



CITY OF OREM
BOARD OF ADJUSTMENTS MEETING
56 North State Street, Orem, Utah
May 24, 2023

*This meeting may be held electronically
to allow a Board Member to participate.*

5:30 PM PRE-MEETING

6:00 PM REGULAR SESSION – CITY COUNCIL CHAMBERS

1. CALL TO ORDER
2. INVOCATION/INSPIRATIONAL THOUGHT: BY INVITATION
3. 6:00 PM SCHEDULED ITEM
 - 3.1 **Variance – The applicant requests the Board of Adjustment grant a variance for property located at 2501 East Provo Canyon Road to Section 10-5-1 by allowing a septic tank system to be installed and not require the new structure to connect to the City’s sanitary sewer system.**
4. MINUTES REVIEW AND APPROVAL
 - 4.1 **Review and approve the minutes from the June 22, 2022 meeting.**
5. ADJOURN
 - 5.1 **The next meeting is scheduled for Wednesday, June 28, 2023.**

THE PUBLIC IS INVITED TO PARTICIPATE IN ALL BOARD OF ADJUSTMENT MEETINGS.
If you need a special accommodation to participate in the Board of Adjustment Meetings and Study Sessions,
please call the Development Services Office at least 3 working days prior to the meeting.
(Voice 801-229-7183)

This agenda is also available on the City's webpage at orem.org

Item #: 3.1 Prepared By: Jason Bench, AICP Assistant Development Services Director Applicant: Sean Hadlock NOTICES: • Posted in 2 public places • Posted on City webpage and City hotline • Faxed to newspapers • E-mailed to newspapers • Posted at utah.gov/pmn • Mailed 24 notices on May 12, 2023 SITE INFORMATION: • General Plan Designation: Rural Density Residential • Current Zone: OS5 • Acreage: 0.28 • Neighborhood: Unclassified ACTION: The Board of Adjustment shall approve or deny the applicant’s variance request FIVE CRITERIA: • Literal enforcement of the zoning ordinance would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of the zoning ordinance; • There are special circumstances attached to the property that do not generally apply to other properties in the same district; • Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same district; • The variance will not substantially affect the general plan and will not be contrary to the public interest; and • The spirit of the zoning <tr><td data-bbox="410 96 1211 1919"> Board of Adjustment May 24, 2023 VARIANCE – The applicant requests the Board of Adjustment grant a variance for property located at 2501 East Provo Canyon Road to Section 10-5-1 by allowing a septic tank system to be installed and not require the new structure to connect to the City’s sanitary sewer system. REQUEST: The applicant requests to rebuild an existing structure on a parcel located at 2501 East Provo Canyon Road. BACKGROUND: The applicant is requesting to rebuild a structure on a parcel located at 2501 East Provo Canyon Road. The parcel contains an older one-story structure built in 1924 containing 285 square feet which will be removed. The applicant is hoping to build a new home containing approximately 1,500 square feet according to a concept floor plan submitted. The parcel is located in the Flood Plain (adjacent to the Provo River) and is designated as Zone A on the Flood Insurance Rate Map (FIRM) dated June 19, 2020. Development in the flood plain is regulated by Orem City Code Chapter 10. <i>Flood Damage Prevention</i> and requires strict development standards within the flood plain. The ordinance requires (Section 10-3-3) that “No structure or land shall hereafter be constructed, located, extended, or altered or have its use changed without full compliance with the terms of this Chapter and other applicable regulations.” Section 10-3-5 (<i>Interpretation</i>) outlines how the ordinances in Chapter 10 should be interpreted: In the interpretation of this Chapter, all provisions shall be: A. Considered as minimum requirements; B. Liberally construed in favor of the governing body; and C. Deemed neither to limit nor repeal any other powers granted under State statutes. In order for the applicant to construct a new home at this location the Board of Adjustment must grant a variance to Section 10-5-1 as outlined below: Section 10-5-1 states that “<u>All new construction shall be required to connect to City’s sanitary sewer system.</u>” Since this parcel is located approximately two (2) miles from the nearest connection it seems impracticable to require the applicant to connect to an existing sewer line. The current older cabin is using an existing septic system. The applicant suggests that “<i>Without a variance for connecting to the city sanitary waste system, we cannot build, add on or renovate on this property, and neither could any of the homeowners on Provo Canyon Road.</i>” The applicant has received approval from the Utah County Health Department to keep the existing <tr><td data-bbox="1211 96 1502 1919">  </td></tr></td></tr>	Board of Adjustment May 24, 2023 VARIANCE – The applicant requests the Board of Adjustment grant a variance for property located at 2501 East Provo Canyon Road to Section 10-5-1 by allowing a septic tank system to be installed and not require the new structure to connect to the City’s sanitary sewer system. REQUEST: The applicant requests to rebuild an existing structure on a parcel located at 2501 East Provo Canyon Road. BACKGROUND: The applicant is requesting to rebuild a structure on a parcel located at 2501 East Provo Canyon Road. 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ordinance is observed and substantial justice done.

