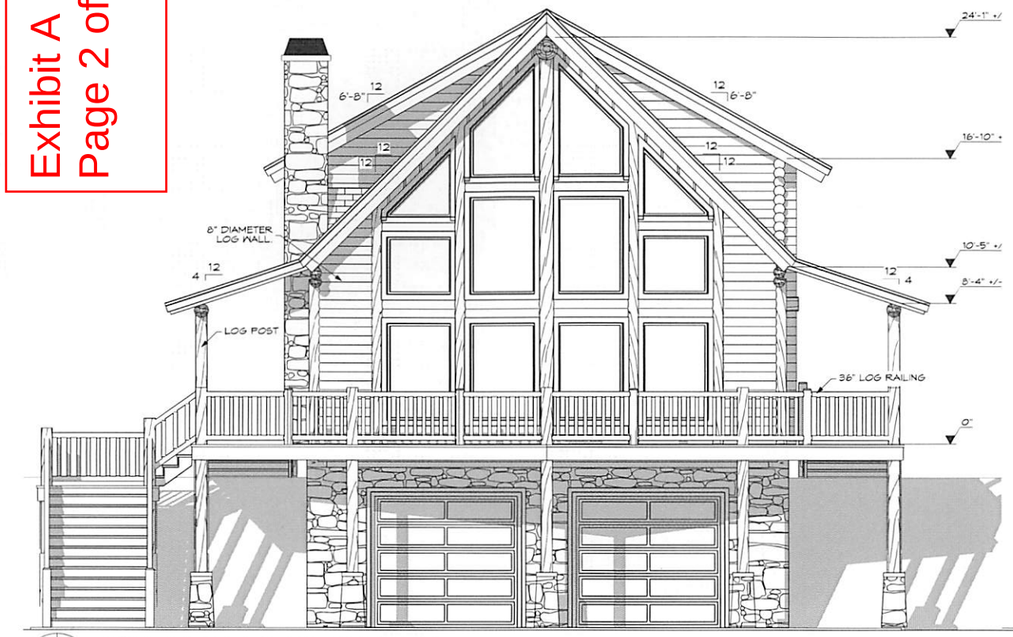
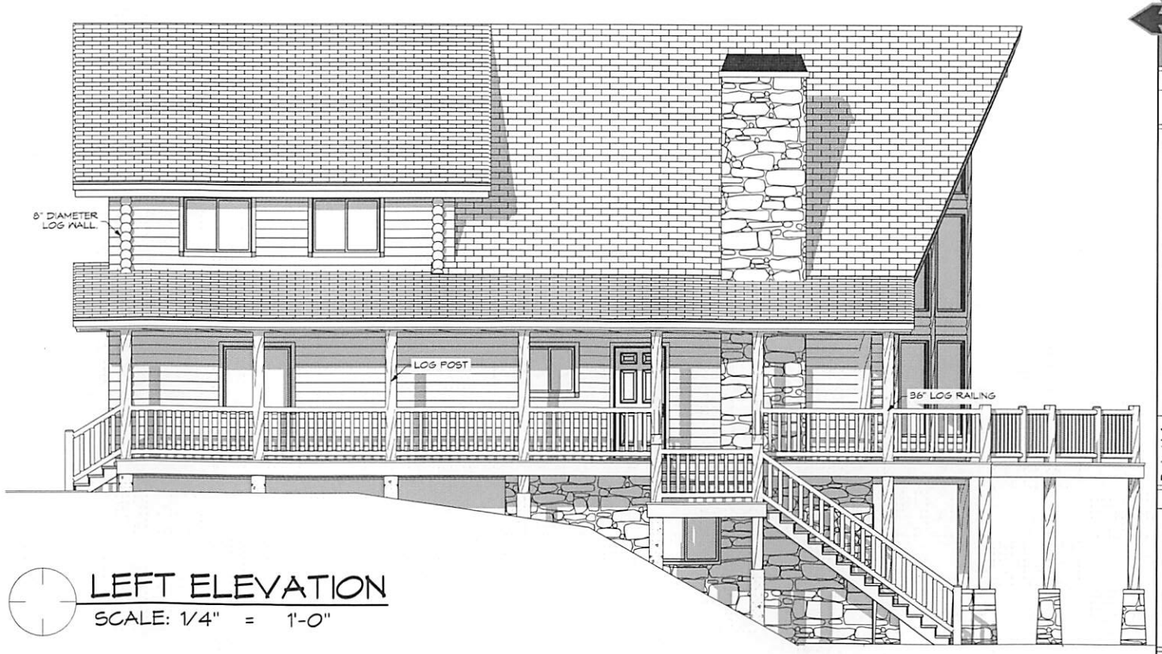


FRONT ELEVATION
SCALE: 1/4" = 1'-0"

RIGHT ELEVATION
SCALE: 1/4" = 1'-0"

BACK ELEVATION
SCALE: 1/4" = 1'-0"



LEFT ELEVATION
SCALE: 1/4" = 1'-0"

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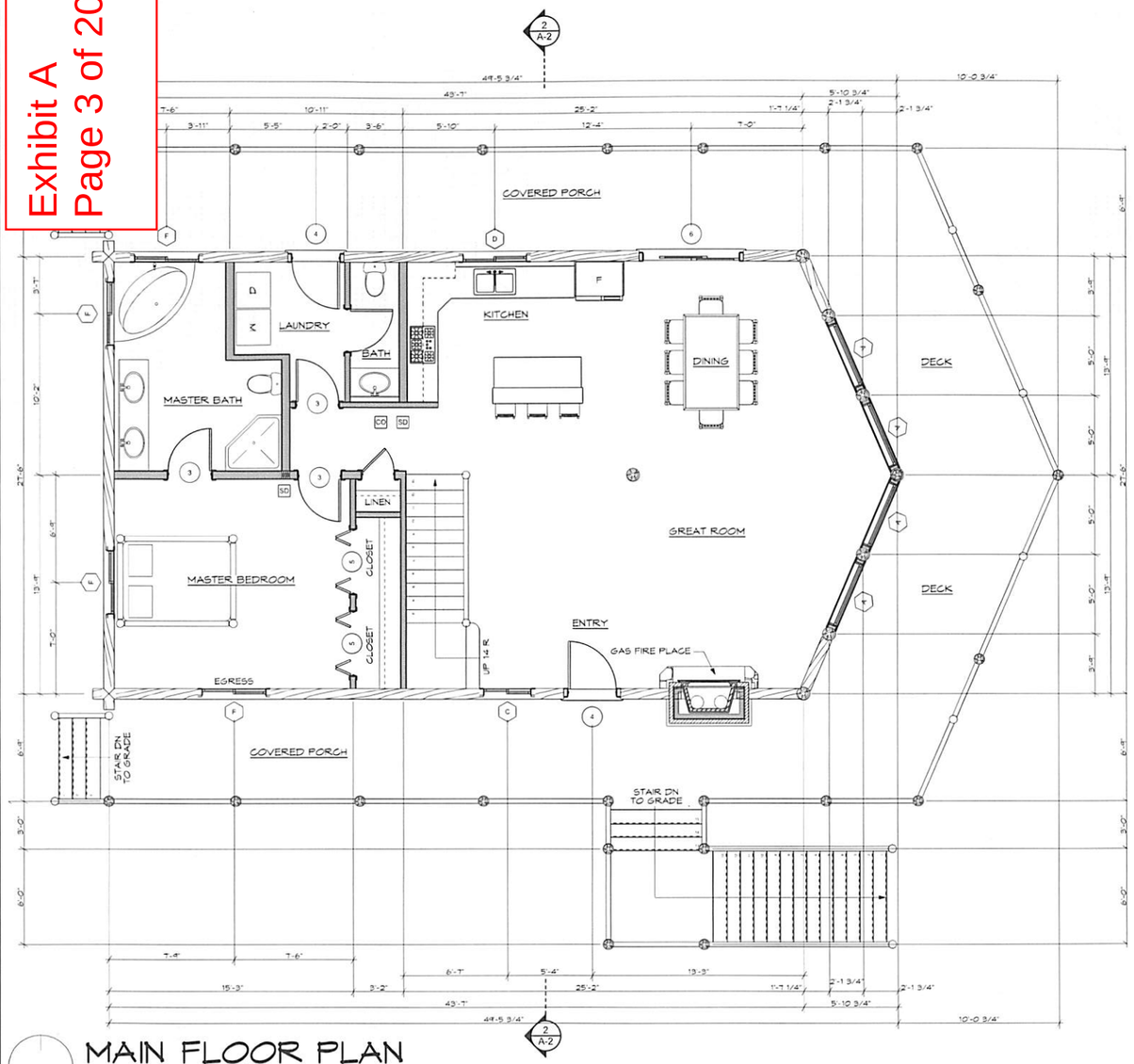


MAIN FLOOR PLAN
SCALE: 1/4" = 1'-0"

NOTE:
ALL (A) WINDOWS & DOORS ARE TO BE VERIFIED IN THE FIELD TO DETERMINE ACTUAL SIZE AND PLACEMENT.

ALL DOOR/ WINDOW SIZES AND TYPES TO BE DETERMINED PER OWNER/BUILDER AND MANUFACTURERS SPECIFICATIONS

FIELD MEASURE THE CORRECT ROUGH OPENINGS FOR ALL PICTURE WINDOWS PRIOR TO ORDERING.

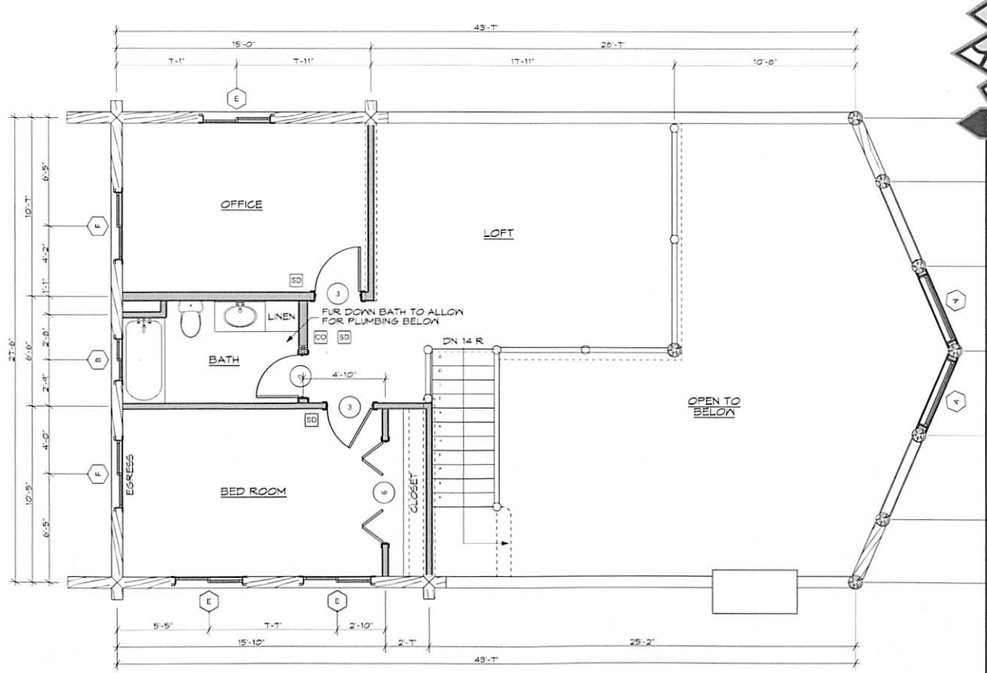
WINDOW KEY			
ID	WINDOW SIZE	QTY	WINDOW NOTES
B	2'-6"x1'-0"	1	
C	3'-0"x3'-0"	1	
D	4'-0"x3'-0"	2	
E	4'-0"x3'-6"	3	
F	4'-0"x4'-0"	7	(2) EGRESS

DOOR KEY			
ID	DOOR SIZE	QTY	DOOR NOTES
1	2'-0"x6'-8"	1	
2	2'-6"x6'-8"	1	
3	2'-8"x6'-8"	9	
4	3'-0"x6'-8"	2	
5	4'-0"x6'-8"	2	
6	6'-0"x6'-8"	2	

SQUARE FEET

MAIN FLOOR:	1204
SECOND FLOOR:	626
BASEMENT/GARAGE:	1232
LIVABLE AREA:	1830
TOTAL AREA:	3062

SQUARE FOOTAGE IS APPROXIMATE. THE BASEMENT, MAIN FLOOR, AND GARAGE ARE MEASURED FROM OUTSIDE OF THE FOUNDATION. THE LOFT IS MEASURED FROM ACTUAL SURFACE AREA OF THE LOFT FLOOR.



SECOND FLOOR PLAN
SCALE: 1/4" = 1'-0"

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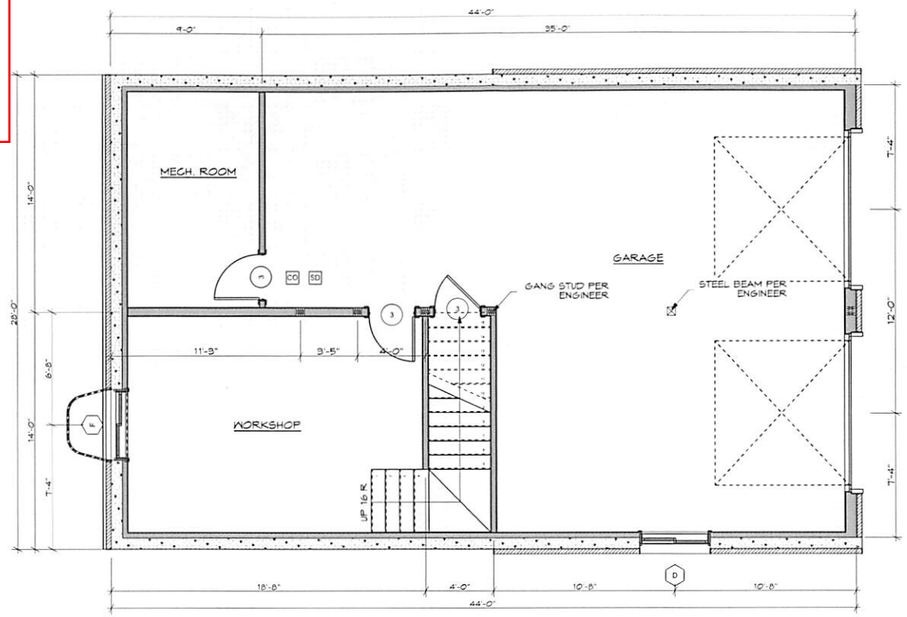
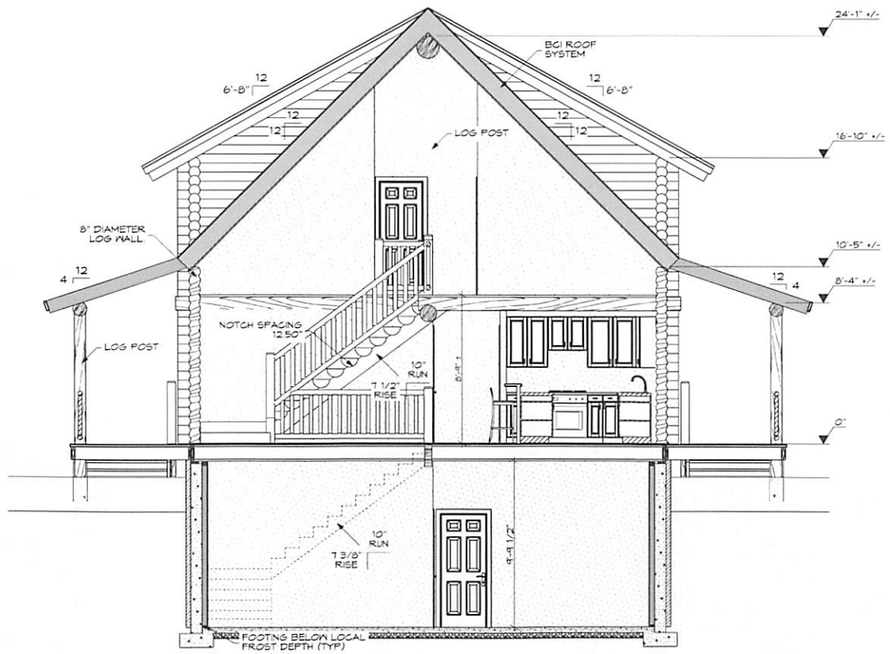


BASEMENT FLOOR PLAN

SCALE: 1/4" = 1'-0"



SECTION @ STAIRS

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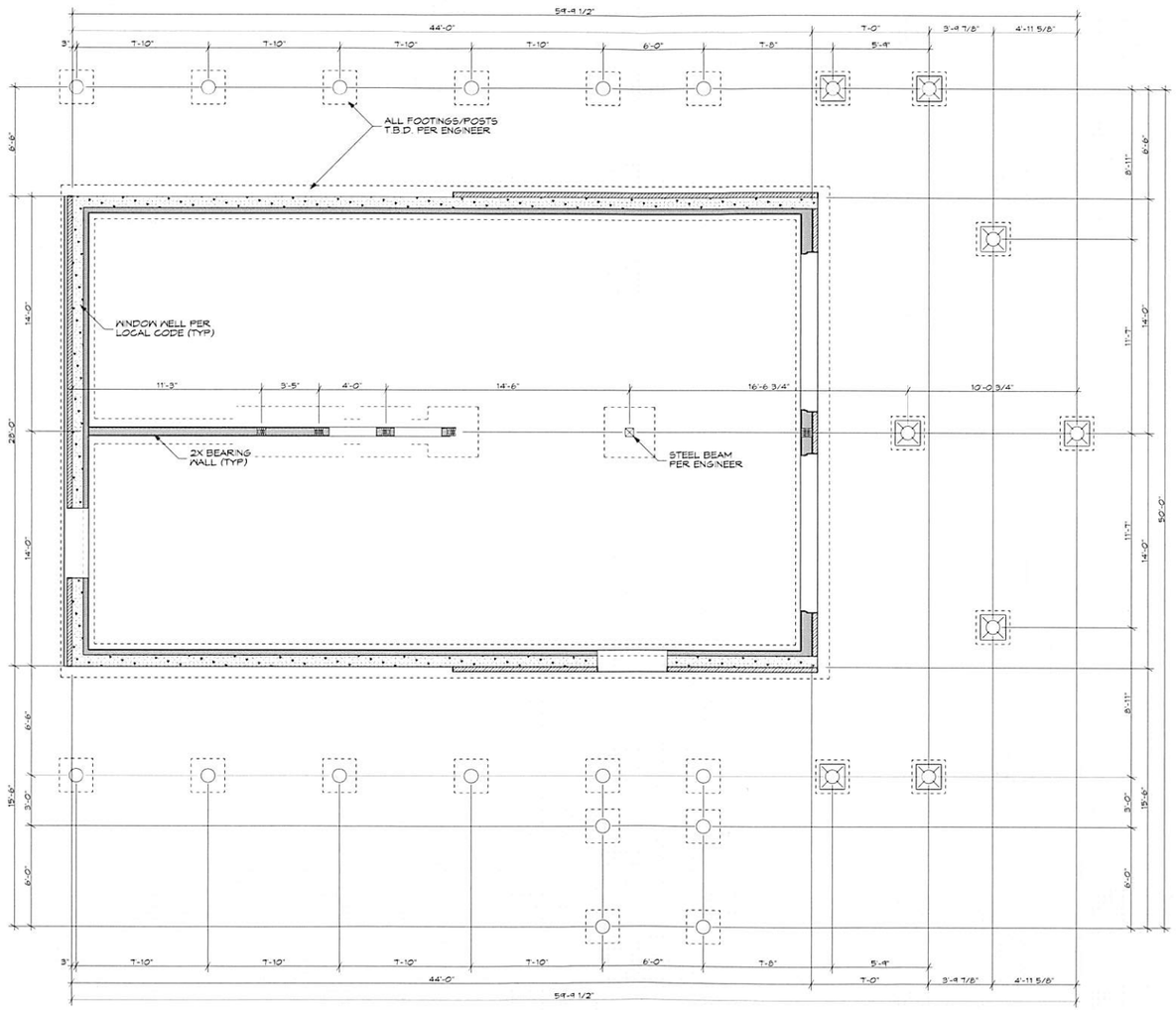

FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

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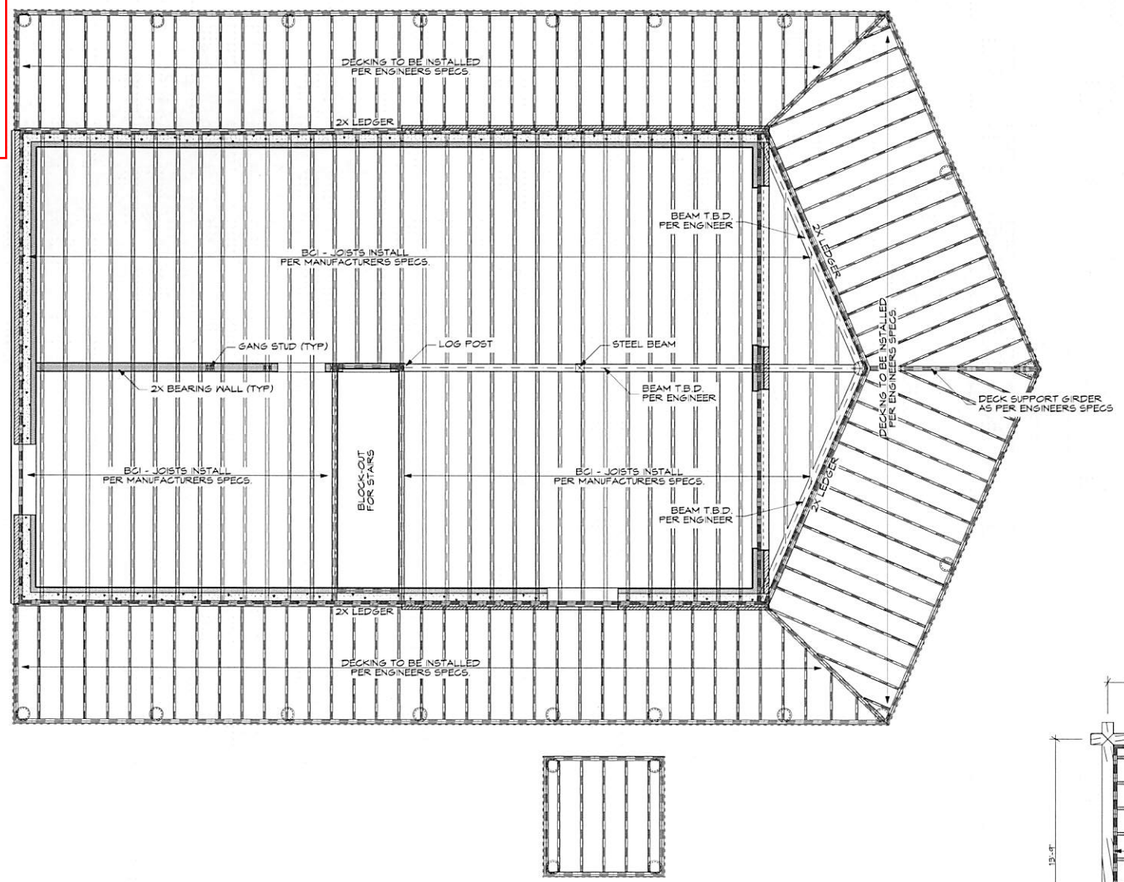
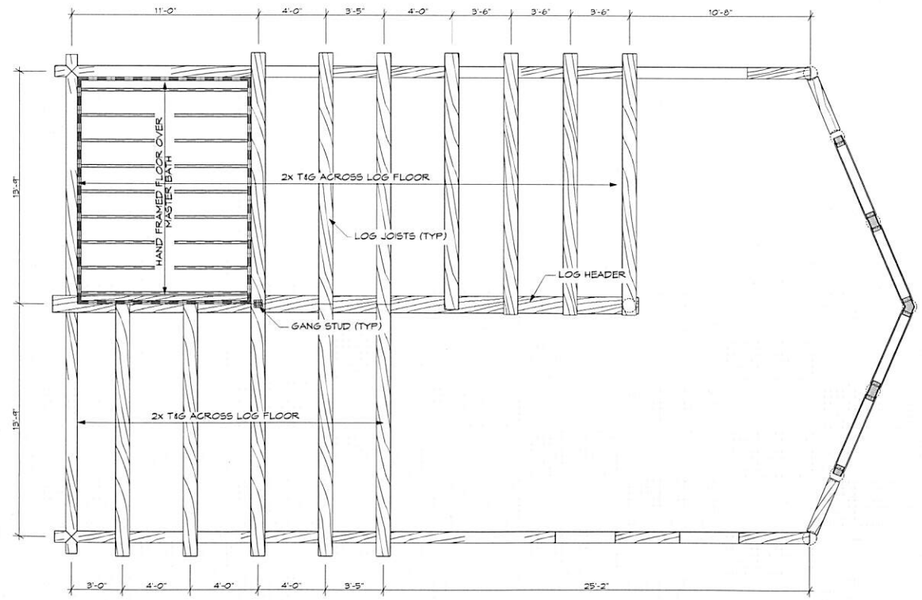


MAIN FLOOR FRAMING
SCALE: 1/4" = 1'-0"