1,000-gallon septic tank and install 70 feet of new drain field. The final inspection of the drain field will be completed by the Health Department. The septic system permit is part of the report for your review.

The applicant has also provided detailed information concerning the base flood elevation of the proposed structure and how it relates to the surrounding area which complies with the standards outlined in the ordinance.

In addition, the applicant has received FEMA determination that the lot is not located within a Special Flood Hazard Area (SFHA); and, has provided verification of the actual elevation of the new structure in relation to mean sea level.

Furthermore, the site plan verifies that the lowest floor level is elevated one foot above the base flood elevation as drawn by a registered professional engineer.

Finally, the site plan shows the improvements, including any addition or new structure, will not result in any increase in flood levels during the occurrence of the base flood discharge as required.

Chapter 10 also outlines specific factors the Board of Adjustment must consider in the determination for granting variances to Chapter 10. The applicant has addressed these questions and the information provided is part of the staff report for your review.

Section 10-4-5:

“G. Prerequisites for granting variances:

1. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
2. Variances shall only be issued upon:
 - a. showing a good and sufficient cause;
 - b. a determination that failure to grant the variance would result in exceptional hardship to the applicant, and
 - c. a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, the creation of nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.
3. Any application to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

Variances may be issued by the Board of Adjustment for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that:

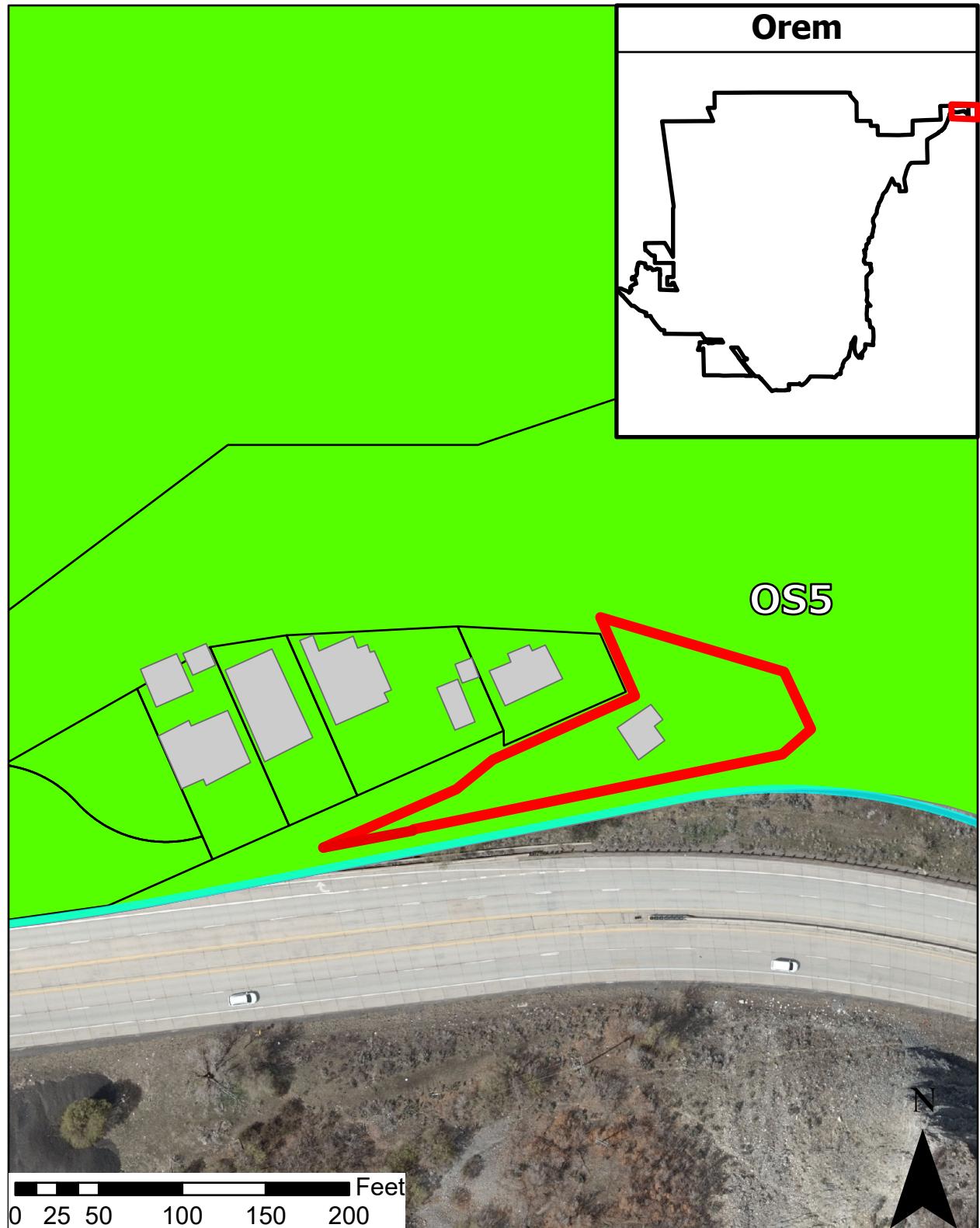
- H. The structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.”