SECOND FLOOR FRAMING
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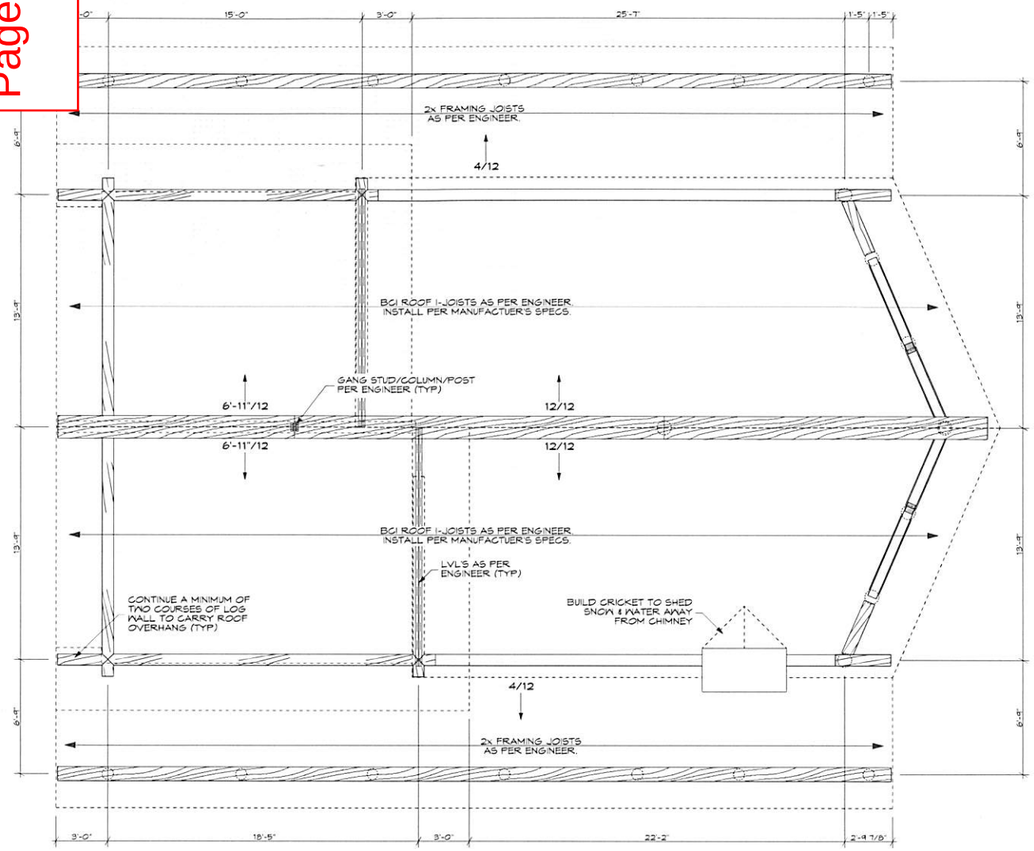
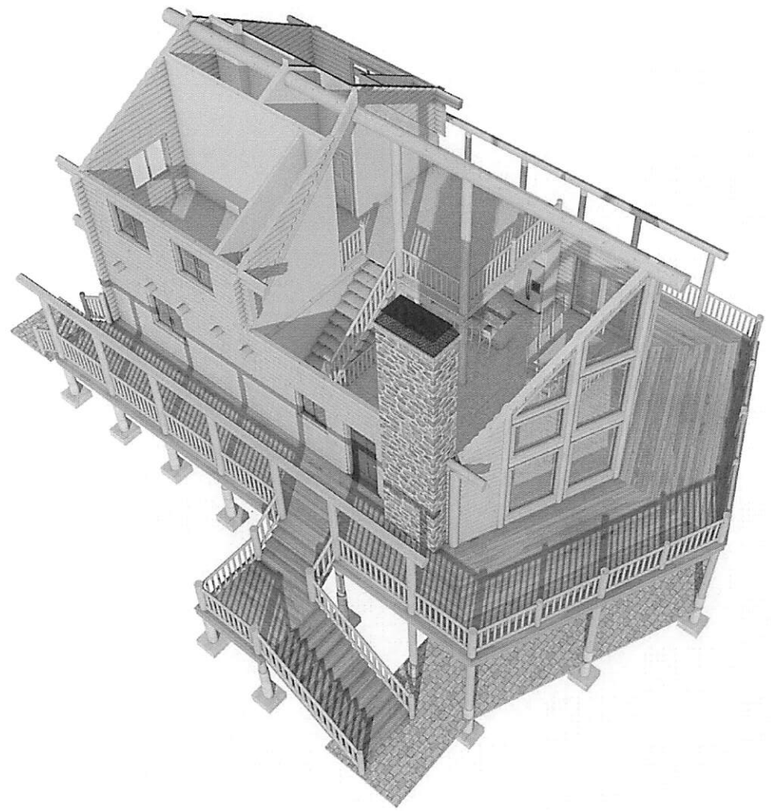


ROOF FRAMING PLAN

SCALE: 1/4" = 1'-0"



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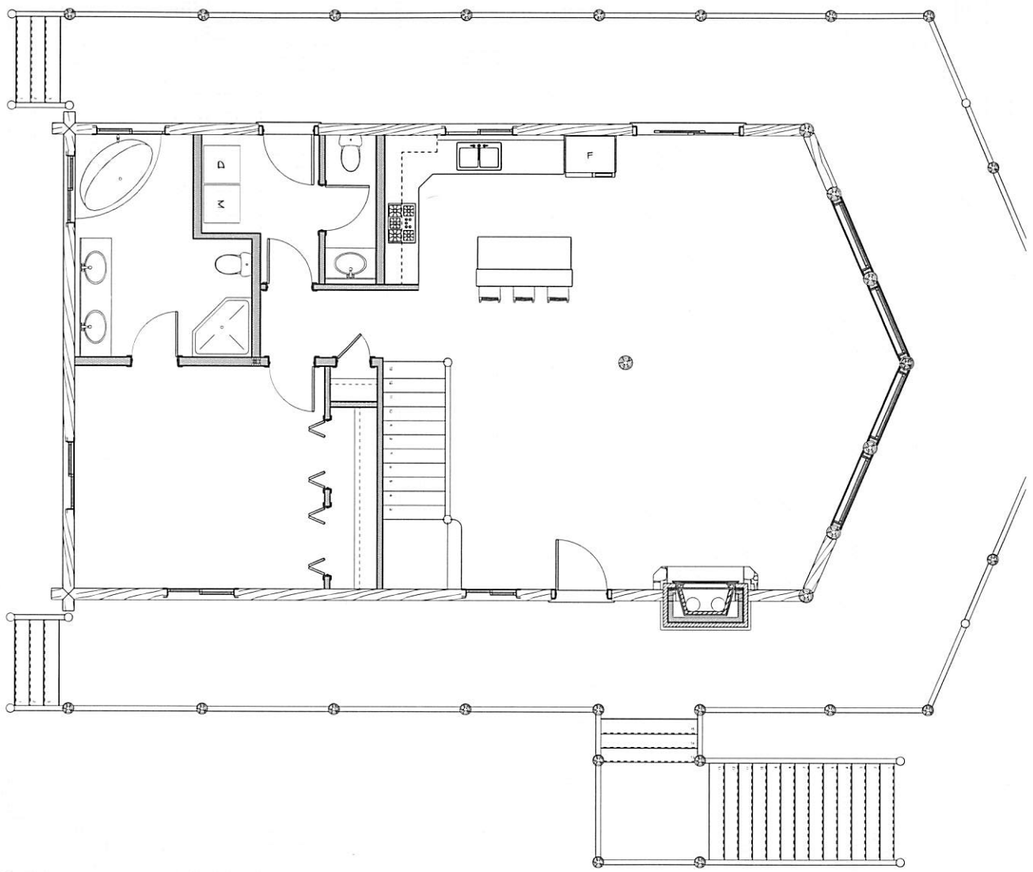
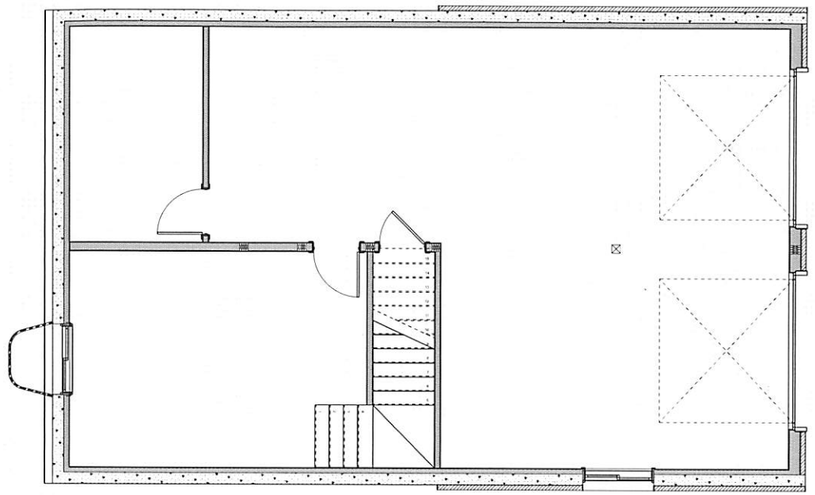
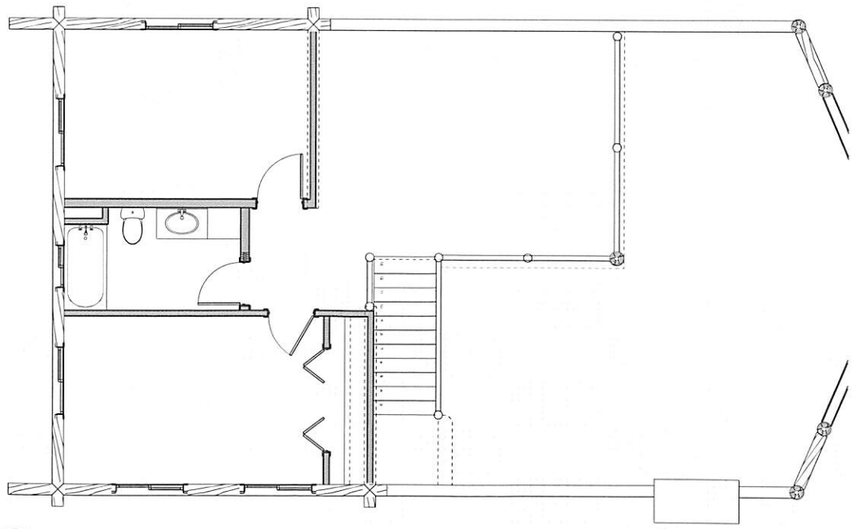


MAIN FLOOR ELECTRICAL
SCALE: 1/4" = 1'-0"

ALL ELECTRICAL TO BE DESIGNED BY OWNER/BUILDER/ELECTRICIAN TO MEET ALL LOCAL CODES AND REGULATIONS.



BASEMENT FLOOR ELECTRICAL
SCALE: 1/4" = 1'-0"



SECOND FLOOR ELECTRICAL
SCALE: 1/4" = 1'-0"

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E-1

Exhibit A
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man not a Engineer or an Architect. Yellowstone Log Homes LLC strongly recommends that ...ellowstone Log Homes LLC strongly recommends that ...ctural Engineer to meet code for the area the structure

...se drawings in their entirety before attempting to build. ...Yellowstone Log Homes LLC. Any errors due to not ...wners responsibility.

...cted by or at the owners request to size all structural ...uilder will be responsible for all structural designs. By ... the proper Engineering the owner & or builder are in ...r this building.

... Builder, Contractors or Subcontractors or any other ...rk on the building are to comply with the local building ...there are no local building codes then all participating ...les or the current UBC or ICBO building codes.

...dicate the building in the finished state. The parties ...for sound , current, & safe building practices, & on site ...roofs, decks , etc. The parties building all or part of the ...me and shall have no loads that exceed the maximum ...ding) for any duration of time, temporary or permanent. ...aterials and existing conditions at the job site, and fully ...s with other disciplines before attempting to build.

...er, owner, or any other party without written consent in the design stage or afterwards will void all liabilities from the Engineers, designers, & other parties involved in the design stages of the building. The owner & or builder agree to hold harmless all parties involved in the design stage from any claims resulting from variances.

8- In the event of a conflict between pertinent codes and regulations and referenced standards on these plans, the more stringent provisions will govern.

9- Any design loads shown are assumed loads. The owner and contractor are responsible for checking the actual soil and snow load requirements. The owner & contractor are also responsible for obtaining a soils report if necessary.

Grading & Drainage:

1- It is the responsibility of the building parties to verify grade and to build accordingly. Any req'd steps in the foundation are the responsibility of the building parties. It is the building parties responsibility to keep the work area safe while digging, scraping, backfilling and in all other aspects of the building project and practices.

2- It is the responsibility of the building parties to supply adequate drainage grade & or drainage systems in the lot surrounding the building & in the foundation as req'd by local codes & as needed for local conditions. Use gravel as requested by owner for extra drainage.

3- Finished grade is to provide sufficient slope for drainage away from the building in all seasons & as req'd by local code.

Log Preservation:

1- In order to insure a weather tight seal, gasket should be used between each log, and over the notched corners. After completion of stacking logs, caulk or chinking should be applied on both sides of logs to all joints, seams cracks, or crevasses where air infiltration may occur.

2- Logs should be a minimum of 2 feet above grade, and a recommended 3 feet above grade. This will help protect logs from excess water backsplash and snow fall.

3- Contractor should maintain a minimum of 3' foot roof overhang on gables, and 2' foot recommended on eaves, for proper log protection.

4- When stacking the log walls, OLY LOG screws, and or 1/2" Lag Bolts should be used per manufacturer's specifications and per local codes/ requirements.

5- Stain/ Sealant should be used per manufacturer's specifications to help protect against water, sun, rot, and insect infestation.

6- Utilize a landscaping barrier around the entire perimeter of the home to keep water from sprinklers off of the logs.

Plans:

1- Great care and proficiency has been put into producing accurate plans. Any discrepancies in the plans shall be brought to the attention of Yellowstone Log Homes L.L.C. before attempting to build. However due to the impossibility of being on the site of construction, providing close supervision, giving personal consultations, having control over the actual construction, & due to the great variation of building materials, methods, practices, regulations, local codes, local building conditions, & weather conditions, Yellowstone Log Homes LLC. assumes NO liability or responsibility for any damages due to poor building methods, practices, errors or omissions, the failure to meet any & all codes, and the failure of the builder to verify plans before attempting to build. If the owner & or builder chooses to not have these plans Engineered by a structural engineer then the party making the decision is responsible for all structural & other related areas of the building.

2- The plans should be reviewed thoroughly & an understanding of the plans & accepted building practices & codes should be reached before attempting to build.

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Log Construction:

1- Logs will generally be Western Woods with a low moisture content at the time of delivery. Logs are generally TPI graded at the plant site.

2- Provision shall be made for shrinkage or settling of the log walls during & after construction.

3- Setting jacks as shown shall be adjusted periodically as required after initial construction of the log shell.

4- Contractor is responsible for construction that allows for settling in log walls, interior framed walls, cabinets, plumbing, etc.

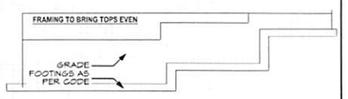
Concrete:

1- All steel or other reinforcing in the concrete is to be to local Building Codes. The Building parties are responsible to ensure that all building methods & practices are upheld.

2- Use vapor barriers below grade as per local code.

GENERAL BUILDING NOTES:

1- The foundation is to be as per local code w/ footings placed as per local codes w/ frost line depths being met. Due to great variance in grade from building site to building site, it may be necessary to step the foundation to meet code.



2- The soil conditions & any required testing are the responsibility of the owner & or builder. If unique conditions are found then it is the responsibility of the parties finding the conditions to report them to the proper engineers for adequate modifications for the foundation.

3- Final finished grade is to be at least 12" from the top of the foundation with a recommended 24". If local codes require something different then that code is to be followed. Finished grade is to provide sufficient drainage away from the building with slope, French drains or other as permitted by local codes. Sufficient drainage varies from area to area due to weather conditions so it is the responsibility of the owner & or builder to provide such drainage specifications or to acquire specifications from the local authorities.

4- Foundation reinforcement & mechanical connections shall comply with local Seismic & Building code.

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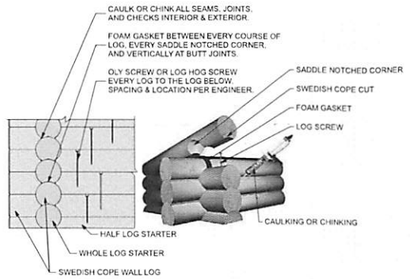
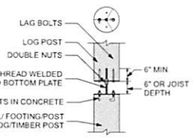
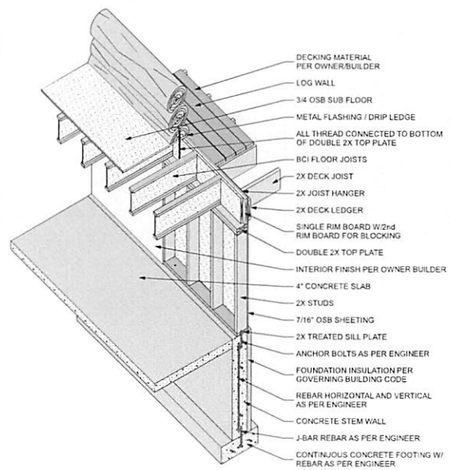


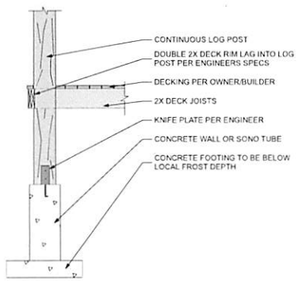
1 Foam Gasket,Fastening & Caulking



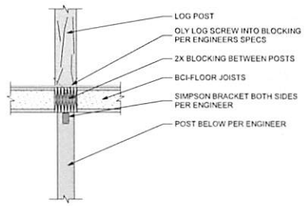
2 Settling Jack Detail (If Applicable)



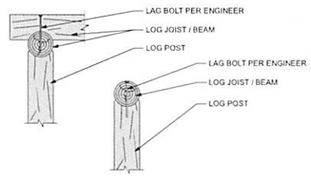
6 Daylight Basement



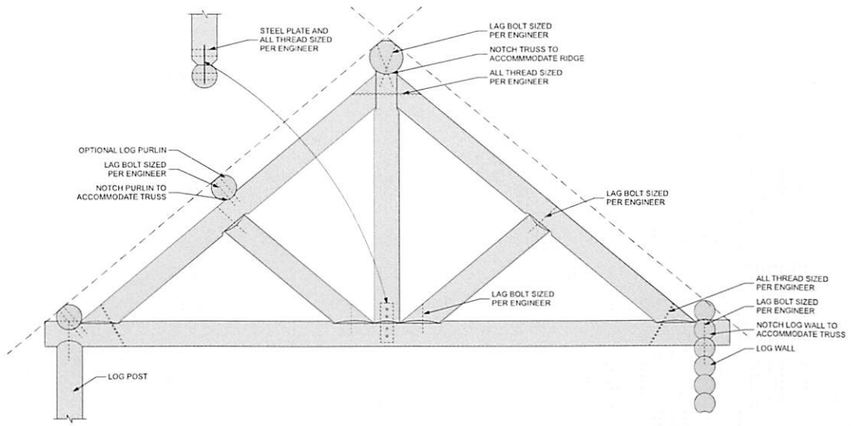
3 Log Deck Post



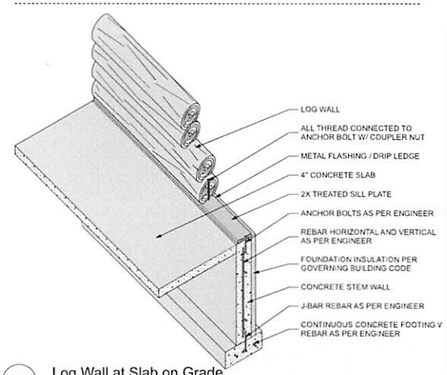
4 Blocking Between Floor Joists For Log Post



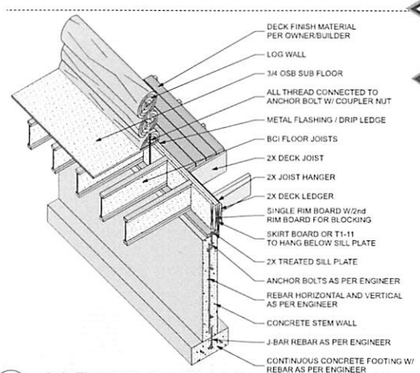
5 Log Joist or Beam Connection



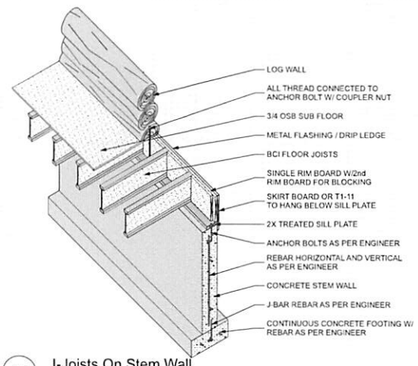
7 Typical King Truss Detail



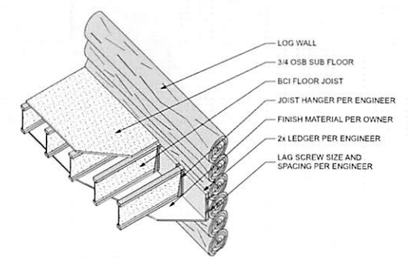
8 Log Wall at Slab on Grade



9 Sub-Floor & Deck on Foundation



10 I-Joists On Stem Wall



11 I-Joist Floor Hung From Log Wall

The owner / builder are responsible for acquiring an engineer to size structural members. If engineering is not done then the owner / builder is liable for the structural members.

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Yellowstone LOG HOMES L.L.C.
280 N. Yellowstone Hwy.
Rigby, ID 83442
Ph: 208-745-8108 Fax: 208-745-8525
www.yellowstoneloghomes.com

Draftsman:
#CAD Technician Full Name

Project Info:
Bill and Lisa Rules
(Modified 8 Inch Hillside)
(3rd Edition)

Revisions:

Plot Date: 8/29/17

Sheet: D-1

Exhibit A
Page 10 of 20

...n not a Engineer or an Architect. Yellowstone Log ...stone Log Homes LLC strongly recommends that ...ural Engineer to meet code for the area the structure

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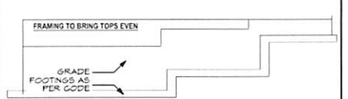

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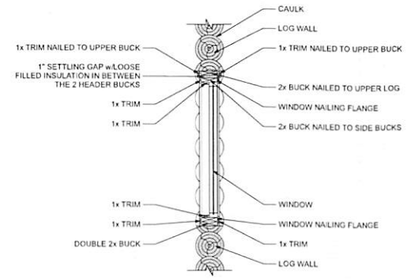
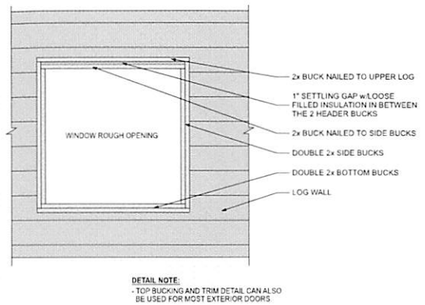
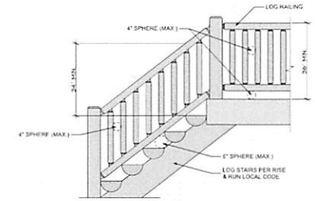


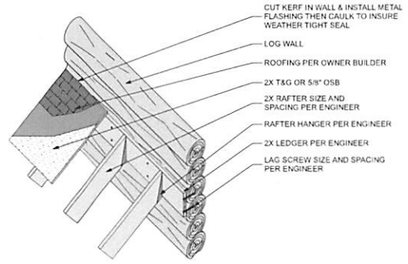
12 Window/Door Section Detail



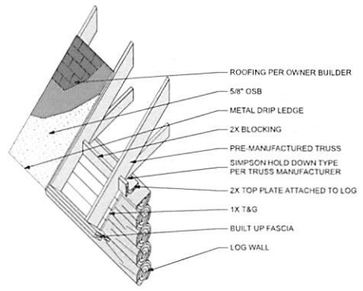
13 Window Frame Detail



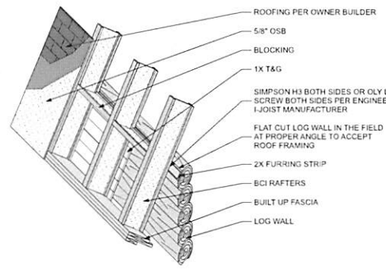
14 Log Stair Railing



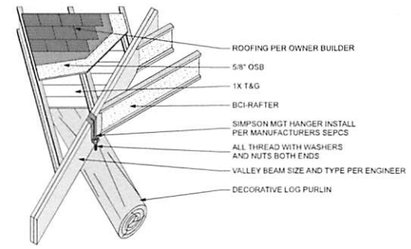
15 Log Wall Porch Roof Attachment



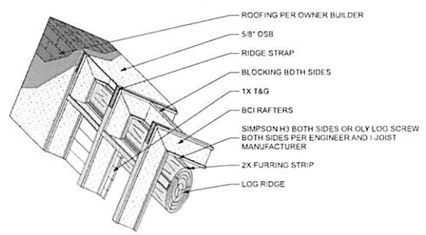
16 Log Wall With Manufactured Trusses



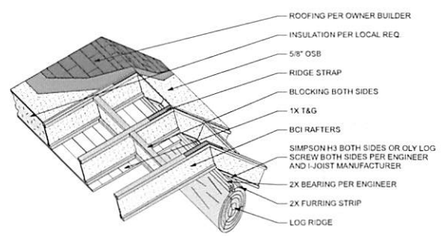
17 I-Joist Rafters @ Log Wall



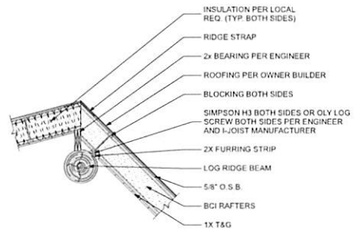
18 Decorative Purlin Hung From Valley (If Applicable)



19 I-Joist Rafters On Log Ridge



21 Shed Dormer @ Log Ridge



20 (Section) Shed Dormer @ Log Ridge

The owner / builder are responsible for acquiring an engineer to size structural members. If engineering is not done then the owner / builder is liable for the structural members.

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Yellowstone LOG HOMES L.L.C.
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Rigby, ID 83442
Ph: 208-745-8108 Fax: 208-745-8525
www.yellowstoneloghomes.com

Draftsman:
#CAD Technician Full Name

Project Info:
Bill and Lisa Rules
(Modified 8 Inch Hillside)
(3rd Edition)

Revisions:

Plot Date: 8/29/17

Sheet: D-2

RULES RESIDENCE,
WEBER COUNTY,
UTAH

PROJECT DATA

1. GOVERNING BUILDING CODE: IRC 2015

2. OCCUPANCY AND GROUP: R-3

3. TYPE OF CONSTRUCTION: TYPE V-B

4. LOCATION ON PROPERTY:

   EXTERIOR WALLS: NON-RATED

   EXTERIOR OPENINGS: NON-RATED

5. OCCUPANCY SEPARATION : NOT REQUIRED

   SPRINKLED: NO

   NUMBER OF STORIES: 2.0

6. FIRE RESISTIVE REQUIREMENTS:

   SEE ARCHITECTURAL DWGS

PROJECT INFORMATION

OWNER ADDRESS :

BILL RULES
1700 WEST 2700 NORTH
PLEASANTVIEW, UT 84414

BUILDING DEPARTMENT:

WEBER COUNTY, UT

DRAWING INDEX

BUILDING SQ. FT.

LIVING SPACE :

MAIN FLOOR = 1204 SQ. FT.
SECOND FLOOR = 626 SQ. FT.

TOTAL = 1830 SQ. FT.

NON LIVING SPACE :

BASEMENT/GARAGE = 1232 SQ. FT.
DECK OR PORCH = 1189 SQ. FT.

DESIGN NOTES

GROUND SNOW LOAD - 62 PSF
FLAT ROOF SNOW LOAD - 43 PSF
SNOW LOAD IMPORTANCE FACTOR - 1.0
SNOW EXPOSURE FACTOR - 1.0
THERMAL FACTOR - 1.0

OCCUPANCY CATEGORY - II
BEARING PRESSURE - 2000 PSF

ULTIMATE WIND SPEED - 115 MPH, EXP B
WIND IMPORTANCE FACTOR - 1.0

SEISMIC DESIGN CATEGORY - D
SEISMIC SITE CLASS - D
RISK CATEGORY - II
SEISMIC COEFFICIENTS -
Sds: 0.723g Sd1: 0.387g Cs: 0.18 R: 4.0
SEISMIC ANALYSIS PROCEDURE -
EQUIVALANT LATERAL FORCE METHOD

FLOOR LIVE LOAD - 40 PSF
FLOOR DEAD LOAD - 15 PSF
ROOF DEAD LOAD - 15 PSF

CONTRACTOR'S RESPONSIBILITY

IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL ASPECTS OF THESE DRAWINGS ARCHITECTURAL AND STRUCTURAL PRIOR TO CONSTRUCTION. ANY CONFLICTS SHALL BE REPORTED TO THE ENGINEER FOR CORRECTION. CHANGES MAY BE PROPOSED BY THE CONTRACTOR IF HE FEELS THE CHANGE IS IN THE BEST INTEREST OF THE OWNER. CHANGES SHALL BE FORWARDED TO THE ENGINEER IN WRITING FOR APPROVAL PRIOR TO CONSTRUCTION

STRUCTURAL DRAWINGS ONLY

DESIGN INTELLIGENCE, LLC
1031 ERIKSON DR.
REXBURG, IDAHO 83440
TEL. (208) 359-1461
FAX. (208) 359-0140

SCALE AS NOTED
DRAWN BY MDW
2017-202

DESIGN INTELLIGENCE
DATE September 11 2017
REVISED
DRAWING

A0

A0 | RULES RESIDENCE
WEBER COUNTY, UT

Exhibit A
Page 12 of 20

...AL STRUCTURAL NOTES

...CED CODES

...ing Code - 2015 Edition
...ing Code Requirements
... Concrete

... STRUCTURAL NOTES

... ...ilding shall be used in conjuction with ... other disciplines and the project. ... contractor shall verify the ... other trades as to sleeves, chases hangers, inserts, anchors, holes and other items to be placed or set in the structure work.

2. The contractor shall be responsible for complying with all safety precautions and regulations during the work. The engineer will not advise or nor issue direction as to safety precautions and programs.

3. The structure drawings herein represent the finished structure. The contractor shall provide all temporary guying and bracing required to erect and hold the structure in proper alignment until all structural work and connections have been completed. The investigation, design, safety, adequacy and inspection of erection bracing, shoring, temporary supports, etc. is the sole responsibility of the contractor.

4. The engineer shall not be responsible for the methods, techniques and sequences of procedures to perform the work. The supervision of the work is the sole responsibility of the contractor.

5. Drawings indicate general and typical details of construction. Where conditions are not specifically shown, similar details of construction shall be used, subject to approval by the engineer.

6. All structural systems which are to be connected of components to be field erected shall be supervised by the supplier during manufacturing, delivery, handling, storage and erection in accordance with the supplier's instructions and requirements.

7. Loading applied to the structure during the process of construction shall not exceed the safe load-carrying capacity of the structural members. The live loadings used in the design of the structure are indicated in the "Design Criteria Notes". Do not apply any construction loads until structure framing is properly connected together and until all temporary bracing is in place.

8. All ASTM and other references are per the latest editions of these standards, unless otherwise noted.

9. Shop drawings and other items shall be submitted to the engineer for review prior to fabrication. All shop drawings shall be reviewed by the general contractor before submittal. The engineer's review is to be for conformance with the design concept and general compliance with the relevant contract documents. The engineer's review does not relieve the contractor of the sole responsibility to review, check and coordinate the shop drawings, prior to submission. The contractor retains solely responsible for errors and omissions associated with the preparation of the shop drawings as they pertain to member sizes, details, dimensions, etc.

10. Submit shop drawings in the form of two blueline prints. In no case shall reproduction of the contract drawings be used as shop drawings. Submit the following items for review:

A. Concrete mix designs - NOT REQUIRED
B. Reinforcing steel shop drawings - NOT REQUIRED
C. Structural steel shop drawings - NOT REQUIRED
D. Steel Joist / Girder shop drawings - NOT REQUIRED
E. Metal decking shop drawings - NOT REQUIRED
F. Pre-engineered wood system - Truss shop drawings - NOT REQUIRED
G. Pre-engineered metal building system - NOT REQUIRED

Other submittals may be required per the "Schedule of Special Inspections" or the sequence notes contained herein.

11. Special inspections will be required for this project as noted below.

A. Concrete - NOT REQUIRED
B. Bolts Installed in Concrete - NOT REQUIRED
C. Structural Welding - Field Welds - NOT REQUIRED
D. High Strength Bolting - NOT REQUIRED
E. Structural Masonry - NOT REQUIRED

12. Unless otherwise indicated, all items noted to be demolished shall become the contractor's property and be removed from the site.

13. Contractors shall visit the site prior to bid to ascertain conditions which may adversely affect the work or cost thereof.

14. Decks, plumbing and openings through engineered shear walls shall not exceed 6" in diameter except as noted on drawings. No perforations exceeding 3/4" in diameter shall be made in structural members except as noted on drawings. Perforations with 3/4" diameter and less shall be made in the center 1/3rd of the beam height and length. A maximum of 2) perforations per beam are allowed. Contact the engineer if additional perforations are required.

DESIGN CRITERIA

Design Gravity Loads:

Roof DL - SEE COVER SHEET
Floor DL - SEE COVER SHEET

Design Live Loads:

Roof LL - 30 psf min.
Snow - SEE COVER SHEET
Commercial Floor LL - 50 psf + 20 psf Partition
Residential LL - 40 psf

Lateral Live Loads:

Wind - SEE COVER SHEET
Seismic - SEE COVER SHEET
Equivalent Fluid Pressure - 35 pcf

FOUNDATION NOTES

1. All footings shall bear on undisturbed, firm natural soil or compacted fill capable of supporting a minimum design bearing pressure as noted on the cover sheet. All foundation excavations shall be evaluated by a qualified geotechnical engineer/testing agency prior to pouring foundation concrete if required by the Structure Engineer.

2. Top of footing elevations shall be as shown on the foundation plan. These elevations are a maximum and shall be lowered as required to obtain the required design bearing pressure.
Unless noted otherwise, the bottom of all exterior footings shall be placed 6" below local frost depth; the bottom of all interior footings shall be placed 12" minimum below interior finished grade.

3. All foundation concrete shall obtain a 28 day compressive strength of 2500 psi. All concrete to be permanently exposed to the weather shall be air-entrained to 5% +/- 1% with an admixture that conforms to ASTM C-260.

4. All concrete work shall conform to the requirements of ACI 301 "Specification for Structural Concrete Buildings". All weather concreting shall be in accordance with ACI 306.

5. All reinforcing steel shall conform to ASTM A-615, Grade 60 for #5 and larger and Grade 40 for #4 and smaller.

6. Unless noted otherwise, the following concrete cover shall be provided for reinforcement.
A. Concrete cast against & permanently exposed to earth - 3"
B. Concrete exposed to earth or weather:
#6 through #18 bars - 2"
#5 or W31 or D31 wire & smaller - 1 1/2"

7. All reinforcing noted continuous (Cont.) on the plans and details shall be lapped 36 X bar diameters at splices unless noted otherwise.

8. No unbalanced backfilling shall be done against foundation walls unless walls are securely braced against overturning either by temporary bracing or by permanent construction.

9. Prior to commencing any foundation work, coordinate work with any existing utilities. Foundations shall be lowered where required to avoid utilities.

11. Unless noted otherwise, the centerlines of cont. foundations shall be located on cont. centerlines.

10. All retaining walls shall have at least 12" of free draining granular backfill, full height of wall. Provide control joints in retaining walls at approximately equal intervals not to exceed 25 feet nor 3 times the wall height. Provide expansion joints at every fourth control joint, unless otherwise indicated.

SITE PREPARATION NOTES

1. Within an area a minimum of 5 feet beyond the building limits excavate a minimum of 4" of existing soil. Remove all organics, pavement, roots, debris and otherwise unsuitable material.

2. The surface of the exposed subgrade shall be inspected by probing or testing to check for pockets of soft or unsuitable material. Excavate unsuitable soil as directed by the engineer.

3. Proof roll the surface of the exposed subgrade with a loaded tandem axle dump truck. Remove all soils which pump or does not compact properly as directed by the engineer.

4. Fill as excavated areas with approved compacted fill. Place in 8" loose lifts and compact to a minimum of 95% of the maximum dry density in accordance with ASTM D-698.

5. All approved fill material shall be a select granular material free from all organics or otherwise deleterious material with not more than 20% by weight passing a no. 200 sieve and with a plasticity index not to exceed 6%.

6. Provide field density tests for each 3,000 SF of building area for each lift of controlled fill.

PRE-ENGINEERED TRUSS NOTES

1. Wood trusses shall be designed by the manufacturer to support the loads dictated by the governing jurisdiction.

2. Wood trusses shall be designed by the manufacturer in accordance with the applicable provisions of the latest edition of the National Design Specification of the National Forest Products Association and the design specification for metal plate connected wood trusses of the Truss Plate Institute.

3. Wood materials shall be Douglas Fir and shall be kiln dried and used at 19% maximum moisture content. Provide grade required to meet stress requirements.

4. Connector plates shall be not less than 0.036 inches (20 gauge) in coated thickness shall meet or exceed ASTM Grade A or higher and shall be hot dipped galvanized according to ASTM A-525 (coating G60). Minimum steel yield stress shall be 33,000 psi.

5. Trusses shall be fabricated in a properly equipped manufacturing facility of a permanent nature. Trusses shall be manufactured by experienced workmen, using practices in cutting, jigging and pressing equipment under the requirements of quality control standard DSR-88 of the Truss Plate Institute.

6. Secondary bending stresses in truss top and bottom chords due to dead, live and wind loads shall be considered in the design. Load duration factors shall be per the "National Design Specification for Wood Construction" latest edition.

7. Wood trusses shall be erected in accordance with the truss manufacturer's requirements. This work shall be done by a qualified and experienced contractor.

8. The Contractor shall provide all temporary and permanent bracing as required for safe erection and performance of the trusses. The guidelines set forth by the Truss Plate Institute publication "WTB-9: Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses" shall be a minimum requirement.

9. Truss member and components shall not be cut, notched or tied nor otherwise altered in any way without the written approval of the Engineer.

10. Submit complete shop drawings for all wood trusses showing member sizes, species, grade, moisture content, size, camber, dimensions, chord splice locations, bracing requirements and loadings. Shop drawing shall be submitted to the Engineer and shall bear the seal of a Professional Engineer registered in Idaho.

WOOD FRAMING NOTES

1. All wood framing material shall be surfaced dry and used at 19% maximum moisture content.

2. All stud and wall framing shall be No. 2 grade Doug Fir.

3. All joist, rafter & misc. framing shall be Select Str. grade Doug Fir. Provide full depth or metal bridging at midspan and at a maximum spacing of 8 ft. o.c. between.

4. All framing exposed to the weather or in contact with masonry or concrete shall be pressure treated in accordance with the American Wood Preservers Association Specifications where possible. All cuts and holes should be completed before treatment. Cuts and holes due to on-site fabrication shall be brushed with 2 coats of copper naphthenate solution containing a minimum of 2% metallic copper in solution (per AWPA STD. M4).

7. Provide double joists under all partitions which run parallel with joists and under all concentrated loads from framing above.

8. Provide header beams of the same size as joists or rafters to frame around openings in the plywood deck, unless otherwise indicated.

9. Structural steel plate connectors shall conform to ASTM A-36 specifications and be 1/4" thick, unless noted otherwise. Bolts connecting wood members shall be ASTM A-307 and be 3/4" diameter unless otherwise indicated. Provide washers for all bolt heads and nuts in contact with wood surfaces.

10. Bolt holes shall be carefully centered and drilled not more than 1/16" larger than the bolt diameter. Bolted connections shall be snugged tight but not to the extent of crushing wood under washers.

11. Prefabricated metal joist hangers, hurricane clips, hold-down anchors and other accessories shall be as manufactured by "Simpson Strong-Tie Company", or approved equal. Install all accessories per the manufacturer's requirements. All steel shall have a minimum thickness of 0.04 inches (per ASTM A446 Grade A) and be galvanized (coating G60).

12. Holes and notches drilled or cut into wood framing shall not exceed the requirements of the International Building Code or the manufacturers specifications.

13. All plates, anchors, rails, bolts, washers and other miscellaneous hardware permanently exposed to weather or in treated wood shall be hot dip galvanized.

14. All 20 rails shall have a minimum shank diameter of 0.113". All 10d & 12d nails shall have a minimum shank diameter of 0.120". All 16d nails shall have a minimum shank diameter of 0.131".

SLAB ON GRADE NOTES

1. Provide concrete slabs over a 6 or 10 mil polyethylene vapor barrier and 4" of porous fill. Maximum slump for concrete slabs shall be 5", using Type I cement.

2. All porous fill material shall be a clean granular material with 100% passing a 1 1/2" sieve and no more than 5% passing a No. 4 sieve. Porous fill shall be compacted to 95% max. dry density per ASTM D-698.

3. Slab joints shall be filled with approved material. This should take place as late as possible preferably 4 to 6 weeks after the slab has been cast. Prior to filling remove all debris from the joints, then fill in accordance with the manufacturer's recommendations as follows:

6" slabs - Fill with Epoxy resin
Other slabs - Fill with field molded or elastomeric sealant.

5. Unless approved otherwise, all reinforcing shall be blocked into the center of the slab with precast concrete blocks having a compressive strength equal to that of the slab.

6. Walks, edge and other exterior slabs are not shown on the structural drawings. See the site plan and architectural drawings for location, dimensions, elevations, jointing details and footer details. Provide 4" walks reinforced with 6x6 - W1.4/W1.4 WWF unless otherwise noted.

7. Slabs to be permanently exposed to weather shall be air entrained to 5% +/- 1% with an admixture that conforms to ASTM C-260.

8. All concrete work shall conform to the requirements ACI 301 "Specification for Structural Concrete Buildings". Hot weather concreting shall be in accordance with ACI 305. Cold weather concreting shall be in accordance with ACI 306.

9. In order to avoid concrete shrinkage cracking place concrete slabs in an alternating lane or checker board pattern. The maximum length of slab cast in any one continuous pour is recommended to be less than 100 feet. The maximum spacing of joints shall be 25 feet.

10. See architectural drawings for exact locations of depressed slab areas and drains. Slope slab to drains where shown.

11. The finish tolerance of all slabs shall be in accordance with ACI 301, Type A.

12. Slabs shall be constructed in accordance with the following flatness/levelness requirements:

Slab Category	Specified	Local Minimum
Unshored	FF = 15 , FL = 13	FF = 13 , FL = 10
Straight Edged	FF = 15 , FL = 13	FF = 13 , FL = 10
Flat	FF = 15 , FL = 13	FF = 13 , FL = 10
Very Flat	FF = 15 , FL = 13	FF = 13 , FL = 10
Super Flat	FF = 15 , FL = 13	FF = 13 , FL = 10

For flatness and levelness tests shall be conducted if deemed necessary by the owner in accordance with ASTM E 155. Results, including acceptance or rejection of the work, shall be provided to the contractor within 48 hours after data collection. Remedies for out of tolerance work may include grinding and reconstruction at the contractors expense. Any other remediation requires the approval of the owner.

PLYWOOD/GYPBOARD SHEATHING NOTES

1. All plywood construction shall be in accordance with the American Plywood Association (APA) specifications.

2. All roof panel sheathing shall be 5/8" (nom.) OSB - APA rated sheathing. Building's edge support shall be provided by use of panel clips or blocking between framing. Unless otherwise noted connect roof sheathing with 8d common nails at 6" o.c. at supported panel edges and 6" o.c. at intermediate supports.

3. All floor sheathing shall be 3/4" (nom.) APA rated STURD-I-FLOOR Exp. 1, with tongue and groove edge. Unless noted otherwise connect floor sheathing with 10d common nails spaced 6" o.c. supported edges and 12" o.c. at intermediate supports. Field glue using adhesives meeting APA specification AFG-01, applied in accordance with the manufacturer's recommendations.

4. All wall sheathing shall be 1/2" (nom.) OSB APA rated sheathing. Unless noted otherwise, connect wall sheathing with 8d common nails spaced at 6" o.c. at supported panel edges and 12" o.c. at intermediate supports.

5. Install wall sheathing either vertically or horizontally with panel continuous over two or more spans. All other sheathing shall have long edges spanning over supports. Stagger panel end joints.

6. All nailing shall be carefully driven and not over-driven.

7. Provide 2x blocking at all unsupported panel edges.

CAST-IN-PLACE CONCRETE NOTES

Concrete mixes shall be designed per ACI 301 using Portland Cement conforming to ASTM C-150 or C-595, aggregate conforming to ASTM C-33, and admixtures conforming to ASTM C-494, C-1017, C-618, C-989 and C-260. Concrete shall be ready-mixed in accordance with ASTM C-94.

2. Concrete shall conform to the following compressive strength, slump and water/cement ratio requirements unless specifically approved by the Engineer in writing:

Concrete	Min. f'c (28 days)	Slump	W/C Ratio
Columns	4000 psi	3" - 4"	0.46
Elevated Slabs	3000 psi	3" - 4"	0.46
Concrete not Noted	3000 psi	3" - 4"	0.50
Foundations	2500 psi	3" - 4"	0.50
Slabs on Grade	4000 psi	3" - 4"	0.50

3. All concrete work shall conform to the requirements of ACI 301 "Specification for Structural Concrete Buildings". Hot weather concreting shall be in accordance with ACI 305. Cold weather concreting shall be in accordance with ACI 306.

4. All reinforcing steel shall conform to ASTM A-615, Grade 60 for #5 and larger bars and Grade 40 for #4 and smaller. All welding of reinforcing steel shall be in accordance with AWS D1.4. Epoxy coated reinforcing shall conform to ASTM A-775.

5. All welded wire fabric (WWF) shall conform to ASTM A-185.

6. All reinforcing steel shall be set and tied in place prior to pouring of concrete, except that vertical dowels for masonry wall reinforcing may be "floated" in place. Do not field bend bars partially embedded in hardened concrete unless specifically indicated or approved by the Engineer.

7. Reinforcing steel, including hooks and bends shall be detailed in accordance with ACI 315. All reinforcing steel indicated as being continuous (Cont.) shall be lapped with a Type 2 splice unless noted otherwise.

8. Unless noted otherwise, the following minimum concrete cover shall be provided for reinforcement:

A. Concrete exposed to earth or weather:
#6 through #18 bars - 2"
#5 bar, W31 or D31 wire & smaller - 1 1/2"
B. Concrete not exposed to earth or weather:
Slabs, & beyond slabs & joists - 3/4"
Beams and columns - 1 1/2"
C. For additional concrete - see Foundation Notes.

9. Bar supports and holding bars shall be provided for all reinforcing steel to have minimum concrete cover. Bar supports are to be plastic tipped or stainless steel.

10. Unless noted otherwise, all one way slabs shall be reinforced as follows:

Bottom reinforcing	#4 @ 18" o.c.	(Between Supports)
Top Reinforcing	#4 @ 12" o.c.	(Centered on Supports)
Temp. Reinforcing	#4 @ 18" o.c.	(Transverse Bottom)

11. Unless noted otherwise, all concrete walls (other than retaining walls) shall be reinforced as follows:

Wall Thickness	Horizontal	Vertical	Location
4" - 6"	#4 @ 18" o.c.	#4 @ 18" o.c.	Centered
8"	#4 @ 12" o.c.	#4 @ 18" o.c.	Centered
10"	#4 @ 18" o.c.	#4 @ 18" o.c.	Each Face
12"	#4 @ 16" o.c.	#4 @ 18" o.c.	Each Face

12. All edges of permanently exposed concrete surfaces shall be chamfered 3/4" unless otherwise noted.

13. In order to avoid concrete shrinkage cracking place concrete slabs in an alternating lane pattern. The maximum length of slab cast in any one continuous pour shall be limited to 80 feet.

14. Formwork shall remain in place until concrete has obtained at least 90% of its 28 day compressive strength. The Contractor shall provide all shoring and reshoring.

NOTE TO CONTRACTOR

1. TRUSS DRAWINGS SHALL BE ON SITE AT THE TIME OF FRAMING INSPECTION.
2. JOIST/RAFTER MANUFACTURER'S INSTALLATION MANUAL OF INSTRUCTIONS TO BE ON SITE AT THE TIME OF FRAMING INSPECTION.

MASONRY VENEER

1. Wood Stud Backing - a 2 inch by 2 inch 0.625" zinc-coated or non-metallic coated wire mesh with two layers of water-resistant barrier in accordance with Section 1404.2 shall be applied directly to wood studs spaced a max. of 16" o.c. On studs, the mesh shall be attached with 2" long corrosion-resistant steel wire furring nails at 4" o.c. providing a minimum 1.125" penetration into each stud and with 8d annular threaded nails at 8" o.c. into top and bottom plates or with equivalent wire ties. There shall be not less than a 0.1055" zinc-coated or nonmetallic coated wire or approved equal, attached to the stud with a minimum of an 8d (0.120" diameter) annular threaded nail for every 2 square feet of stone veneer. This tie shall be a loop having legs not less than 15" in length, so bent that it will lie in the stone veneer mortar joint. The last 2" of each wire leg shall have a right-angle bend. Drawings minimum thickness of cement grout shall be placed between the backing and the stone veneer.

STRUCTURAL STEEL NOTES

1. All structural steel shall conform to the latest edition of the "Manual of Steel Construction" of the AISC.

2. Unless noted otherwise, all materials shall be in conformance with the following ASTM identifications:

MEMBER	ASTM	MIN. STRENGTH
Structural Tubing	A500 Grade B	46 ksi
Steel Pipe	A53 (Type E or Grade B)	35 ksi
Other Rolled Shapes and Plates	A36	36 ksi
Connection Bolts	A325	92 ksi
Anchor Bolts	A307	----
Threaded Rods	A36	36 ksi
Non-Shrink Grout	CRD	8000 psi

3. Minimum bolt diameter shall be 3/4" unless noted otherwise. All bolts shall be shear/bearing type bolts and be snug-tight.

4. All welding shall be in accordance with AWS D1.1 using E70XX electrodes. Unless noted otherwise, provide continuous, size fillet welds per AISC requirements. All filler material shall have a minimum yield strength of 58 ksi.

5. Where "Continuous Chord" angles are indicated, provide a continuous butt weld or full penetration weld at the splice connection detail for approval.

6. Moment connections are denoted thus ( ) on the plan. See typical details.

7. Where steel beams bare across building expansion joints or at wall control joints, provide a "slip" connection as shown in the typical details.

8. Holes in steel shall be drilled or punched. All slotted holes shall be provided with smooth edges. Burning of holes and torch cutting at the site is not permitted.

9. Unless otherwise noted, all structural steel permanently exposed to view shall be shop painted with one coat of SSPC 15-60 Type 1 (Red Oxide) paint.

10. The structural steel erector shall provide all temporary guying and bracing.

11. Columns, anchor bolts, base plates, etc. have been designed for the loading encountered during steel erection and construction. Any investigation of the columns, anchor bolts, base plates, etc. is the sole responsibility of the contractor.

12. Steel fabricators shall be an AISC certified shop for Category I steel structures and materials detailed, quality control procedures as required to satisfy the special inspections of the International Building Code.

13. Provide girts with a slight downward "bow" at midspan.

14. Unless otherwise noted, all structural steel permanently exposed to the weather, including all brick shelf angles shall be hot-dip galvanized in accordance with ASTM A153.

15. Protective coatings damaged during the transporting, erecting and field welding processes shall be repaired in the field to match the shop applied coating.

16. The contractor shall hire an independent testing agency to provide special inspections of bolting, welding and other items in accordance with the International Building Code.

17. Provide angle frames at all roof openings and mechanical roof top units per typical details.

RADON CONTROL

1. A minimum 6-mil (or 3-in-1 cross laminated), polyethylene or equivalent flexible sheeting material shall be placed on top of the gas permeable layer prior to pouring the slab. The sheeting should cover the entire floor area. Any separate sections of sheeting should be overlapped at least 12 inches.

2. To reduce soil gas entry, large openings through concrete slabs (wood, and other floor assemblies in contact with the soil such as spaces around bathtub, shower, or toilet drains, shall be filled or closed with materials that provide a permanent, airtight seal such as non-shrink mortar, grouts, expanding foam, or similar materials designed for such application.

3. A minimum 3-inch diameter pvc or other gas-tight pipe shall be embedded vertically into the sub slab aggregate or other permeable material before the slab is poured. A "T" fitting or other support on the bottom of the pipe shall be used to ensure that the pipe opening remains within the sub-slab permeable material. This gas tight pipe shall be extended vertically through the building floors, terminate at least 12 inches above the surface of the roof in an attic or at least 10 feet away from any window or other opening into the conditioned spaces of the building that is less than 2 feet above the exhaust points, and 10 feet from any adjoining or adjacent buildings.

FIRE BLOCKING

Fire blocking shall be provided in wood-frame construction in the following locations:

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs as follows:
1.1 Vertically at the ceiling and floor levels.
1.2 Horizontally in intervals not exceeding 10 feet.
2. At all intersections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
3. In concealed spaces between stair stringers at the top and bottom of the run.
4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion.

CONTRACTOR'S RESPONSIBILITY

IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL ASPECTS OF THESE DRAWINGS (ARCHITECTURAL AND STRUCTURAL) PRIOR TO CONSTRUCTION. ANY CONFLICTS SHALL BE REPORTED TO THE ENGINEER FOR CORRECTION. CHANGES MAY BE PROPOSED BY THE CONTRACTOR IF HE FEELS THE CHANGE IS IN THE BEST INTEREST OF THE OWNER. CHANGES SHALL BE FORWARDED TO THE ENGINEER IN WRITING FOR APPROVAL PRIOR TO CONSTRUCTION.

DESIGN INTELLIGENCE, LLC
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TEL (208) 359-1461
FAX (208) 359-0740

DATE September 27 2017
REVISED
DRAWN BY MDW
SCALE AS NOTED
2017-202

SO RULES RESIDENCE
WEBBER COUNTY, UT

SO

Exhibit A
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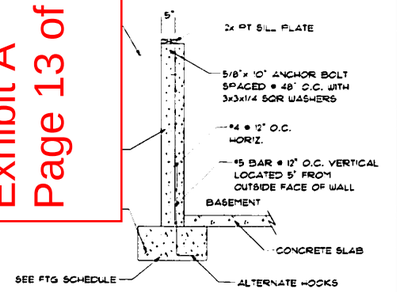

BASEMENT WALL DETAIL

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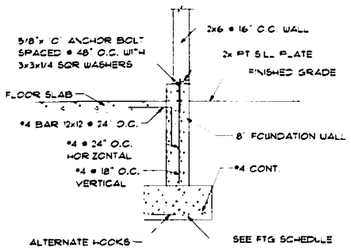
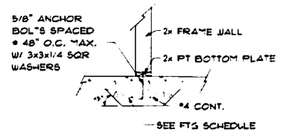


STEM WALL DETAIL WITH SLAB FLOOR

2 / S1.0



INTERIOR FOOTING

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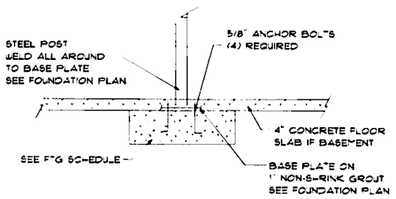

STEEL POST CONNECTIONS

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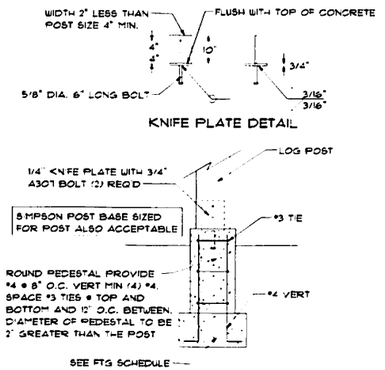
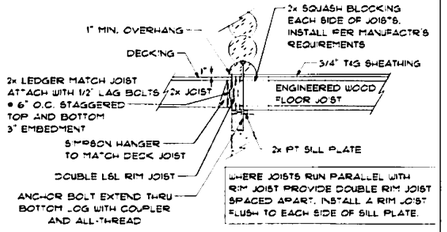


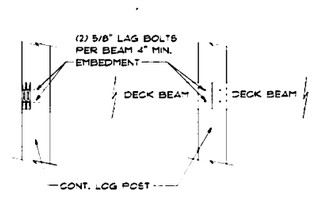
LOG POST TO DECK PEDESTAL DETAIL

5 / S1.0



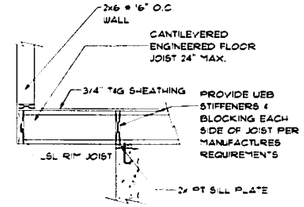
DECK ATTACHMENT

6 / S1.0



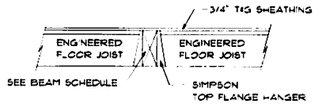
DECK BEAM TO LOG POST

7 / S1.0



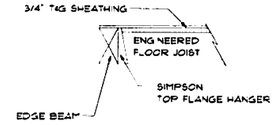
CANTILEVERED FLOOR JOIST

8 / S1.0



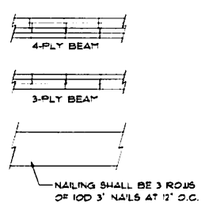
BEAM FLOOR JOIST SUPPORT

9 / S1.0



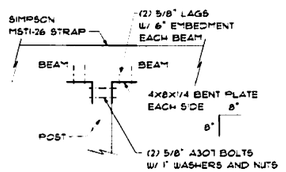
EDGE BEAM FLOOR JOIST SUPPORT

10 / S1.0



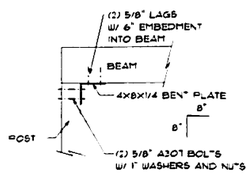
BUILT UP BEAM DETAIL

11 / S1.0



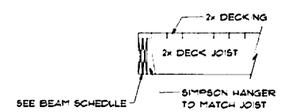
POST TO BEAM

12 / S1.0



POST TO BEAM

13 / S1.0



BEAM DECK JOIST SUPPORT

14 / S1.0

15 / S1.0

CONTRACTOR'S RESPONSIBILITY

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DATE: September 21, 2017
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DRAWING: S1.0

SCALE: AS NOTED
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2017-202

RULES RESIDENCE

WEBER COUNTY, UT

S1.0

Exhibit A
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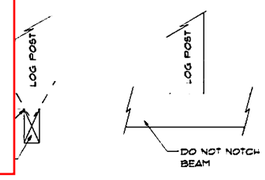
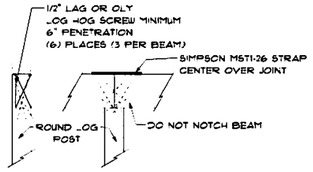


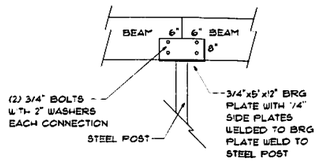
LOG POST TO BEAM

1 / S1.1



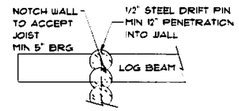
WOOD BEAM TO LOG POST

2 / S1.1



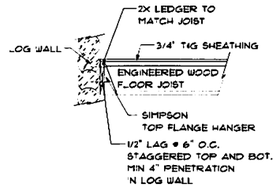
WOOD BEAM TO STEEL POST

3 / S1.1



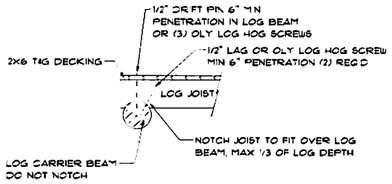
LOG BEAM THROUGH LOG WALL

4 / S1.1



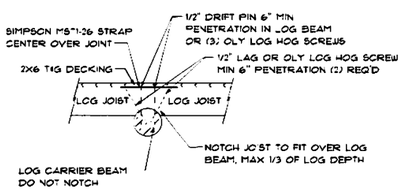
FLOOR JOIST TO LOG WALL

5 / S1.1



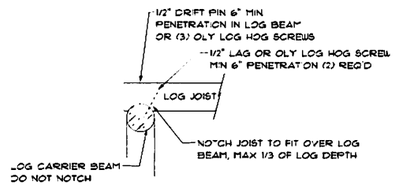
LOG JOIST TO LOG BEAM

6 / S1.1



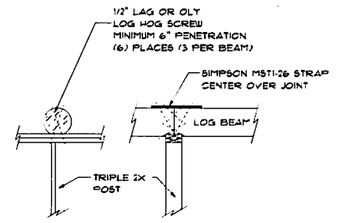
LOG JOISTS TO LOG BEAM

7 / S1.1



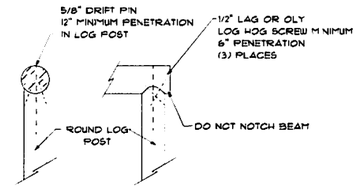
LOG JOIST TO LOG BEAM

8 / S1.1



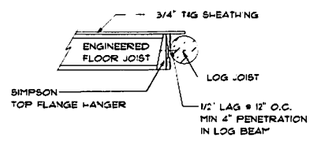
LOG BEAM TO FRAMED WALL

9 / S1.1



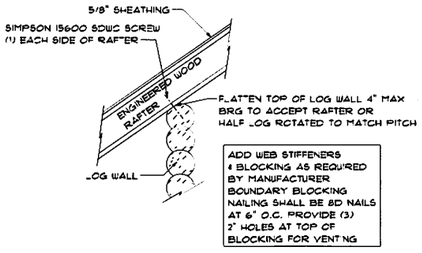
LOG BEAM TO LOG POST

10 / S1.1



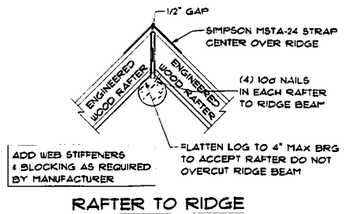
EDGE BEAM FLOOR JOIST SUPPORT

11 / S1.1



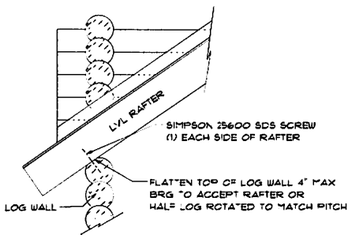
RAFTER TO LOG WALL

12 / S1.1



RAFTER TO RIDGE

13 / S1.1



LOG DORMER WALL TO LVL RAFTER

14 / S1.1

15 / S1.1

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S1.1

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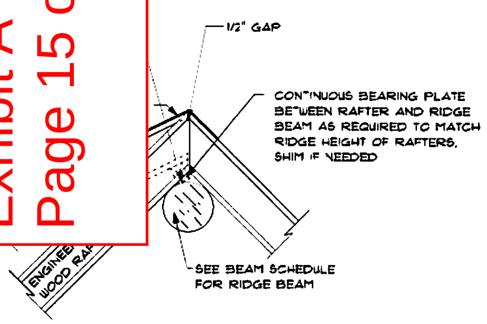
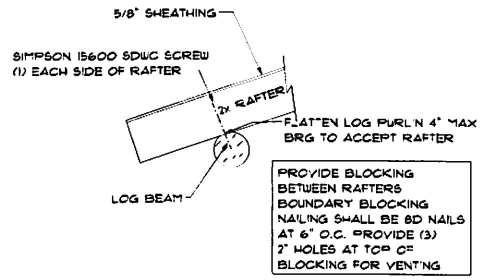


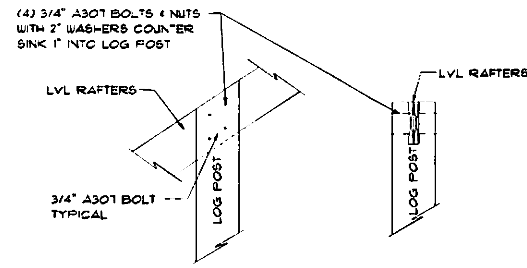
DORMER RAFTER CONNECTION

1 / S1.2



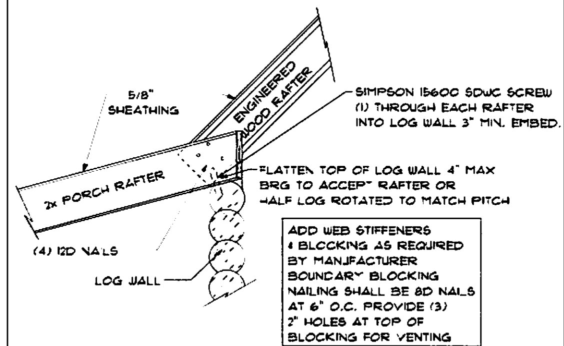
RAFTER TO LOG BEAM

2 / S1.2



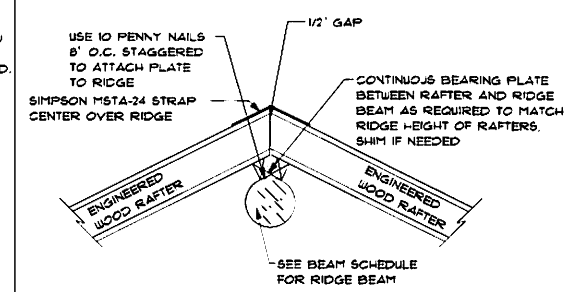
LOG POST TO LVL RAFTER

3 / S1.2



PORCH TO ROOF EDGE ATTACHMENT

4 / S1.2



DORMER RAFTER CONNECTION

5 / S1.2

6 / S1.2

7 / S1.2

8 / S1.2

9 / S1.2

10 / S1.2

11 / S1.2

12 / S1.2

13 / S1.2

14 / S1.2

15 / S1.2

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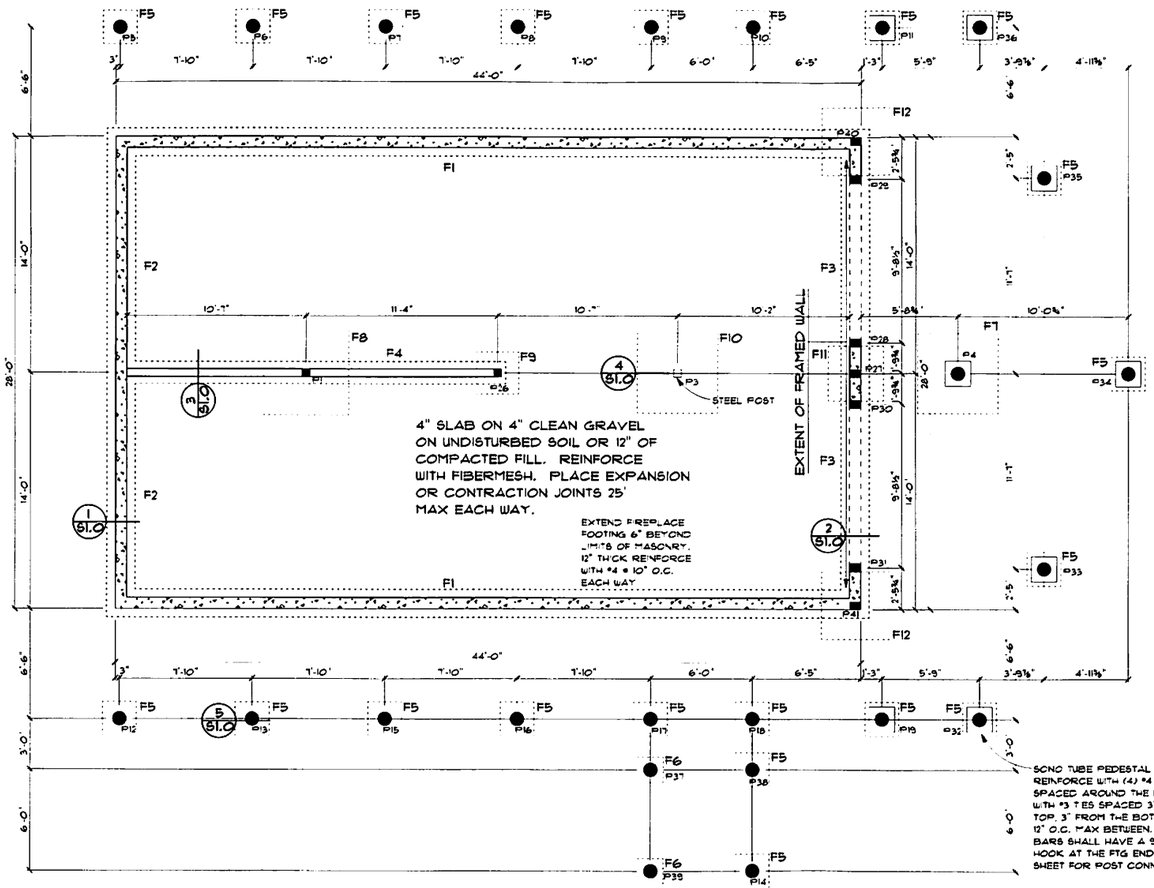
S1.2



FOUNDATION PLAN

1/4" = 1'-0"

LEGEND

- ■ STRUCTURAL POST
- ● SONO TUBE UNO

ALTERNATE BIG FOOT FOOTING SCHEDULE:

FOR SPREAD FOOTINGS:
UP TO 18"X18" USE BF20
UP TO 21"X21" USE BF24
UP TO 24"X24" USE BF28
UP TO 30"X30" USE BF36

BLOCKOUTS

CONTRACTOR SHALL VERIFY ALL WINDOW AND DOOR ROUGH OPENING SIZES BEFORE FORMING BLOCKOUTS. SEE ARCHITECTURAL DRAWINGS FOR ALL WINDOW AND DOOR SIZES AND LOCATIONS.

FOUNDATION NOTES:

1. SEE SHEET S0 FOR ADDITIONAL GENERAL NOTES.
2. BOTTOM OF FOOTING SHALL BE BELOW LOCAL FROST LINE.

BOTTOM OF FOOTINGS MAY VARY SEE ARCHITECTURAL DRAWINGS

FOOTING SCHEDULE

F1 = 26X10 CONT. FTG WITH (3) #4 CONT.
F2 = 20X10 CONT. FTG WITH (2) #4 CONT.
F3 = 16X10 CONT. FTG WITH (2) #4 CONT.
F4 = 12X8 CONT. FTG WITH (2) #4 CONT.
F5 = 24X24X12 FTG WITH (3) #4 EACH WAY
F6 = 18X18X12 FTG WITH (3) #4 EACH WAY
F7 = 54X54X12 FTG WITH (7) #4 EACH WAY
F8 = 63X63X12 FTG WITH (8) #4 EACH WAY
F9 = 30X30X12 FTG WITH (4) #4 EACH WAY
F10 = 57X57X12 FTG WITH (7) #4 EACH WAY
F11 = 39X39X12 FTG WITH (5) #4 EACH WAY
F12 = 48X48X12 FTG WITH (6) #4 EACH WAY

POST SCHEDULE

P1 = (1) DF #1 6X8
P2 = (1) 10" R LOG POST
P3 = (1) HSS 4x4x1/4 W/ 12X12X1 BP
P4-P25 = (1) 10" R LOG POST
P26 = (2) DF #1 2x6
P27-P31 = (2) DF #1 2x8
P32-P39 = (1) 10" R LOG POST
P40-P41 = (1) DF #1 6X8

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S2

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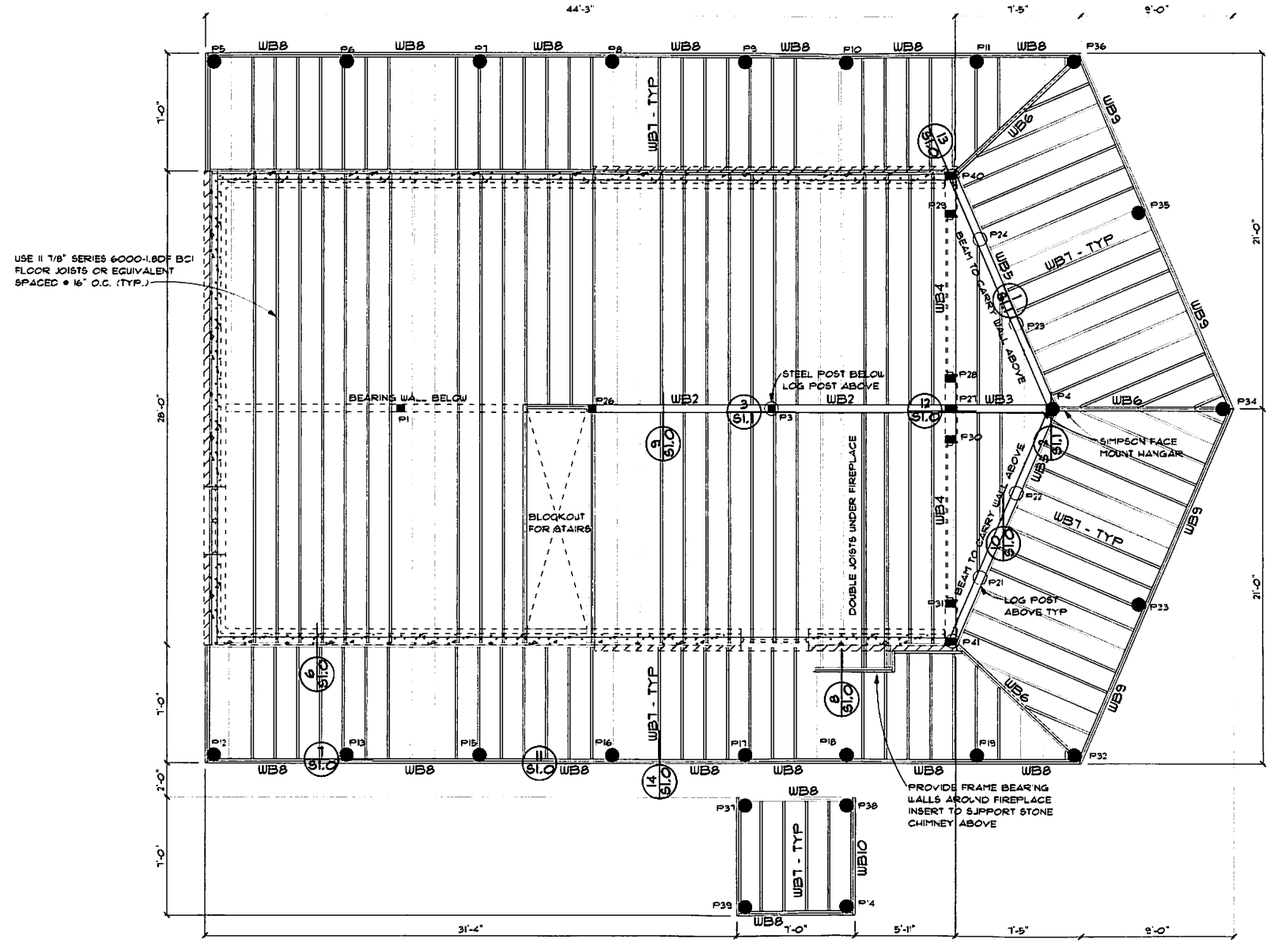

MAIN FLOOR FRAMING

1/4" = 1'-0"

LEGEND

- STRUCTURAL POST
- STRUCTURAL LOG POST

FLOOR FRAMING NOTES:

1. INSTALL JOISTS PER MANUFACTURER'S RECOMMENDATIONS INCLUDING ALL BRIDGING AND BRACING.
2. PROVIDE DBL JOISTS UNDER ALL BEARING WALLS THAT RUN PARALLEL TO FLOOR JOISTS.
3. FRAME AROUND STAIRS USING (2) 1.75x11.875 LVL.
4. ALL BEARING WALL HEADERS SHALL BE (2) CONTINUOUS LOG COURSES, OR (2) DF 2x10 UNLESS NOTED OTHERWISE.
5. ALL EXTERIOR WALLS ARE BEARING WALLS
6. JOIST COUNT SHOULD BE DETERMINED FROM JOIST SPACING NOT FROM DRAWING LAYOUT.
7. SEE SHEET S2 FOR STRUCTURAL POST SIZES.
8. SEE SHEET S5 FOR BEAM SCHEDULE.

RESPONSIBILITY FOR LOG SHRINKAGE

SINCE THE ENGINEER DOES NOT KNOW THE SOURCE OF LOGS TO BE USED IN CONSTRUCTION IT IS THE CONTRACTOR'S RESPONSIBILITY TO ACCOUNT FOR LOG SHRINKAGE USING ADJUSTABLE SCREW JACKS OR OTHER MEANS ACCEPTED IN THE LOG HOME BUILDING INDUSTRY.

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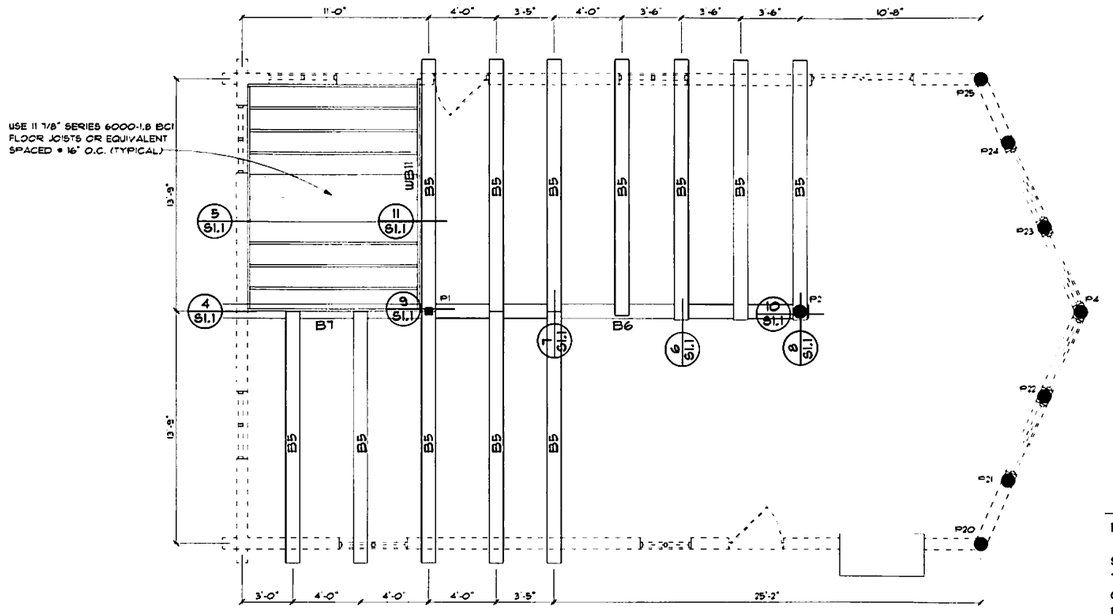

SECOND FLOOR FRAMING

1/4" = 1'-0"

LEGEND

- ■ STRUCTURAL POST
- ● STRUCTURAL LOG POST

LOG FLOOR FRAMING NOTES:

1. ALL LOG HEADERS SHALL BE (2) CONT. COARSES OF WALL LOG UNLESS NOTED OTHERWISE.
2. COVER LOG JOISTS WITH 2x6 T&G DECKING.
3. SEE SHEET S2 FOR STRUCTURAL POST SIZES.
4. SEE SHEET S5 FOR BEAM SCHEDULE.

FLOOR FRAMING NOTES:

1. INSTALL JOISTS PER MANUFACTURER'S RECOMMENDATIONS INCLUDING ALL BRIDGING AND BRACING.
2. PROVIDE DBL JOISTS UNDER ALL BEARING WALLS THAT RUN PARALLEL TO FLOOR JOISTS.
3. FRAME AROUND STAIRS USING (2) 1.75x11.875 LVL.
4. ALL BEARING WALL HEADERS SHALL BE (2) LOG COURSES, OR (2) DF 2x10 UNLESS NOTED OTHERWISE.
5. ALL EXTERIOR WALLS ARE BEARING WALLS
6. JOIST COUNT SHOULD BE DETERMINED FROM JOIST SPACING NOT FROM DRAWING LAYOUT.
7. SEE SHEET S2 FOR STRUCTURAL POST SIZES.
8. SEE SHEET S5 FOR BEAM SCHEDULE.

RESPONSIBILITY FOR LOG SHRINKAGE

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S4 | RULES RESIDENCE
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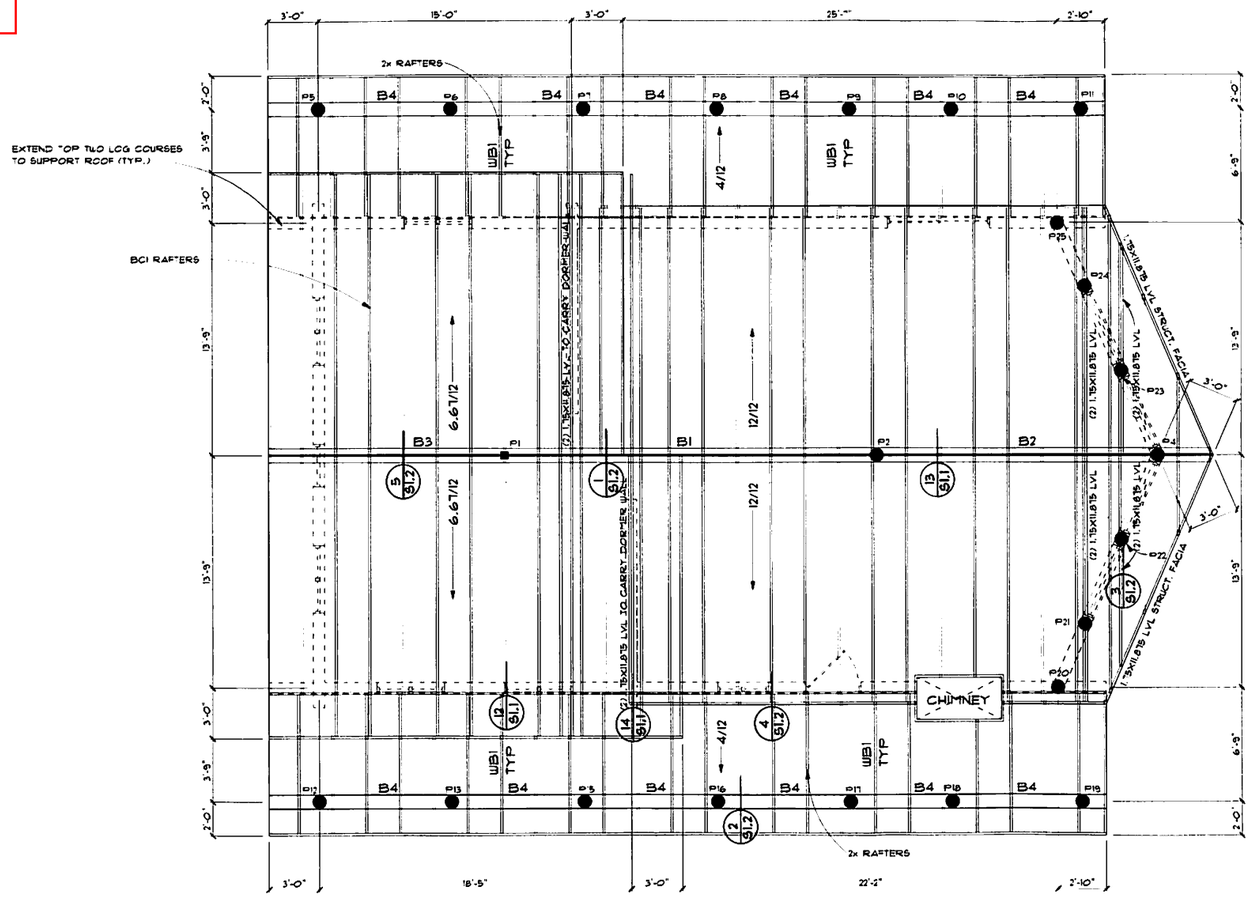

ROOF FRAMING

1/4" = 1'-0"

LEGEND

- ■ STRUCTURAL POST
- ● STRUCTURAL LOG POST

HAND FRAMED ROOF NOTES:

1. INSTALL RAFTERS PER MANUFACTURER'S RECOMMENDATIONS INCLUDING ALL BRIDGING AND BRACING.
2. PROVIDE SIMPSON H2.5 OR EQUAL AT BRG ENDS OF EACH RAFTER.
3. RAFTER COUNT SHOULD BE DETERMINED FROM RAFTER SPACING NOT FROM DRAWING LAYOUT.
4. BEARING WALL HEADERS SHALL BE (2) CONTINUOUS LOG COURSES, OR (2) DF 2x10 UNLESS NOTED OTHERWISE.
5. ALL ROOF OVERHANGS SHALL BE AS NOTED.

RESPONSIBILITY FOR LOG SHRINKAGE

SINCE THE ENGINEER DOES NOT KNOW THE SOURCE OF LOGS TO BE USED IN CONSTRUCTION IT IS THE CONTRACTOR'S RESPONSIBILITY TO ACCOUNT FOR LOG SHRINKAGE USING ADJUSTABLE SCREW JACKS OR OTHER MEANS ACCEPTED IN THE LOG HOME BUILDING INDUSTRY.

DORMER WALLS TO BE BUILT ON TOP OF LVL RAFTERS.

BEAM SCHEDULE

ALL DOUG FIR SHALL BE SELECT STRUCTURAL U.N.O.

BCI RAFTER SHALL BE 11 7/8" BCI 6000-1.8 DF SPACED AT 24" O.C. TYP.

WB1 = DF 2X6 @ 24 IN. O.C.
WB2 = (2) 1.75X11.875 LVL
WB3 = (2) 1.75X11.875 LVL
WB4 = (2) 1.75X11.875 LVL
WB5 = 6.75X12 GLB (24F-V4)
WB6 = (2) DF 2X8
WB7 = DF 2X8 @ 16 IN. O.C.
WB8 = (2) DF 2X8
WB9 = (2) DF 2X12
WB10 = (2) DF 2X12
WB11 = (2) 1.75X11.875 LVL

B1 = 18"R LODGE POLE SELECT
B2 = 18"R WEST WOOD SELECT
B3 = 16"R WEST WOOD SELECT
B4 = 8"R WEST WOOD SELECT
B5 = 10"R WEST WOOD SELECT
B6 = 16"R DOUG FIR SELECT
B7 = 16"R WEST WOOD SELECT

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WEBER COUNTY, UT

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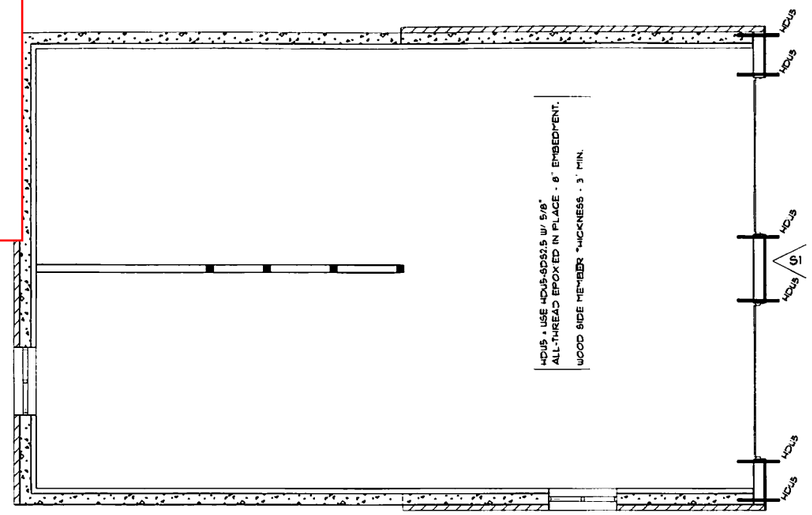
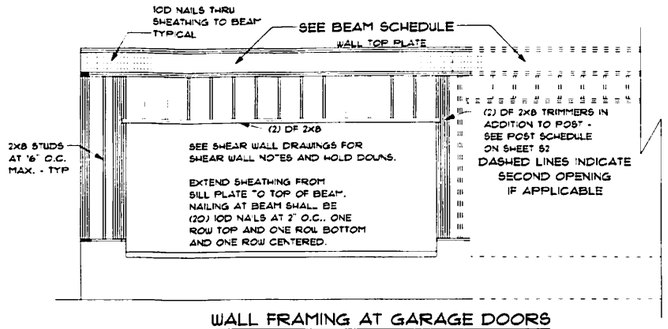


BASEMENT SHEAR WALLS

1/4" = 1'-0"



WALL FRAMING AT GARAGE DOORS

NOTE: 1 1/2" 16 GAGE STAPLES MAY BE USED INSTEAD OF 8D NAILS AS FOLLOWS:

8D NAILS @ 6" O.C. = 1 1/2" 16 GA. STAPLES AT 4" O.C.
8D NAILS @ 4" O.C. = 1 1/2" 16 GA. STAPLES AT 3" O.C.
8D NAILS @ 3" O.C. = 1 1/2" 16 GA. STAPLES AT 2" O.C

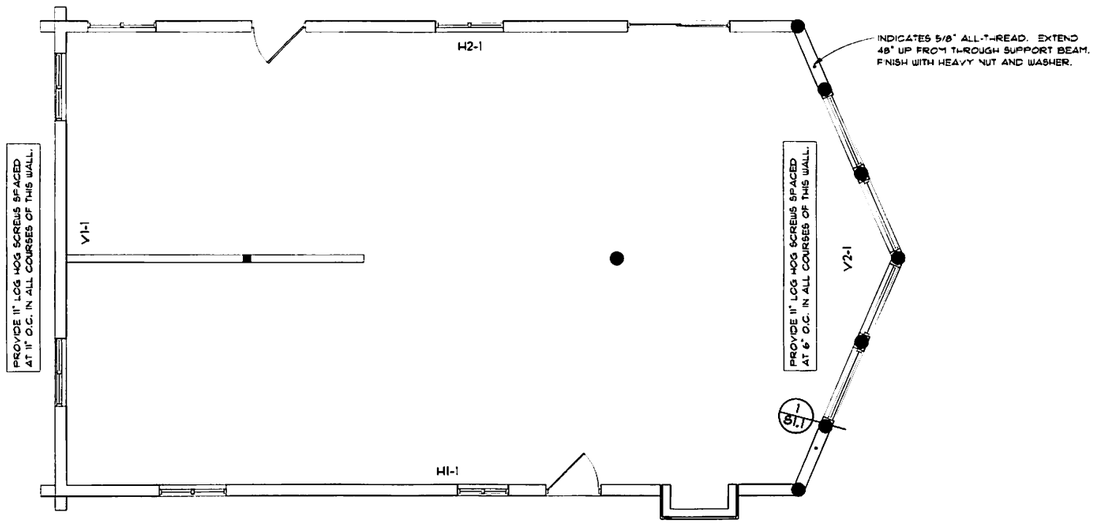
ALL HOLD DOWNS ARE SIMPSON BRAND AND SHALL BE INSTALLED PER THE MANUFACTURER'S REQUIREMENTS.

ALL EXTERIOR WALLS SHALL BE NAILED PER S1 UNLESS NOTED OTHERWISE.

SHEAR WALL NOTES

1. ALL EXTERIOR WALLS ARE DESIGNATED SHEAR WALLS.
2. ALL FRAMED SHEAR WALLS SHALL BE 2x8 @ 16" O.C.
3. PROVIDE 7/16" APA RATED SHEATHING BOTH SIDES OF THE WALL WITH 8D NAILS @ 2" O.C. AT PANEL EDGES AND 12" O.C. IN THE FIELD. 3" NOMINAL BLOCKING IS REQUIRED AT ALL PANEL EDGES INCLUDING THE SILL PLATE. NAILS ON EACH SIDE SHALL BE STAGGERED. (2044 PLF)

S1



MAIN FLOOR SHEAR WALLS

1/4" = 1'-0"

APPLY SASHCO LOG JAM OR SASHCO LOG BUILDER AS A CAULK TO THE INSIDE AND OUTSIDE FACES OF ALL LOG WALL JOINTS. THICKNESS SHALL BE 1/2 THE WIDTH OF THE BEAD UP TO A MAXIMUM OF 1/2" THICK.

ADHESIVE PROPERTIES ARE PART OF THE LATERAL FORCE RESISTING SYSTEM.

PROVIDE 11" LOG HOG SCREWS SPACED AT 36" O.C. IN ALL COURSES OF WALL LOG UNLESS NOTED OTHERWISE.

CONTRACTOR'S RESPONSIBILITY

IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL ASPECTS OF THESE DRAWINGS, ARCHITECTURAL AND STRUCTURAL PRIOR TO CONSTRUCTION. ANY CONFLICTS SHALL BE REPORTED TO THE ENGINEER FOR CORRECTION. CHANGES MAY BE PROPOSED BY THE CONTRACTOR IF HE FEELS THE CHANGE IS IN THE BEST INTEREST OF THE OWNER. CHANGES SHALL BE FORWARDED TO THE ENGINEER IN WRITING FOR APPROVAL PRIOR TO CONSTRUCTION

S6

RULES RESIDENCE
WEBER COUNTY, UT

S6

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DATE September 21, 2017
RE/ISED
DRAWING

SCALE AS NOTED
DRAWN BY MDW
2017-202

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Geotechnical Study
Bill Rules Residence
4033 East Nordic Valley Drive
Liberty, Utah

Project No. 177075

November 29, 2017

Prepared For:

Mr. Bill Rules
1700 West 2700 North, #33
Pleasant View, UT 84404

Prepared By:

EARTHTEC ENGINEERING
Ogden Office

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1.0 EXECUTIVE SUMMARY

This entire report presents the results of Earthtec Engineering's completed geotechnical study for the Bill Rules Residence in Liberty, Utah. This executive summary provides a general synopsis of our recommendations and findings. Details of our findings, conclusions, and recommendations are provided within the body of this report.

- The subject property is approximately 1 acre and is proposed to be developed with the construction of a single-family residence. The proposed structure will consist of conventionally framed, two-story residence with a basement. We anticipate foundation loads for the proposed structure will not exceed 5,000 pounds per linear foot for bearing wall, 30,000 pounds for column loads, and 100 pounds per square foot for floor slabs. (see Section 3)

- Our field exploration included the excavation of two (2) test pits to depths of 9 to 12 feet below the existing ground surface. Groundwater was not encountered within the excavations at the depths explored. (see Section 5)

- The native soils have a slight potential for expansion (heave) and a slight potential for compressibility under increased moisture contents and anticipated load conditions. (see Section 6)

- The subsurface soils encountered generally consisted of topsoil overlying near-surface stiff to very stiff clay and silt, and dense to very dense sand. All topsoil should be removed beneath the entire building footprints, exterior flatwork, and pavements prior to construction. (see Section 7)

- Conventional strip and spread footings may be used to support the structure, with foundations placed entirely on a minimum 18 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils. (see Section 10)

Based on the results of our field exploration, laboratory testing, and engineering analyses, it is our opinion that the subject site may be suitable for the proposed development, provided the recommendations presented in this report are followed and implemented during design and construction.

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 Earthtec observes 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 approximately 4033 East Nordic Valley Drive in Liberty, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map* and Figure No. 2, *Aerial Photograph Showing Location of Test Pits and Slope Stability Cross-section*, at the end of this report. The purposes of this study are 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, and concrete floor slabs.

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, as described to us by Mr. Bill Rules, consists of developing the approximately 1-acre existing parcel with a residence. The proposed structure will consist of conventionally framed, two-story residence with a basement. We have based our recommendations in this report on the anticipated foundation loads for the proposed structures will not exceed 5,000 pounds per linear foot for bearing wall, 30,000 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.

In addition to the construction described above, we anticipate that

- Utilities will be installed to service the proposed building, and
- Exterior concrete flatwork will be placed in the form of curb, gutter, sidewalks, and a driveway.

4.0 GENERAL SITE DESCRIPTION

4.1 Site Description

At the time of our subsurface exploration the site was an undeveloped lot partially vegetated with scrub oak trees. The future house and septic system areas were cleared from trees. The site is densely vegetated with scrub oak trees with a steep slope toward north. The ground surface appears to slope more than 15 percent grade, we anticipate up to 3 feet of cut and fill may be required for site grading. The lot was bounded on the north by Nordic Valley Drive and partially undeveloped land, on the east and west by developed residential lots, and on the south

by partially developed lots.

4.2 Geologic Setting

The subject property is located in the foothill on northwest side of Ogden Valley. The subject lot is between approximately 5,245 and 5,330 feet above sea level. These foothills start form 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.

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 subject lot has a north facing slope of approximately 30% across the site, in an area mapped by Coogan and King 20161 to be Norwood Formation (lower Oligocene and upper Eocene) – Typically light-gray to light-brown altered tuff (claystone), altered tuffaceous siltstone and sandstone, and conglomerate; locally colored light shades of red and green; variable calcareous cement and zeolitization; involved in numerous landslides of various sizes.

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 November 1, 2017 by the excavation of two (2) test pits to depths of 9 to 12 feet below the existing ground surface using a a rubber-tire backhoe. The approximate locations of the test pits are shown on Figure No. 2, *Aerial Photograph Showing Location of Test Pits and Slope Stability Cross-section*. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 4, *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

[1] Utah Geological Survey OFR 653: Interim geologic map of the Ogden 30' x 60' quadrangle, Weber, Box Elder, Cache, Davis, Morgan, Rich, and Summit Counties, Utah, and Uinta County, Wyoming by by James C. Coogan and Jon K. King 2016.

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. 5, *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 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, dry density test, liquid and plastic limits determinations, mechanical (partial) gradation analyses, and one-dimensional consolidation test. The table below summarizes the laboratory test results, which are also included on the attached *Test Pit Logs* at the respective sample depths, on Figure Nos. 3 and 4, and *Consolidation-Swell Test,* on Figure No. 6.

Table 1: Laboratory Test Results

Test Pit 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)	
1	4	14	---	---	---	8	21	71	ML
1	6	13	---	58	26	1	54	45	SM
2	8	18	104	47	22	6	38	56	CL
2	10	14	102	41	8	4	50	46	SM

NP* = Non-Plastic

As part of the consolidation test procedure, water was added to a sample to assess moisture sensitivity when the sample was loaded to an equivalent pressure of approximately 1,000 psf. The native clay and silt soils have a slight potential for expansion (heave) and a slight potential for compressibility 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 about one foot

in depth at the test pit locations. Below the topsoil we encountered layers of clay, silt, and sand extending to depths of 9 to 12 feet below the existing ground surface. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 4, *Test Pit Log* at the end of this report. Based on our experience and observations during field exploration, the clay and silt soils visually ranged from stiff to very stiff in consistency and the sand soils visually had a relative density varying from dense to very dense.

7.2 Groundwater Conditions

Groundwater was not encountered within the excavations at the depths explored. 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, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials) should be removed from below foundations, floor slabs, exterior concrete flatwork, and pavement areas. We encountered topsoil on the surface of the site. The topsoil (including soil with roots larger than about ¼ inch in diameter) should be completely removed, even if found to extend deeper, along with any other unsuitable soils that may be encountered. Over-excavations below footings and slabs also may be needed, as discussed in Section 10.0.

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. Because there is more than 14 feet of relief from north to south in the building area, we anticipate that more than 3 feet of fill may be placed in some areas of the site during grading. 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.

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[2] requirements for Type B soils.

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

8.3 Fill Material Composition

The native soils within the upper 10 feet are not suitable for use as placed and compacted structural fill. Excavated soils, including clay and silt, 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, stricter quality control measures than normally used may be required, such as using thinner lifts and increased or full-time observation of fill placement.

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 and silt soils (as observed in the explorations) 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 existing 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.

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%
- Greater than 5 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

Near surface layers of clay, silt, and silty sand 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. 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 2015 International Residential Code (IRC). The IRC designates this area as a seismic design class D_1.

The site is located at approximately 41.310 degrees latitude and -111.851 degrees longitude from the approximate center of the site. The IRC site value for this property is 0.725g. The design spectral response acceleration parameters are given below.

Table 4: Design Acceleration for Short Period

S_S	F_a	Site Value (S_{DS})
		2/3 S_S*F_a
0.982 g	1.107	0.725g

S_S = Mapped spectral acceleration for short periods
F_a = Site coefficient from Table 1613.3.3(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[3], no active faults traverse through or immediately adjacent to the site and the site is not located within local fault study zones. The nearest mapped fault trace is the North Fork Fault about ½ mile east of the site.

9.3 Liquefaction Potential

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 clay, silt and sand soils. 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.

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 compacted.

[3] U.S. Geological Survey, Quaternary Fault and Fold Database of the United States, November 3, 2010

10.2 Strip/Spread Footings

We recommend that conventional strip and spread foundations be constructed entirely on a minimum 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 a minimum 18 inches of structural fill may be designed using a maximum allowable bearing capacity of 1,500 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 2015 International Building Code.
- 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.
- 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 is 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, if loading conditions are greater than anticipated in Section 3, and/or if foundation soils are allowed to become wetted.

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 are 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 structural fill as backfill material using a 33° friction angle and a dry unit weight of 115 pcf.

Table 5: Lateral Earth Pressures (Static and Dynamic)

Condition	Case	Lateral Pressure Coefficient	Equivalent Fluid Pressure (pcf)
Active	Static	0.29	34
	Seismic	0.40	46
At-Rest	Static	0.46	52
	Seismic	0.65	75
Passive	Static	3.39	390
	Seismic	5.25	604

*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.

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 0.55 for structural fill meeting the recommendations presented herein. Concrete or masonry walls shall be selected and constructed in accordance to the provision of Section R404 of the 2015 International Residential Code or sections referenced therein. Retaining wall lateral resistance design should further reference Section R404.4 for reference of Safety Factors.

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

Concrete floor slabs and exterior flatwork may be supported on 8 inches of properly placed and compacted structural fill 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 road-base material. Prior to placing the free-draining fill or road-base materials, the native sub-grade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

For slab design, we recommend using a modulus of sub-grade reaction of 130 pounds per cubic inch. The thickness of slabs supported directly on the ground shall not be less than 3½ inches. A 6-mil polyethylene vapor retarder with joints lapped not less than 6 inches shall be placed between the ground surface and the concrete, as per Section R506 of the 2015 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 wall 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. A drip irrigation system may be utilized in landscaping areas within 10 feet of 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.
- Any broken or leaking pipes should be fixed immediately.
- Watering of landscape areas should be limited to reduce the amount of water introduced into the slope.
- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Section R405.1 of the 2015 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 R310.2.3.2 of the 2015 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 soils observed in the explorations at the depth of foundation consisted primarily of silt (ML) and clay (CL) which are not Group 1 soils. 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.

13.0 SLOPE STABILITY

We evaluated the overall stability of the proposed slope at the subject property. The properties of the native soils at the site were estimated using laboratory testing on samples recovered during our field investigations and our experience with similar soils. Our direct shear testing on the native Lean Clay (CL) the soils encountered during our field investigation indicated the soils have an internal friction angle of about 33 degrees and cohesion of about 100 psf (See Figure No. 7, *Direct Shear Test*). We used an internal friction angle of 33 degrees, an apparent cohesion of 100 psf, a saturated unit weight of 127 pcf, and a moist unit weight of 118 pcf for our analyses.

For the seismic (pseudostatic) analysis, a peak horizontal ground acceleration of 0.392g for the 2% probability of exceedance in 50 years was obtained for site (grid) locations of 41.310 degrees north latitude and -111.851 degrees west longitude. Typically, one-third to one-half this value is utilized in analysis. Accordingly, a value of 0.196 was used as the pseudostatic coefficient for the stability analysis.

We evaluated the stability of the proposed site using the computer program XSTABLE. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated. The configuration analyzed was based on our observations during the field investigation, provided site plan with the foundation and topography map. The site plan was provided by Mr. Bill Rules.

The configuration of the proposed slope was analyzed at Cross-Section A-A' and starts at the roadway of Nordic Valley Drive. The lot then slopes uphill to the proposed residence an approximately 20 to 25 percent grade. The residence location is model with a 1,500 psf load. The slope above the residence is graded at approximately 50 to 60 percent grade to the natural

grade of 14 to 35 percent grades. A water table was conservatively placed at approximately 10 feet below the ground surface, although groundwater was not encountered during our field exploration. Typically, the required minimum factors of safety are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate that the slope configuration described above meets both these requirements. The slope stability data are attached as Figure Nos. 8 and 9, *Stability Results*. Any modifications to the slope, including the construction of retaining walls, should be properly designed and engineered.

It should be clearly understood that slope movements or even failure can occur if the slope is undermined, the slope soils become saturated, or the lot is underlain by a formation that is prone to landslides, such as the Norwood Tuff formation. Further investigation including a deeper boring may be required: to determine if a landslide is present at the site and if it is currently moving, to quantify the amount of movement, and to characterize the deposits within the affected area. The property owner and the owner's representatives should be made aware of the risks should these or other conditions occur that could saturate or erode/undermine the soils. Surface water should be directed away from the top and bottom of the slope, the slope should be vegetated with drought resistant plants, and sprinklers should not be placed on the face of the slope. Watering of landscape areas should be limited to reduce the amount of water introduced into the slope. Overwatering should be avoided. Any broken or leaking pipes should be fixed immediately.

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 explorations 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 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;

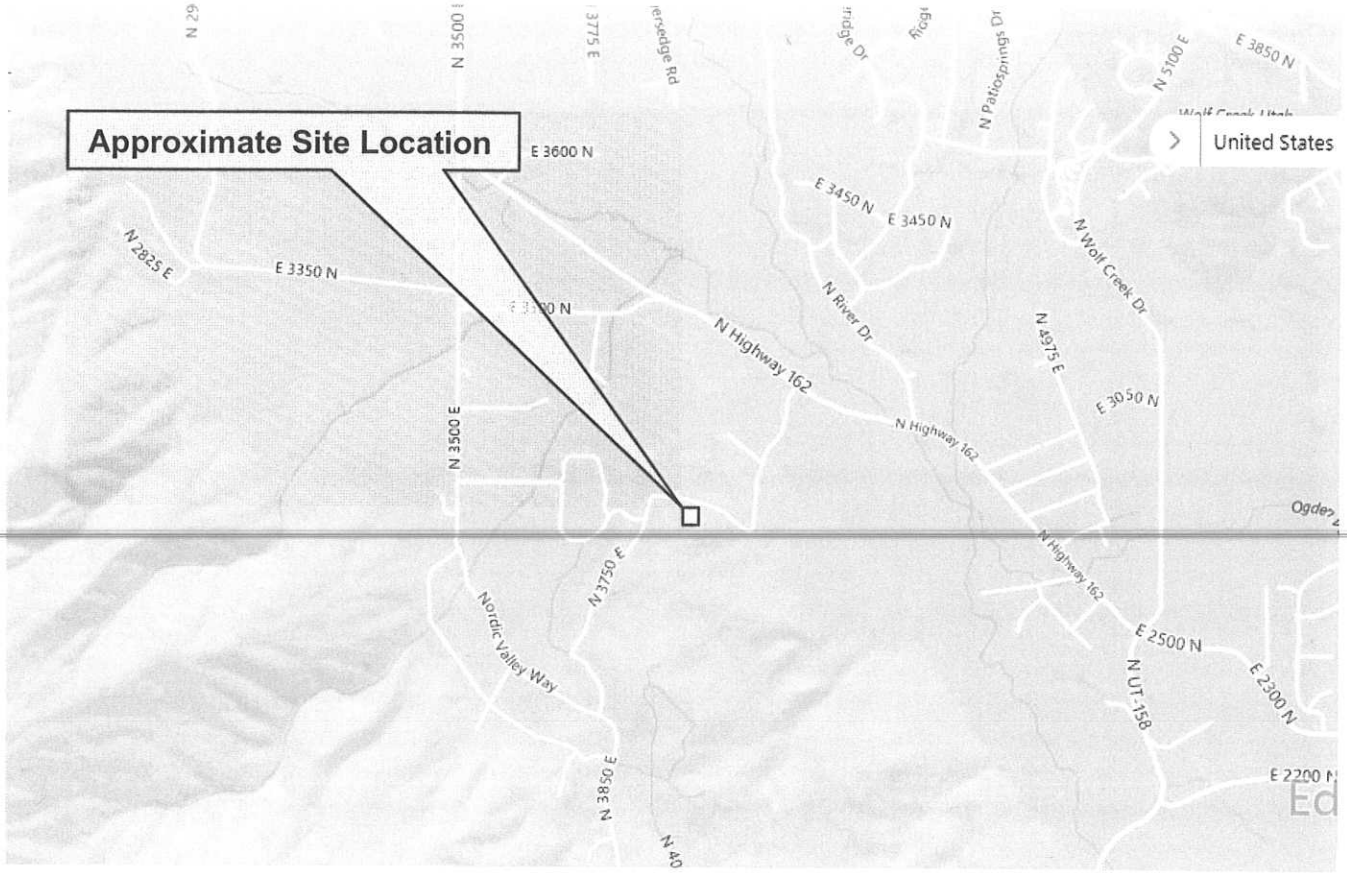
EARTHTEC ENGINEERING

Frank Namdar, P.G., E.I.T.
Project Engineer

Timothy A. Mitchell, P.E.
Senior Geotechnical Engineer

VICINITY MAP

4033 East Nordic Valley Drive
Liberty, Utah



N

Not to Scale

PROJECT NO.: 177075	EARTHTEC ENGINEERING	FIGURE NO.: 1

AERIAL PHOTOGRAPH SHOWING LOCATION OF TEST PITS AND SLOPE STABILITY CROSS-SECTION

4033 East Nordic Valley Drive
Liberty, Utah

Approximate Test Pit Location
Approximate Cross-Section Location

N

Not to Scale

PROJECT NO.: 177075	EARTHTEC ENGINEERING	FIGURE NO.: 2

TEST PIT LOG
NO.: TP-1

PROJECT: Bill Rules Residence
CLIENT: Mr. Bill Rules
LOCATION: See Figure 2
OPERATOR: R. E. Bailey Construction
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 177075
DATE: 11/01/17
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												
1			TOPSOIL, clay with sand, gravel and cobble, moist, dark brown									
2		ML	SILT with sand, stiff to very stiff (estimated), slightly moist, brown									
3												
4												
5					14				8	21	71	
6		SM	Silty SAND, dense to very dense, slighlty moist, light brown									
7					13		58	26	1	54	45	
8												
9												
10			REFUSAL, MAXIMUM DEPTH EXPLORED APPROXIMATELY 9 FEET									
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 177075

EARTHTEC ENGINEERING

FIGURE NO.: 3

LOG OF TESTPIT 177075.GPJ EARTHTEC.GDT 11/29/17

TEST PIT LOG
NO.: TP-2

PROJECT: Bill Rules Residence
CLIENT: Mr. Bill Rules
LOCATION: See Figure 2
OPERATOR: R. E. Bailey Construction
EQUIPMENT: Rubber-tire Backhoe
DEPTH TO WATER; INITIAL ▽ :

PROJECT NO.: 177075
DATE: 11/01/17
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 with sand, gravel and cobble, moist, dark brown									
1			Sandy Lean CLAY, stiff to very stiff (estimated), moist, brown, some pinholes at 2'-3'									
2												
3												
4												
5		CL										
6												
7												
8												
9					18	104	47	22	6	38	56	DS
10			Silty SAND, dense to very dense (estimated), slightly moist, brown									
11		SM			14	102	41	8	4	50	46	C
12												
13			MAXIMUM DEPTH EXPLORED APPROXIMATELY 12 FEET									
14												
15												

Notes: No groundwater encountered.

Tests Key
CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
B = Burnoff

PROJECT NO.: 177075

EARTHTEC ENGINEERING

FIGURE NO.: 4

LOG OF TESTPIT 177075.GPJ EARTHTEC.GDT 11/29/17

LEGEND

PROJECT: Bill Rules Residence
CLIENT: Mr. Bill Rules
DATE: 11/01/17
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.

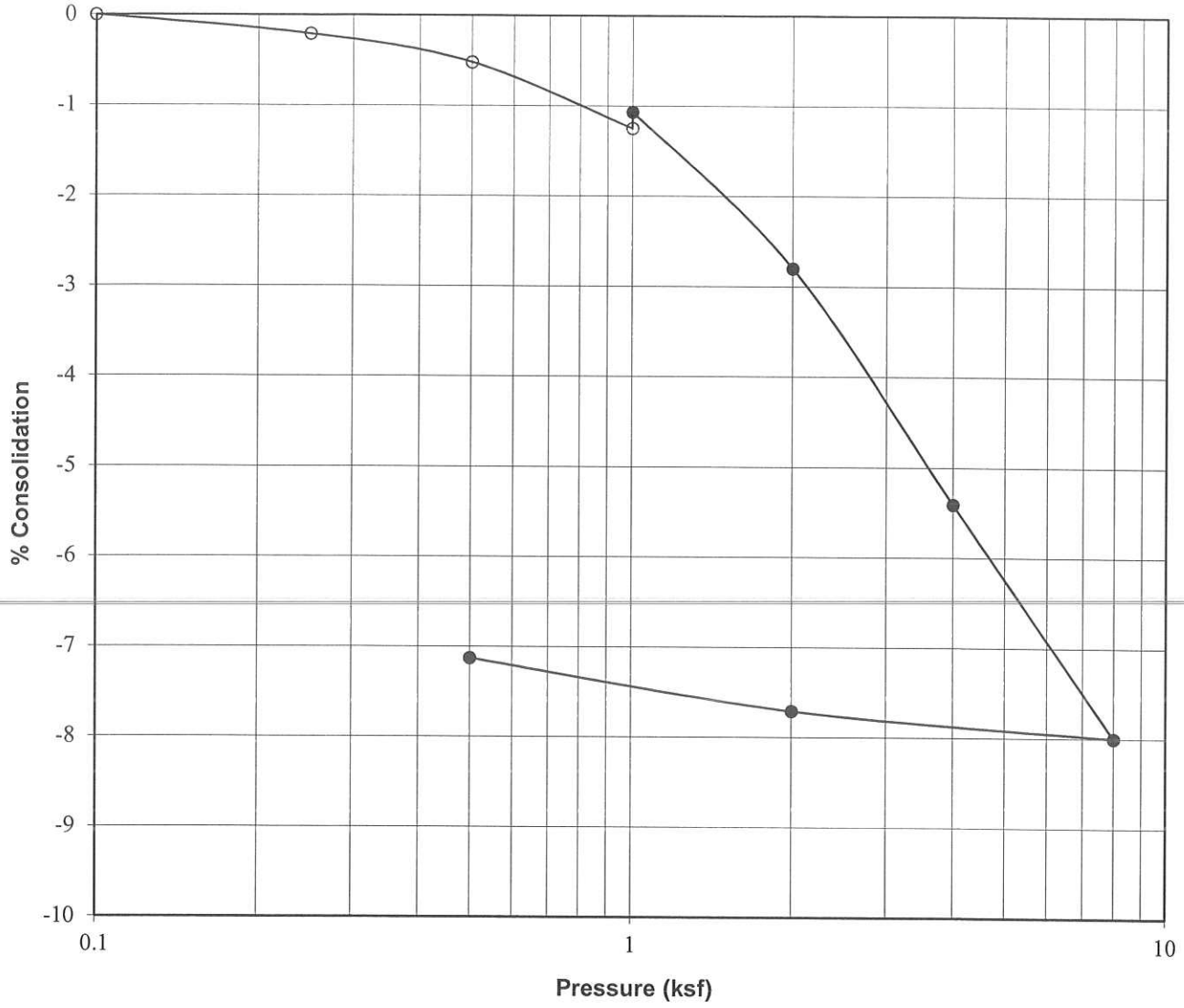
PROJECT NO.: 177075

EARTHTEC ENGINEERING

FIGURE NO.: 5

LEGEND 177075.GPJ EARTHTEC.GDT 11/29/17

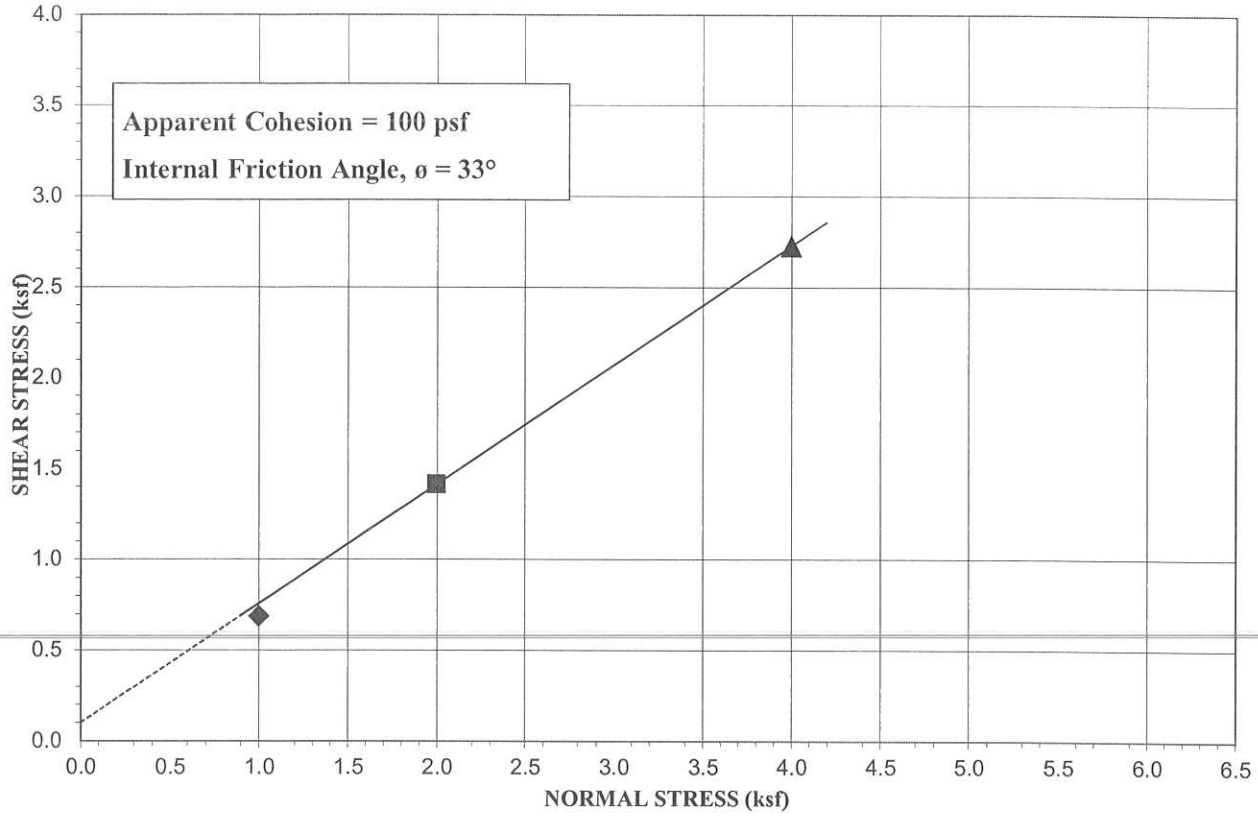
CONSOLIDATION - SWELL TEST

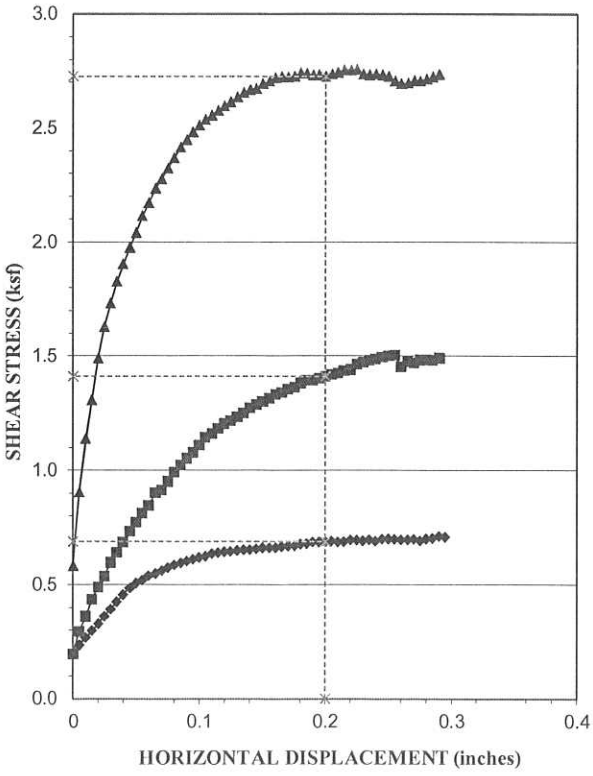


Project:	4033 East Nordic Valley Drive
Location:	TP-2
Sample Depth, ft:	10
Description:	Block
Soil Type:	Silty SAND (SM)
Natural Moisture, %:	14
Dry Density, pcf:	102
Liquid Limit:	41
Plasticity Index:	8
Water Added at:	1 ksf
Percent Swell:	0.2

PROJECT NO.: 177075	EARTHTEC ENGINEERING	**FIGURE NO.:** 6

DIRECT SHEAR TEST





Source: TP-2	**Depth:** 8.0 ft		
Type of Test:	Consolidated Drained/Saturated		
Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Undisturbed		
Initial Height, in.	1	1	1
Diameter, in.	2.4	2.4	2.4
Dry Density Before, pcf	105.2	103.8	103.3
Dry Density After, pcf	104.2	103.1	101.9
Moisture % Before	13.2	13.2	13.2
Moisture % After	21.5	21.5	21.5
Normal Load, ksf	1.0	2.0	4.0
Shear Stress, ksf	0.69	1.41	2.73
Strain Rate	.00005573 IN/SEC		

Sample Properties	
Cohesion, psf	100
Friction Angle, ϕ	33
Liquid Limit, %	47
Plasticity Index, %	22
Percent Gravel	6
Percent Sand	38
Percent Passing No. 200 sieve	56
Classification	CL

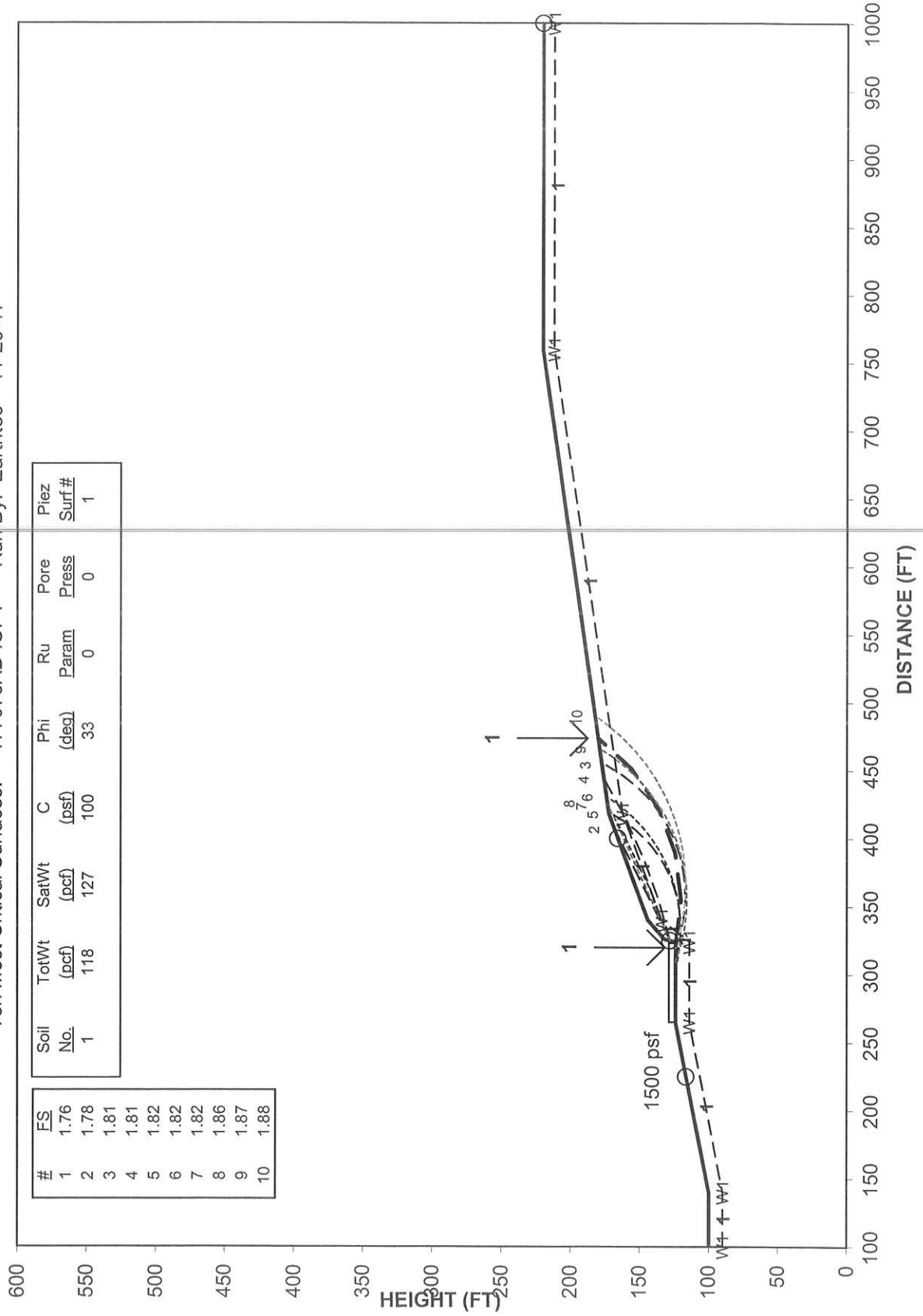
PROJECT: 4033 E. Nordic Valley Drive

PROJECT NO.: 177075

EARTH-TEC ENGINEERING

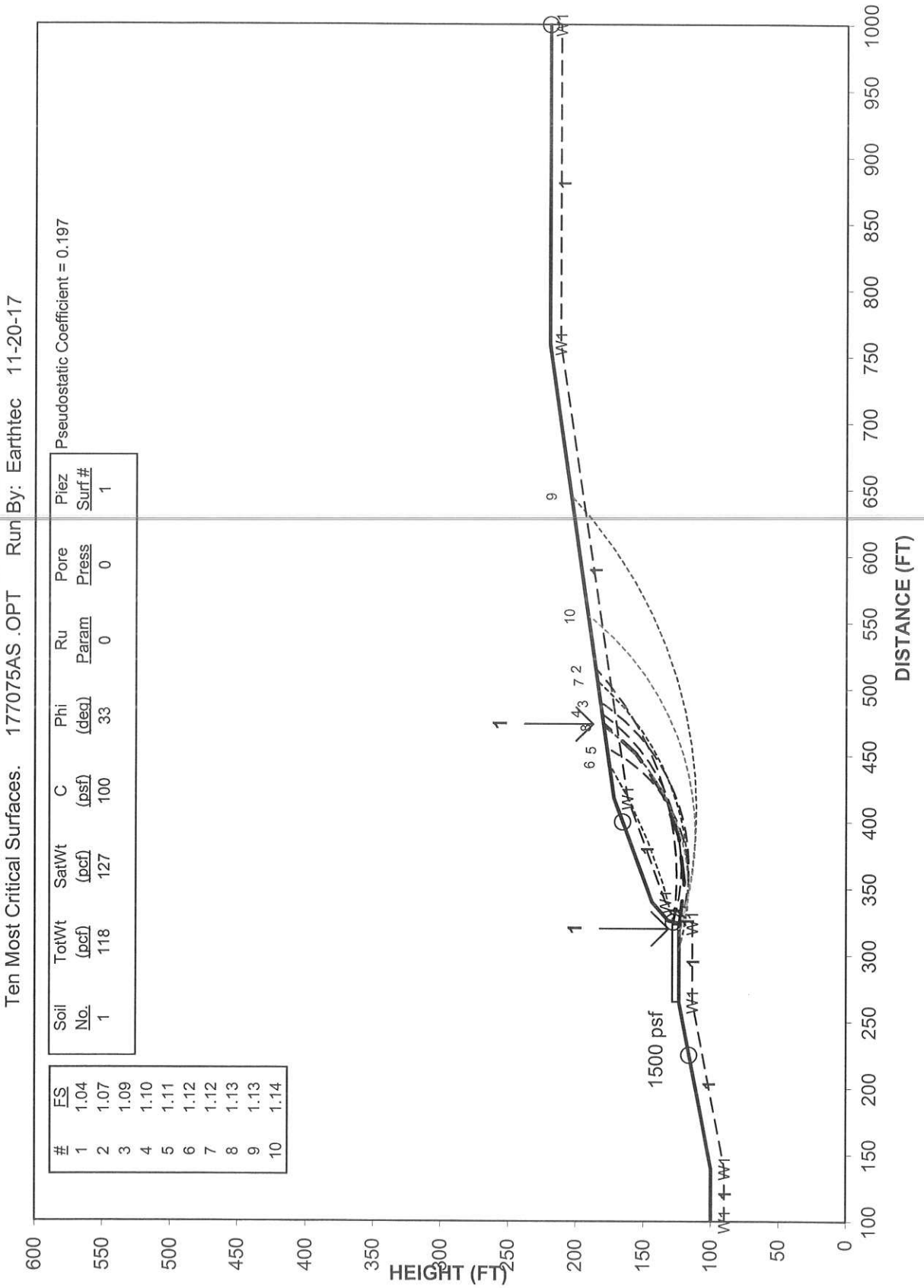
FIGURE NO.: 7

STABILITY RESULTS



PROJECT NO.: 177075	EARTHTEC ENGINEERING	FIGURE NO.: 8

STABILITY RESULTS



PROJECT NO.: 177075	EARTHTEC ENGINEERING	FIGURE NO.: 9

GeoStrata

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

Geologic Hazards Assessment
Parcel# 21-071-0003
4033 East Nordic Valley View Drive
Liberty, Utah

GeoStrata Job No. 1236-002

September 23, 2016

Prepared for:

Michael Moyal
1825 Washington Blvd
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Geologic Hazards Assessment Parcel# 22-071-0003
4033 East Nordic Valley Drive
Huntsville, Utah

GeoStrata Job No. 1236-002

Prepared by:

Sofia Agopian
Geologic Staff

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September 23, 2016

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

The purpose of this investigation and report was to assess the proposed single family residential building lot located at 4033 East Nordic Valley Drive in Huntsville, Utah for the presence or absence of geologic hazards that might impact the planned development of the site. Hazards assessed in this investigation include landslide, alluvial-fan flooding/debris flow, rockfall, surface fault rupture and stream flooding hazard. Hazards such as slope stability, shallow groundwater, soluble soils, and collapsible or expansive soils were not assessed in this investigation.

The Landslide hazard within the subject site was assessed as part of this study. No landslide related geomorphology were observed and no landslide deposits are reported within or adjacent to the subject lot. The subject site and much of the area south of the subject site is mapped as a landslide and/or landslide undifferentiated from talus, colluvial, rock fall, glacial and soil creep deposits by Elliot and Harty, 2010. However, the subject site is mapped as being underlain by Tertiary Norwood Formation (Tn) by Coogan and King (2016) and Sorensen and Crittenden (1979). It is the opinion of GeoStrata that the landslide and/or landslide undifferentiated from talus, colluvial, rock fall, glacial and soil creep deposits delineated by Elliot and Harty, 2010 is incorrect and is not representative of the surficial deposits within the subject site. Our investigation revealed no indications that the subject lot has been subjected to previous landslides. Therefore, the landslide hazard within the subject site is considered low and it is considered unlikely that landslides will impact the proposed development. It is the opinion of GeoStrata that landslide hazard should not preclude development at the subject lot. It is the opinion of GeoStrata that landslide hazard should not preclude development at the subject lot.

Slope stability of the subject site was not assessed as a part of this geological hazard assessment. Slopes within and immediately adjacent to the subject lot were observed to be gently to steeply dipping approximately 10 to 35 degrees to the north toward Ogden Valley. If it is required that slope stability at the site be assessed, then a site specific geotechnical investigation should be performed for the subject site.

The debris flow and alluvial-fan flooding hazard within the subject site was also assessed as part of this study. No Holocene-aged alluvial fan deposits are mapped within the subject site. Our office and field investigation revealed no indications that the subject lot has been subjected to Holocene-aged debris flows or alluvial fan flooding. The debris flow or alluvial fan flooding

hazards within the subject site is considered low and it is considered unlikely that debris flows or alluvial fan flooding will impact the proposed development. It is the opinion of GeoStrata that debris flow and alluvial-fan flooding hazard should not preclude development at the subject lot.

The rock fall hazard within the subject site was also assessed as part of this study. No rock fall talus or debris resulting from rock fall were observed during our field investigation. Furthermore, sources of rockfall debris were not observed upslope of the subject site. It is our opinion that the rock fall hazard within the subject site is considered low and it is considered unlikely that rock falls will impact the proposed development. It is the opinion of GeoStrata that rock fall hazard should not preclude development at the subject lot.

The surface fault rupture hazard within the subject site was also assessed as part of this study. There are no active faults mapped trending through or within the vicinity of the subject site. The nearest faults to the subject site are the northwest-southeast trending Ogden Valley North Fork Fault and the Ogden Valley Southwestern Margin Fault which are middle and late Quaternary in age (<750,000 years old) with an undetermined reoccurrence interval and a slip rate of less than 0.2 mm/yr (Black and others, 1999). These faults are located approximately 2,020 feet northeast of the subject site and 4,400 feet to the southwest of the subject site, respectively. Therefore, the surface fault rupture hazard within the subject site is considered low and it is considered unlikely that surface fault rupture will impact the proposed development. It is the opinion of GeoStrata that surface fault rupture hazard should not preclude development at the subject lot.

The stream flooding within the subject site was also assessed as part of this study. No streams or drainages were observed within or adjacent to the subject site. Given our field and office investigations, the stream flooding hazard within the subject lot is considered low and it is considered unlikely that stream flooding will impact the proposed development. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject lot. Proper site grading and drainage plans should be developed for the subject site as a part of the civil engineering design for the lot.

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

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

The purpose of this investigation and report was to assess the proposed single family residential building lot located at 4033 East Nordic Valley Drive in Huntsville, Utah for the presence of geologic hazards that may impact the cost and feasibility of the development of the subject site. As part of this assessment, we will identify and describe geologic hazards observed within or immediately adjacent to the subject site. The engineering and design of potential geologic hazards mitigation are out of the scope of this geological hazards assessment. Hazards such as slope stability, shallow groundwater, soluble soils, and collapsible or expansive soils will not be addressed as part of this investigation. If it is required that these hazards be assessed, then a site specific geotechnical investigation should be performed for the subject site.

The work performed for this report was performed in accordance with our proposal and your signed authorization dated September 6, 2016. Our scope of services included the following:

- Review of available references and maps of the area.
- Stereographic aerial photograph interpretation of aerial photographs covering the site area.
- Review of the hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) obtained from the State of Utah AGRC.
- Geologic reconnaissance of the site by an engineering geologist to observe and document pertinent surface features indicative of possible geologic hazards; and
- Evaluation of our observations combined with existing information and preparation of this written report with conclusions and recommendations regarding possible geologic hazards observed to affect the site.

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

2.2 PROJECT DESCRIPTION

The subject site is located on the western margin of Ogden Valley just north of Pole Canyon and within the vicinity of the Nordic Valley Ski Area at approximately 4033 East Nordic Valley Way in Liberty, Utah. We understand that the project site is currently an undeveloped single family

residential building lot on a native hillside within the Nordic Valley area. Proposed development, as currently planned, will consist of a single family residential structure as well as associated driveway, utilities and landscape areas. The hillside in the area of the subject lot has moderately steep slopes dipping generally north toward Ogden Valley. It is our understanding that the general area of the subject lot was first developed around the 1960's. The subject site remains in a native condition surrounded by developed residential lots. The subject lot is shown on the Site Vicinity Map included in the Appendix of this report (Plate 1).

3.0 METHODS OF STUDY

3.1 OFFICE INVESTIGATION

To prepare for the investigation, GeoStrata reviewed pertinent literature and maps listed in the references section of this report, which provided background information on the local geologic history of the area and the locations of suspected or known geologic hazards (Elliot and Harty, 2010; Coogan and King, 2016; UGS, 2016; Sorensen and Crittenden, 1979). The geologic hazards considered for this site include landslide, alluvial fan flooding/debris flow, rock fall, surface fault rupture and stream flooding. A stereographic aerial photograph interpretation was performed for the subject site using two sets of stereo aerial photographs obtained from the UGS as shown in Table 1.

Table 1

Source	Photo Number	Date	Scale
USDA	AAJ-4FF-8	August 10, 1965	1:20,000
USDA	AAJ-4FF-9	August 10, 1965	1:20,000

GeoStrata also conducted a review of hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) obtained from the State of Utah AGRC to assess the subject site for visible alluvial fan deposits, scarps associated with landslide geomorphology and lineations related to stream flooding hazards or surface fault rupture related geomorphology. The LiDAR elevation data was used to create hillshade imagery that could be reviewed for assessment of geomorphic features related to geologic hazards (Plate 2 Hillshade Map).

3.2 FIELD INVESTIGATION

An engineering geologist investigated the geologic conditions within the general site area. A field geologic reconnaissance was conducted to observe existing geologic conditions and to assess existing geomorphology for surficial evidence of geologic hazards. During our fieldwork we conducted site observations to assess geologic hazards that might impact the lot. We used our field observations to confirm the observations made during our office research and to observe any evidence of geologic hazards that were not evident in our office research but which could be observed in the field.

4.0 GEOLOGIC CONDITIONS

4.1 GEOLOGIC SETTING

The site is located in Huntsville, Utah at an elevation of approximately 5,286 feet above mean sea level along the base of the Wasatch Front Range foothills which border the northwestern margin of Ogden Valley. The Ogden Valley is a northwest trending deep, lacustrine sediment-filled structural basin of Cenozoic age bounded on the northeast and southwest by two normal faults that dip towards the center of the valley. The Ogden Valley is a fault graben flanked by two uplifted blocks, the Wasatch Range on the west and unnamed flat-topped mountains to the east (King and others 2008). The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah (Stokes, 1986).

The near-surface geology of the Ogden Valley is dominated by lake sediments which were deposited within the last 30,000 years during the high stand of the Lake Bonneville Cycle when water inundated Ogden Canyon and formed a small lake in Ogden Valley (Scott and others, 1983; Hintze, 1993; Leggette and Taylor, 1937; King and others, 2008). As the lake receded, streams began to incise large deltas that had formed at the mouths of major canyons along the Wasatch Range and the unnamed flat-topped mountains bounding the eastern margins of Ogden Valley. The eroded material was then deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand whereas sediments closer to the mountain fronts are shallow-water deposits of coarse sand and gravel. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover.

4.2 SITE GEOLOGY

Surface sediments within the subject site, as shown on Plate 3a Site Vicinity Geologic Map and Plate 4 Site Vicinity 30' X 60' Geologic Map, are mapped as lower Oligocene and upper Eocene Norwood Formation (Tn). The Tertiary Norwood Formation is described as light-gray to light-brown, locally colored light shades of red or green in the west side of Ogden Valley, altered tuff (claystone), altered tuffaceous siltstone and sandstone, and conglomerate (Coogan and King, 2016).

5.0 GENERALIZED SITE CONDITIONS

5.1 SURFACE CONDITIONS

As stated previously, the project site is located along the base of the Wasatch Front Range foothills and within the western region of Ogden Valley at approximately 4033 East Nordic Valley Way in Liberty, Utah. The subject site is situated on a gently to steeply sloping hillside dipping generally to the north toward Ogden Valley. Slopes in the northern portion of the subject site were observed to be gently dipping approximately 10 to 15 degrees to the north. Slopes in the southern portion of the subject site were observed to be steeply sloping at approximately 20 to 35 degrees to the north. Surficial deposits on the subject site were observed to consist of fine-grained sediment with few up to approximately 4½ feet in diameter well-rounded to subrounded arkosic sandstone and quartzite boulders of the Maple Canyon Formation. The site remains in a relatively natural state, and is thickly vegetated with mature scrub oaks, cedar trees, large native brush and grasses. No structures were observed on the subject property. The properties to the east and west of the subject site are occupied by established residential developments.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 LANDSLIDE HAZARD

There are several types of landslides that should be considered when evaluating geologic hazards at a site with moderately to steeply sloping terrain. These include shallow debris slides, deep-seated earth or rock slumps and earth flows. Landslides, slumps and other mass movements can develop on moderate to steep slopes where the slope has been altered or disturbed. Movement can occur at the top of a slope that has been loaded by fill placement, at the base of a slope that has been undercut, or where local groundwater rises resulting in increased pore pressures within the slope. Slopes that exhibit prior failures and large landslide deposits are particularly susceptible to instability and reactivation.

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) and our field observations, no scarp features, hummocky topography, or other landslide related geomorphology features related to landslide deformation were observed and no landslide deposits are reported within or adjacent to the subject lot (Plate 3a Site Vicinity Geologic Map and Plate 4 Site Vicinity 30' X 60' Geologic Map). The subject site and much of the area south of the subject site is mapped as a landslide and/or landslide undifferentiated from talus, colluvial, rock fall, glacial and soil creep deposits on the Landslide Maps of Utah Ogden 30' X 60' Quadrangle compiled by Elliot and Harty, 2010 (Plate 5 Landslide Hazard Map). However, the subject site is mapped as being underlain by Tertiary Norwood Formation (Tn) as indicated on Plate 3a Site Vicinity Geologic Map and Plate 4 Site Vicinity 30' X 60' Geologic Map. Based on field observations and published geologic maps of the area, it is the opinion of GeoStrata that the landslide and/or landslide undifferentiated from talus, colluvial, rock fall, glacial and soil creep deposits delineated by Elliot and Harty, 2010 is incorrect and is not representative of the surficial deposits within the subject site. Our office and field investigation revealed no indications that the subject lot has been subjected to previous landslides. Therefore, the landslide hazard within the subject site is considered low and it is considered unlikely that landslides will impact the proposed development. It is the opinion of GeoStrata that landslide hazard should not preclude development at the subject lot.

Slope stability of the subject site was not assessed as a part of this geological hazard assessment. Slopes within and immediately adjacent to the subject lot were observed to be gently to steeply

dipping approximately 10 to 35 degrees to the north toward Ogden Valley. If it is required that slope stability at the site be assessed, then a site specific geotechnical investigation should be performed for the subject site.

6.2 ALLUVIAL FAN FLOODING/DEBRIS FLOW

Alluvial fan flooding is a potential hazard that may exist in areas containing Holocene alluvial fan deposits. This type of flooding typically occurs as a debris flood consisting of a mixture of soil, organic material, and rock debris transported by fast-moving flood water. Debris floods and debris flows can be a hazard on or below alluvial fans or in stream channels above alluvial fans. Precipitation (rainfall and snowmelt) is generally viewed as a debris-flow "trigger", but this represents only one of the many factors that contribute to debris-flow hazard. Vegetation, root depth, soil gradation, antecedent moisture conditions and long term climatic cycles all contribute to the generation of debris and initiation of debris-flows. Events of relatively short duration, such as a fire, can significantly alter a basin's natural resistance to debris-flow mobilization for an extended period of time.

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) and our field observations, no Holocene-aged alluvial fan or debris flow deposit are mapped within or adjacent to the subject site (Plate 3a Site Vicinity Geologic Map and Plate 4 Site Vicinity 30' X 60' Geologic Map). As indicated on Plate 3a and Plate 4, the subject site is underlain by Tertiary Norwood Formation (Tn). Our office and field investigation revealed no indications that the subject lot has been subjected to Holocene-aged debris flows or alluvial fan flooding. Therefore, the debris flow or alluvial fan flooding hazards within the subject site is considered low and it is considered unlikely that debris flows or alluvial fan flooding will impact the proposed development. It is the opinion of GeoStrata that debris flow or alluvial fan flooding hazards should not preclude development at the subject lot.

6.3 ROCK FALL

Rock falls are the fastest moving mass movement that predominantly occur in mountains where a rock source exists along steep slopes and cliffs greater than 35 degrees. Rock falls are a result of a loss of support from beneath the rock mass that can be caused by freeze/thaw action, rainfall, weathering and erosion, and/or strong ground shaking resulting from seismic activity. Rockfalls

result in the collection of rock fall material, referred to as talus, at the base of the slope. The presence of talus indicates that a rock fall hazard has occurred and may still be present at the site.

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) and our field observations, no rock fall or talus deposits are located within or immediately adjacent to the subject lot. Boulders and cobbles observed on the subject lot as previously stated, were well-rounded to subrounded and were not observed to be characteristic of a recent rock fall. Sources of rock fall debris were not observed up-slope of the subject site. Our field investigation revealed no indications that the subject lot has been subjected to previous rock fall. Therefore, the rock fall hazard within the subject site is considered low and it is considered unlikely that rock fall will impact the proposed development. It is the opinion of GeoStrata that rock fall hazard should not preclude development at the subject site.

6.4 SURFACE FAULT RUPTURE HAZARD

Movement along faults within the crustal rocks beneath the ground surface generates earthquakes. During large magnitude earthquakes (Richter magnitude 6.5 or greater) along the normal faults in the intermountain region, fault ruptures can propagate to the ground surface resulting in a surface fault rupture (Smith and Arabasz, 1991). The fault scarp formed during a surface fault rupture event along a normal fault is generally nearly vertical. A surface rupture fault may be comprised of a larger single surface rupture or several smaller surface ruptures across a fault zone. For all structures designed for human occupancy, a surface rupturing fault is considered active if it has experienced movement in approximately the past 10,000 years (Christenson and others, 2003).

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) and our field observations, no active surface ruptures are located near the subject site (Plate 6 UGS Quaternary Faults Map). The nearest faults are the northwest-southeast trending Ogden Valley North Fork Fault and the Ogden Valley Southwestern Margin Fault which are middle and late Quaternary in age (<750,000 years old) with an undetermined reoccurrence interval and a slip rate of less than 0.2 mm/yr (Black and others, 1999). These faults are located approximately 2,020 feet northeast of the subject site and 4,400 feet to the southwest of the subject site, respectively. Given our field and office investigations, the surface fault rupture hazard within the subject site is considered low and it is considered unlikely that surface fault rupture will impact

the proposed development. It is the opinion of GeoStrata that surface fault rupture hazard should not preclude development at the subject lot.

6.5 STREAM FLOODING HAZARD

Stream flooding can be caused by precipitation, snowmelt or a combination of both. Throughout most of Utah floods are most common in spring during the snowmelt. High flows in drainages can last for a few hours to several weeks. Factors that affect the potential for flooding at a site include surface water drainage patterns and hydrology, site grading and drainage design, and seasonal runoff.

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from the 1 meter Bare Earth LiDAR elevation data (2011) and our field observations, no streams or drainages were observed within or adjacent to the subject site (Plate 7 Drainage Map). Given our field and office investigations, the stream flooding hazard within the subject lot is considered low and it is considered unlikely that stream flooding will impact the proposed development. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject lot. Proper site grading and drainage plans should be developed for the subject site as a part of the civil engineering design for the lot.

7.0 CLOSURE

7.1 LIMITATIONS

The conclusions and recommendations contained in this report, which include professional opinions and judgments, are based on the information available to us at the time of our evaluation, the results of our field observations and our understanding of the proposed site development. If any conditions are encountered at this site that are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed development changes from that described in this report, our firm should also be notified.

All services were completed in accordance with the current standard of care and generally accepted standard of practice at the time and in the place our services were completed. No other warranty, expressed or implied, is made. Development of property in the immediate vicinity of geologic hazards involves a certain level of inherent risk. It is impossible to predict where geologic hazards will occur. New geologic hazards may develop and existing geologic hazards may expand beyond their current limits.

All services were performed for the exclusive use and benefit of the above addressee. No other person is entitled to rely on GeoStrata's services or use the information contained in this letter without the express written consent of GeoStrata. We are not responsible for the technical interpretations by others of the information described or documented in this report. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

8.0 REFERENCES CITED

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Appendix

Legend

Approximate Site Boundary

0 750 1,500 3,000 4,500 6,000 Feet

1 inch = 2,000 feet

Base Map:
Aerial imagery provided by ArcGIS Basemaps.

N

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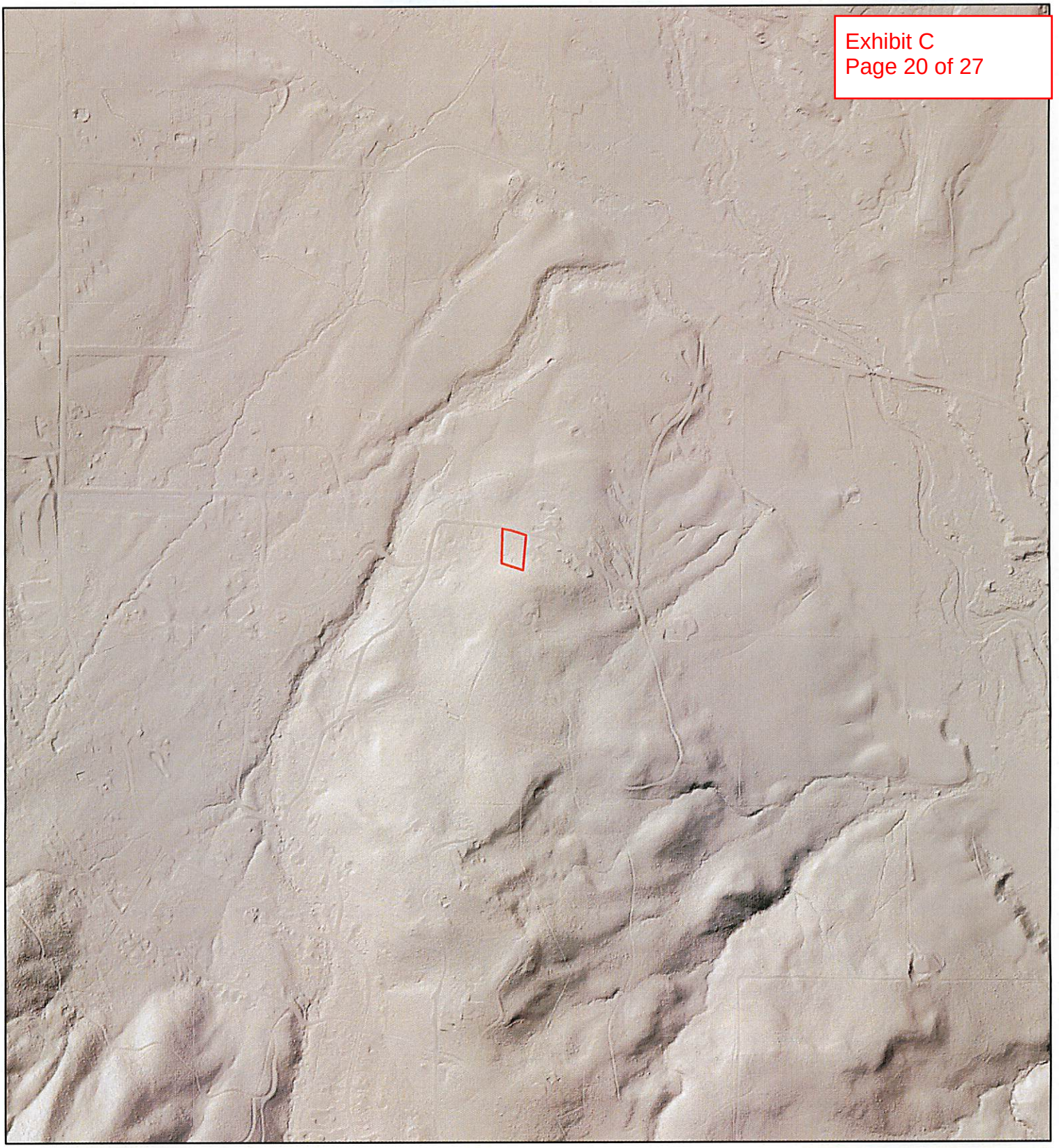
Geologic Hazards Assessment
4033 Nordic Valley Drive
Liberty, Utah
Project Number: 1236-002

Site Vicinity Map

Plate 1



Legend

Approximate Site Boundary

0 375 750 1,500 2,250 3,000 Feet

1 inch = 1,000 feet

Base Map:
Hillshades derived from 2011 1 meter LiDAR
provided by the State of Utah AGRC.

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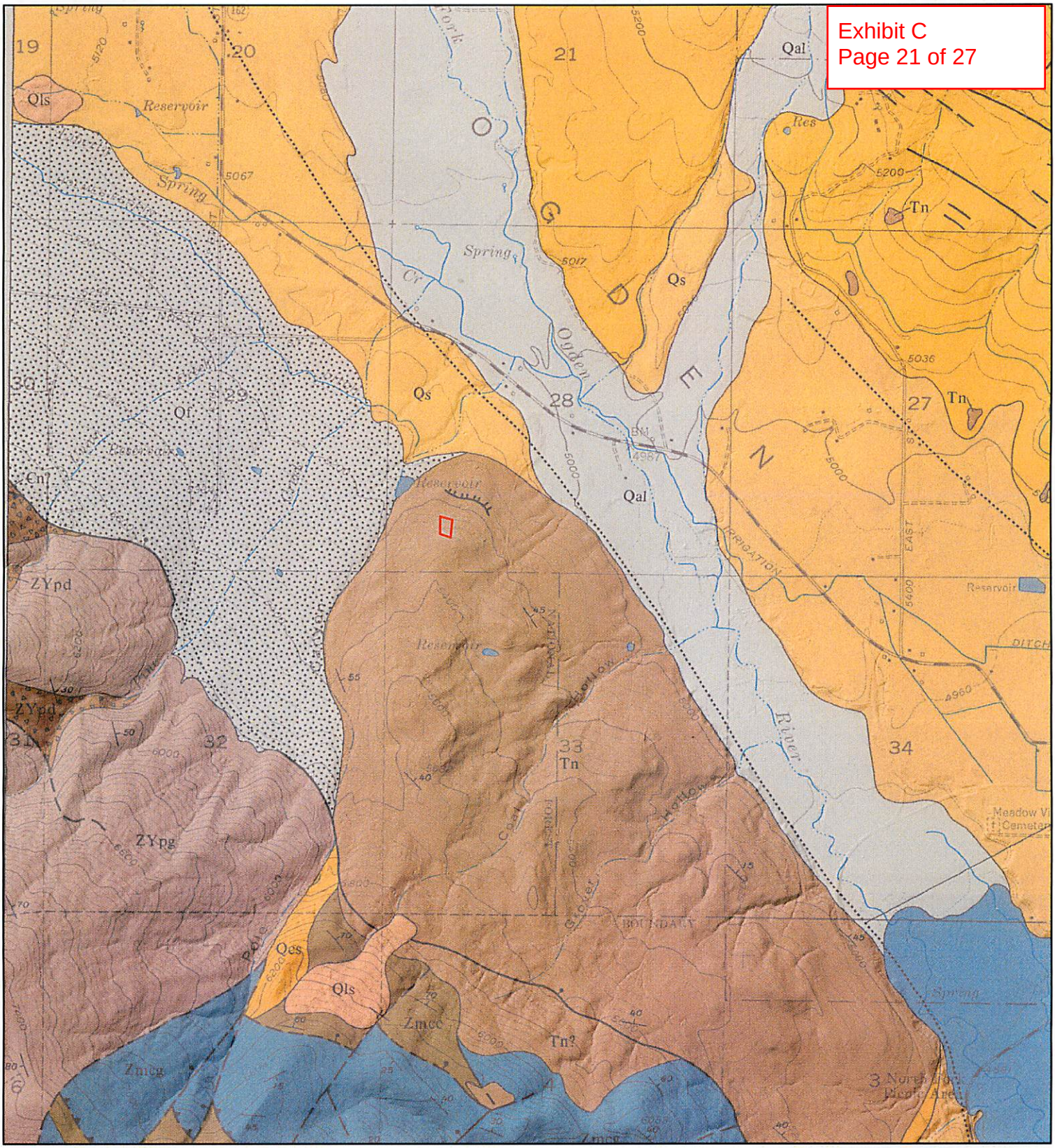
Hillshade Map

Plate 2



Legend

Approximate Site Boundary

refer to Plate 3b and 3c for geologic unit descriptions

0 750 1,500 3,000 4,500 6,000 Feet

1 inch = 2,000 feet

Base Map:
Geologic Map of the Huntsville Quadrangle, Weber and Cache Counties, Utah, Sorensen and Crittenden, 1979. Hillshades derived from 2011 1 meter LiDAR provided by the State of Utah AGRC.

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Project Number: 1236-002

Site Vicinity Geologic Map

Plate 3a

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

Qt — TALUS DEPOSITS (Holocene) – thickness 0-6 m

Qtd — TERRACE AND DELTA(?) DEPOSITS (Pleistocene) – In North Fork Ogden River, gravel, sand, and silt in stream terraces graded to high stand of former Lake Bonneville; at mouth of Middle and South Fork Ogden River, pinkish-tan sand and silt in delta(?) remnants deposited during high stands of Lake Bonneville; thickness 0-45 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

Qg — GRAVEL AND COBBLE DEPOSITS (Pleistocene) – In Ogden Canyon, gravel and cobble terrace remnants, probably deposited after time of highest stand of Lake Bonneville; thickness 0-3 m

Qog — OLDER GRAVEL DEPOSITS (Pleistocene) – North of Huntsville, cobble, gravel, and sand deposit that probably predates high stands of Lake Bonneville; thickness 21 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

LOWER PLATE OF WILLARD THRUST

Mh — HUMBUG FORMATION (Upper Mississippian) – Medium-bedded, commonly crossbedded, medium- to fine-grained, gray- to tan-weathering quartzite, commonly with thin beds and lenses of dark-gray to black chert; interbedded dark- to light-gray medium-bedded dolomite; thickness 300+ m

Md — DESERET LIMESTONE (Upper and Lower Mississippian) – Medium- to thin-bedded, coarsely to finely crystalline, medium-gray- to pale-brown-weathering, dark- to light-gray dolomite and limestone, commonly with thin beds and lenses of dark-gray to black chert; 6 m dark-gray to black mudstone, shale, and oolitic phosphatic shale at base; thickness 60-75 m

Mg — GARDISON LIMESTONE (Lower Mississippian) – Upper part finely to coarsely crystalline, thick-bedded to massive, dark-gray- to pale-brown-weathering, medium- to dark-gray fossiliferous dolomite with thin beds and lenses of light- to dark-gray chert. Lower part finely to medium crystalline, thin- to medium-bedded, commonly platy weathering, dark-gray to black, light-gray- to blue-gray-weathering fossiliferous dolomite; thickness 90-260 m

Db — BEIRDNEAU SANDSTONE (Upper Devonian) – Medium-bedded to laminated, fine- to medium-grained sandstone, dolomitic sandstone, and dolomite with minor limestone, mudstone, shale, and quartzite; intraformational conglomerate common; weathers to buff, tan, orange, and brown; thickness 75-90 m

Dh — HYRUM DOLOMITE (Upper and Middle Devonian) – Thin- to thick-bedded, fine- to medium-grained, dark-gray to black, dark- to light-gray-weathering, cliff-forming dolomite; minor intercalated gray limestone and silty limestone; 5-12 m of medium-grained, buff- to tan-weathering dolomitic sandstone locally present in upper 30 m of unit; thickness 107 m

Dwc — WATER CANYON(?) FORMATION (Lower? Devonian) – Thin-bedded to laminated, fine-grained, medium- to pale-gray, pale- to yellowish-gray-weathering dolomite, silty dolomite, and sandy dolomite; thickness 27 m

Ofh — FISH HAVEN DOLOMITE (Upper Ordovician) – Medium- to thick-bedded, medium to finely crystalline, medium- to light-gray, medium- to pale-gray-weathering, cliff-forming dolomite; upper 3 m weathers very pale gray to silver; small white twiggy structures and remnants of corals and crinoid … thickness 60-69 m

Ogc — GARDEN CITY FORMATION (M… and Lower Ordovician) – Thin- to medium-bedded, medium- to pale-gray and tan, tan- to buff-weathering dolomite, commonly with sandy streaks and lenses. Interbedded and intercalated with thinly laminated, medium-gray to tan, tan- to buff-weathering siltsone containing nodules and lenses of dolomite; thickness 60-75 m

Ꞓsd — ST. CHARLES LIMESTONE (Upper Cambrian) – Includes: Dolomite member – Thin- to thick-bedded, finely to medium crystalline, light- to medium-gray, white- to light-gray-weathering, cliff-forming dolomite; linguloid brachiopods common in basal 15 m; thickness 150-245 m

Ꞓsw — Worm Creek Quartzite Member – Thin-bedded, fine- to medium-grained, medium- to dark-gray, tan- to brown-weathering calcareous quartzitic sandstone; detrital grains well-sorted and well-rounded; thickness 6 m

Ꞓn — NOUNAN DOLOMITE (Upper and Middle Cambrian) – Thin- to thick-bedded, finely crystalline, medium-gray, light- to medium-gray-weathering, cliff-forming dolomite; white twiggy structures common throughout unit; thickness 150-230 m

Ꞓbc — CALLS FORT SHALE MEMBER OF BLOOMINGTON FORMATION (Middle Cambrian) – Olive-drab to light-brown shale and light- to dark-blue-gray limestone with intercalated orange to rusty-brown silty limestone; intraformational conglomerate common throughout unit; thickness 23-90 m

Ꞓm — MAXFIELD(?) LIMESTONE (Middle Cambrian) – Upper part thin-bedded, finely crystalline, medium- to dark-gray, ledge-forming dolomite, often with intercalated light-gray silty limestone; near top of unit, includes distinctive light-gray to white laminated dolomite, underlain by light- and dark-gray mottled limestone. Middle part dominantly olive-drab to greenish-brown micaceous shale, with interbedded medium- to dark-gray limestone, overlain by medium- to dark-gray, cliff-forming platy limestone. Lower part dark-blue-gray, light-gray-weathering, cliff-forming limestone and dolomite, with intercalated reddish-gray silty limestone; underlain by 30 m thin-bedded, light-blue-gray, slope-forming limestone and shaly limestone, with some greenish-olive-drab shale. Base of lower unit is finely crystalline, medium-blue-gray, light-gray-weathering limestone, commonly with intercalated tan to orange-brown silty limestone, and locally containing orange-brown oolites near top. Upper and middle parts of formation exposed in Huntsville quadrangle; lower part exposed in North Ogden quadrangle; thickness 290 m

UPPER PLATE OF WILLARD THRUST

Ꞓsd — ST. CHARLES LIMESTONE – See above
Dolomite member – See above

Ꞓsw — Worm Creek Quartzite Member – See above

Ꞓn — NOUNAN DOLOMITE – See above

Ꞓbc — CALLS FORT SHALE MEMBER OF BLOOMINGTON FORMATION – See above

Ꞓlu — CAMBRIAN LIMESTONES, UNDIVIDED (Middle Cambrian) – Includes limestone and Hodges Shale Members of Bloomington Formation, and Blacksmith and Ute Limestones

Ꞓb — BLACKSMITH LIMESTONE (Middle Cambrian)) – Medium- to thin-bedded, light-gray to dark-blue-gray limestone; thin-bedded, flaggy-weathering, gray to tan silty limestone and interbedded siltstone; light- to dark-gray dolomite, with some reddish siliceous partings; thickness 400? m

Ꞓu — UTE LIMESTONE (Middle Cambrian) – Medium- to thin-bedded, finely crystalline, light- to dark-gray silty limestone with irregular wavy partings, mottled and streaked surfaces, worm tracks, and twiggy structures common throughout unit; oolites and *Girvanella* in many beds; olive-drab fissile shale interbedded throughout unit. Includes thin-bedded, gray-weathering, pale-tan to brown dolomite exposed at base of unit, 18-24 m at head of Geertsen Canyon and 0-3 m elsewhere; thickness 245? m

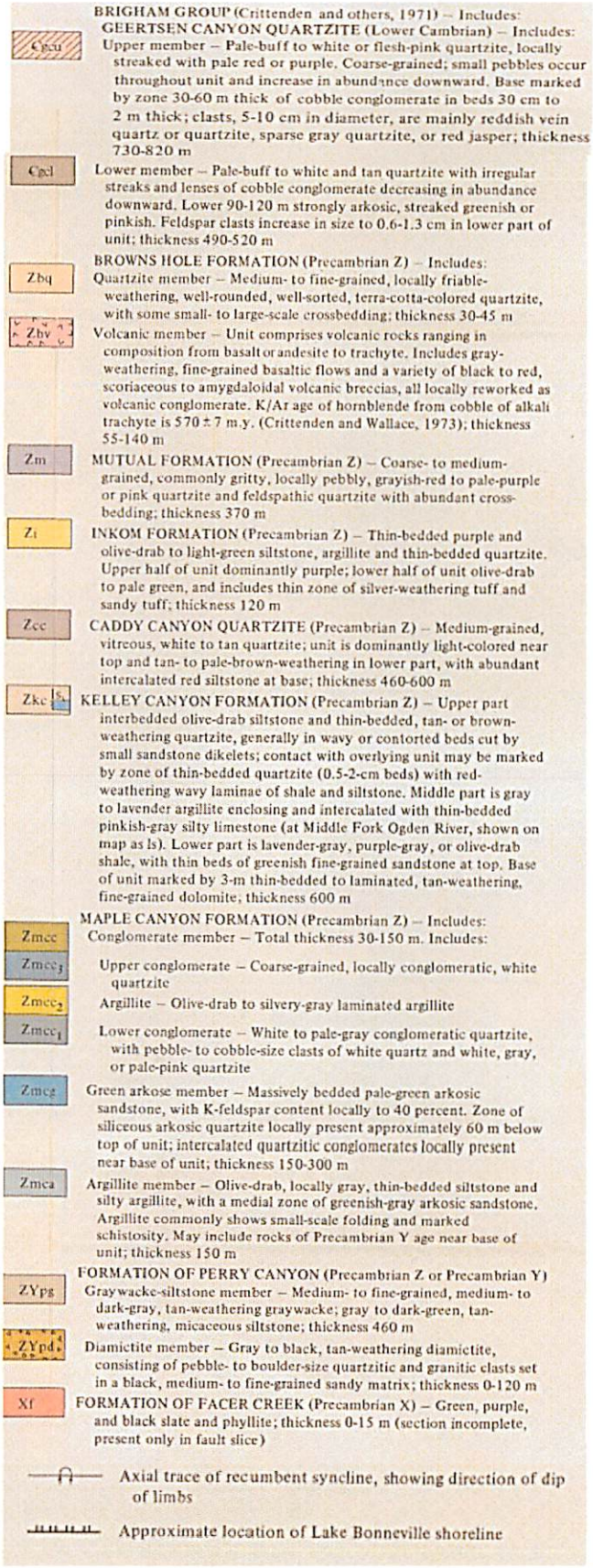
BRIGHAM GROUP (Crittenden and others, 1971) – Includes:

Ꞓgcu — GEERTSEN CANYON QUARTZITE (Lower Cambrian) – Includes: 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

1: 24,000 Geologic Map of the Hunstville Quadrangle, Weber and Cache Counties, Utah, Sorensen and Crittenden, 1979, Map Key

Geologic Hazards Investigation
4033 East Nordic Valley Way
Eden, Utah
Project Number: 1236-002

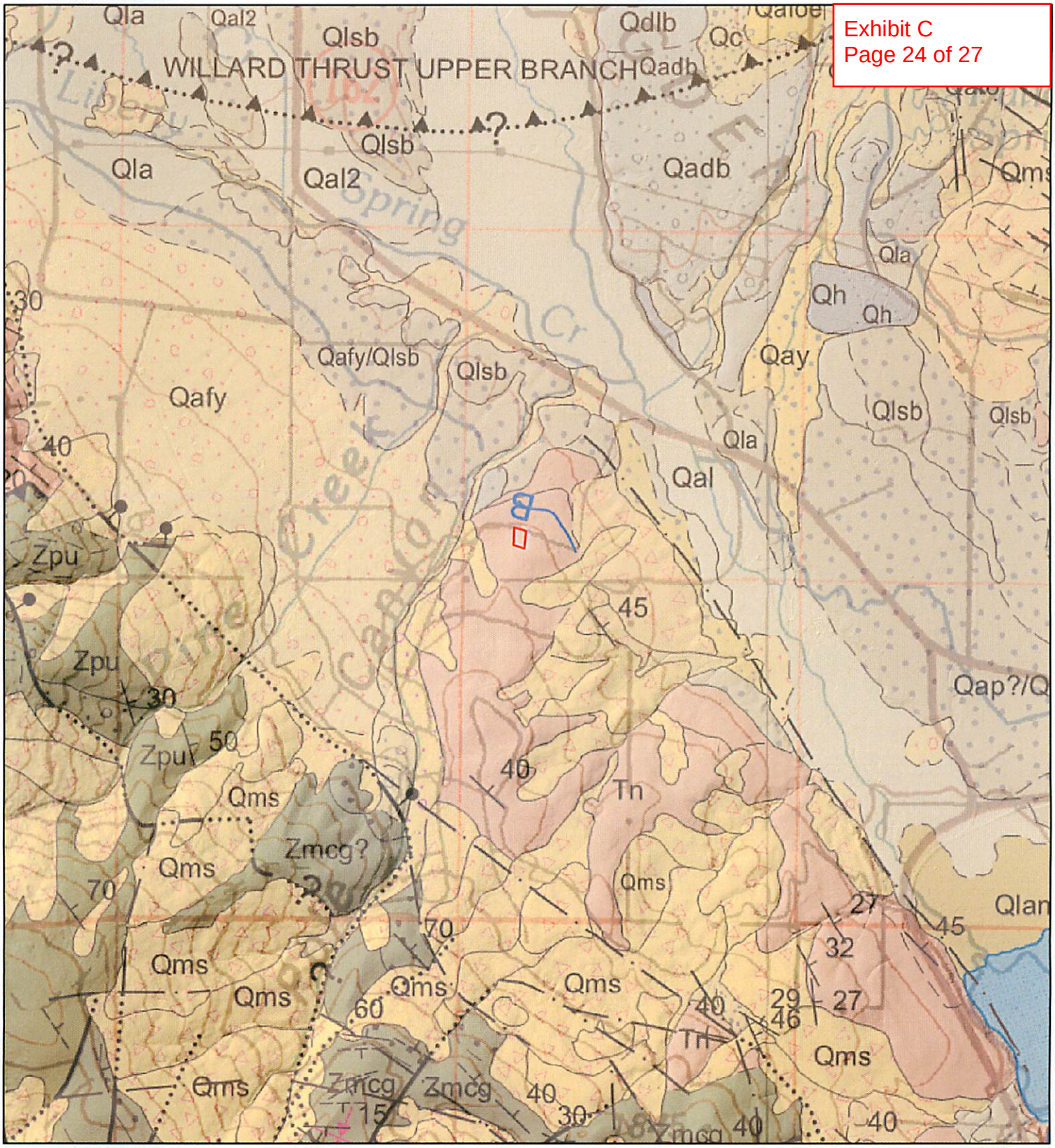
Plate 3b



1:24,000 Geologic Map of the Hunstville Quadrangle, Weber and Cache Counties, Utah, Sorensen and Crittenden, 1979, Map Key

Geologic Hazards Investigation
4033 East Nordic Valley Way
Eden, Utah
Project Number: 1236-002

Plate 3c



Legend

Approximate Site Boundary

refer to map cited for geologic unit descriptions

0 750 1,500 3,000 4,500 6,000 Feet

1 inch = 2,000 feet

Base Map:
Interim Geologic Map of the Ogden 30' X 60' Quadrangle, Box, Elder, Cache, Davis, Morgan, Rich, and Summit Counties, Utah, Coogan and King, 2016. Hillshades derived from 2011 1 meter LiDAR provided by the State of Utah AGRC.

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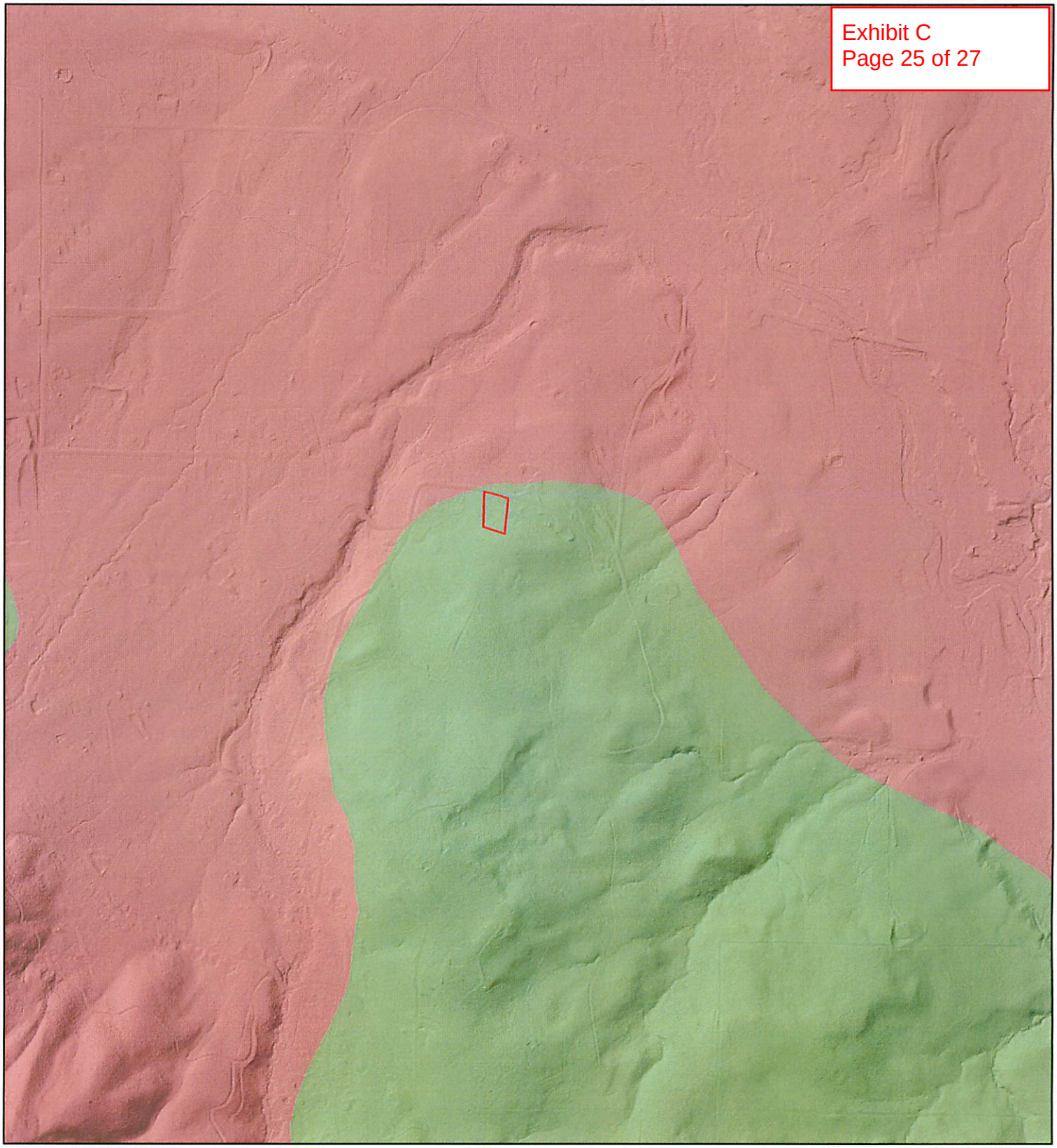
Site Vicinity 30x60 Geologic Map

Plate 4



Legend

- Approximate Site Boundary
- LandslideScarps
- DebrisFlowPaths
- deep or unclassified landslide
- landslide and/or landslide undifferentiated from talus, colluvial, rock-fall, glacial, and soil-creep deposits
- landslide undifferentiated from talus and/or colluvial deposits
- lateral spread and/or flow failure
- not classified
- shallow landslide

0 375 750 1,500 2,250 3,000 Feet

1 inch = 1,000 feet

Base Map:
Landslide Maps of Utah, Ogden 30' X60' Quadrangle, Elliot and Harty, 2010. Hillshades derived from 2011 1 meter LiDAR provided by the State of Utah AGRC.

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Geologic Hazards Assessment
4033 Nordic Valley Drive
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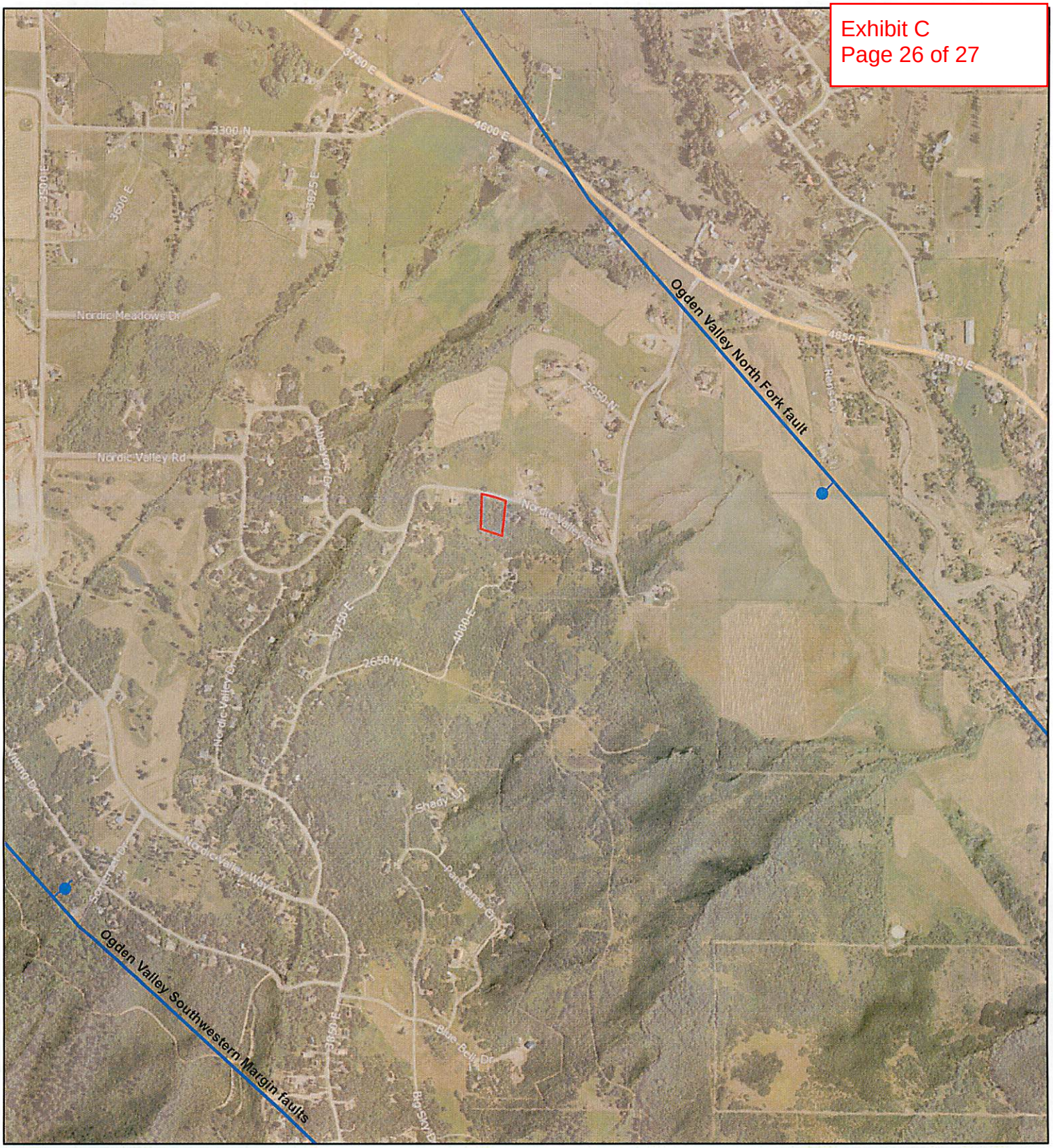
Landslide Hazard Map

Plate 5



Legend

- Approximate Site Boundary

Quaternary Fault

- <150 Years, Well Constrained
- <15,000 Years, Well Constrained
- <15,000 Years, Moderately Constrained
- <15,000 Years, Inferred
- <130,000 Years, Well Constrained
- <130,000 Years, Moderately Constrained
- <130,000 Years, Inferred
- <750,000 Years, Well Constrained
- <750,000 Years, Moderately Constrained
- <750,000 Years, Inferred
- <2.6 Million Years, Well Constrained
- <2.6 Million Yeras, Moderately Constrained
- <2.6 Million Years, Inferred

0 375 750 1,500 2,250 3,000 Feet

1 inch = 1,000 feet

Base Map:
UGS quaternary fault data provided by the State of Utah AGRC.
Aerial imagery provided by ArcGIS Basemaps. Hillshades derived from 2011 1 meter LiDAR provided by the State of Utah AGRC.

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Geologic Hazards Assessment
4033 Nordic Valley Drive
Liberty, Utah
Project Number: 1236-002

UGS Quaternary Fault Map

Plate 6

Legend

- Approximate Site Boundary
- Stream (National Hydrology Dataset)

0 375 750 1,500 2,250 3,000 Feet

1 inch = 1,000 feet

Base Map:
National Hydrology Dataset provided by the State of Utah AGRC.
Aerial imagery proved bu ArcGIS Basemaps. Hillshades derived from 2011 1 meter LiDAR provided by the State of Utah AGRC.

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Geologic Hazards Assessment
4033 Nordic Valley Drive
Liberty, Utah
Project Number: 1236-002

Dainage Map

Plate 7