Based on the factors outlined above the Board of Adjustment must decide whether the request for a variance meets the strict requirements for granting a variance in a flood plain.

RECOMMENDATION: Staff recommends the Board of Adjustment grant a variance for property located at 2501 East Provo Canyon Road to Section 10-5-1 by allowing a septic tank system to be installed and not require the new structure to be connect to the City's sanitary sewer system.



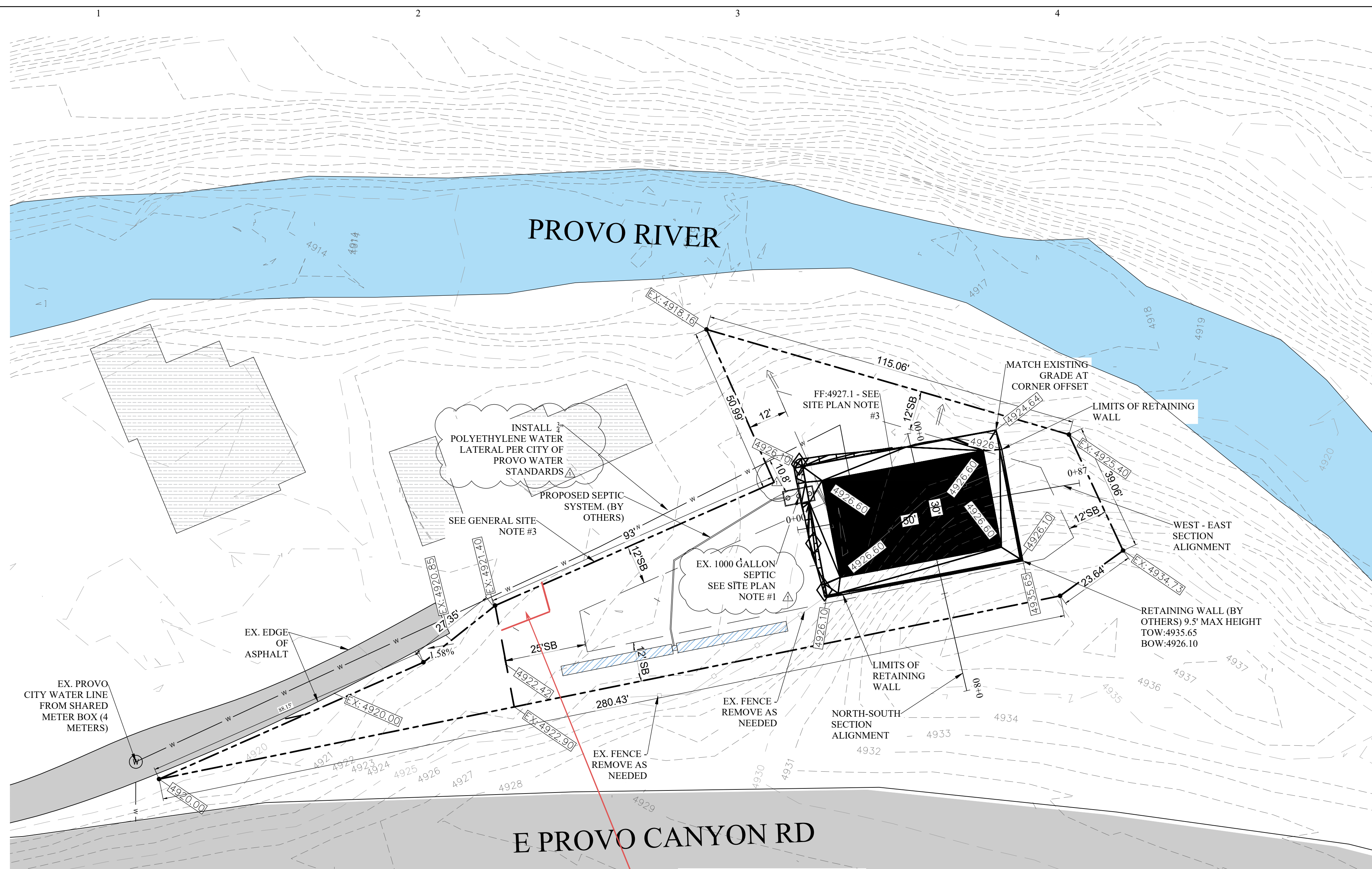
Hadlock Variance



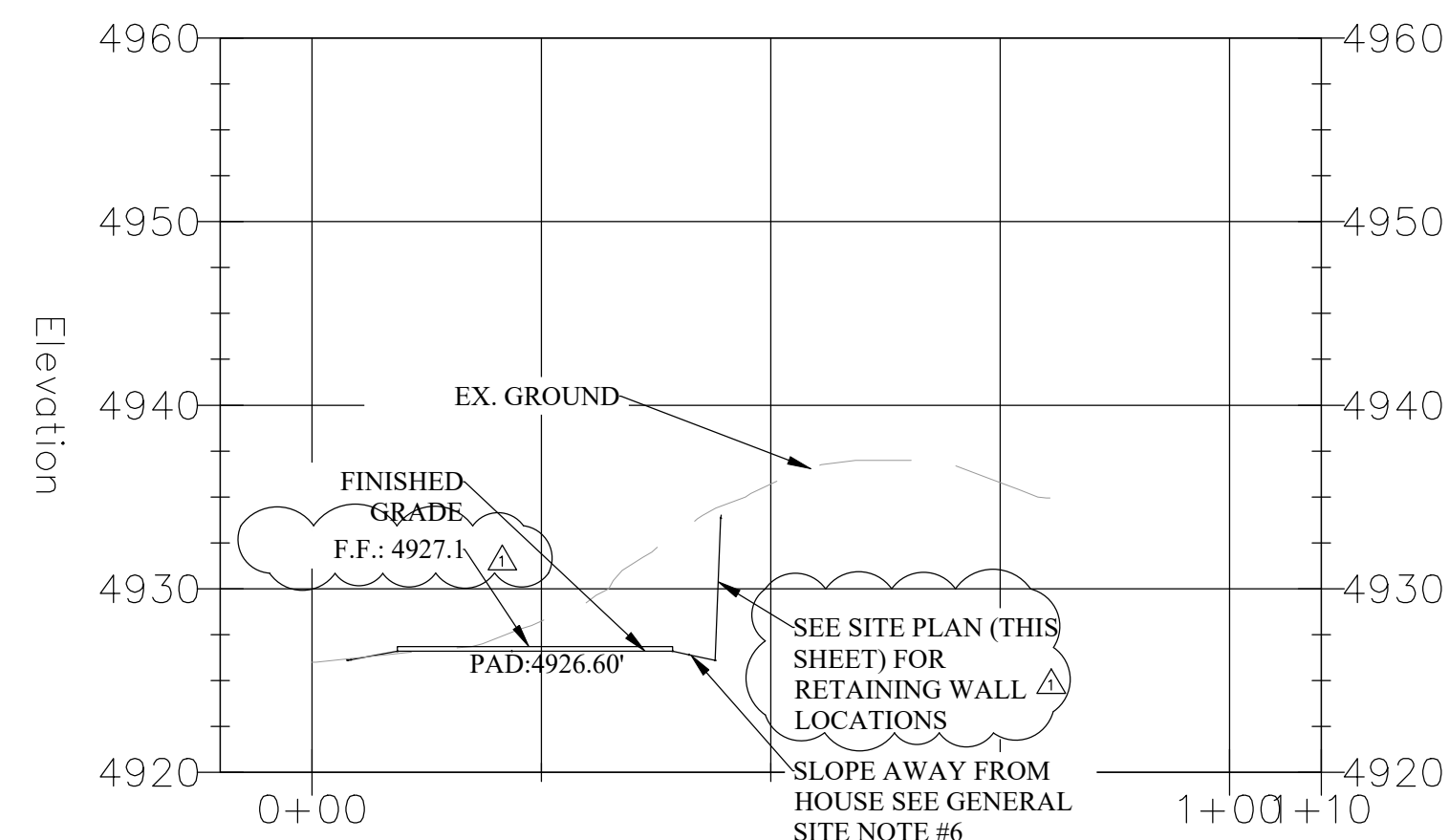
Variance
OS5

- Legend
-  2501 E Provo Canyon
 -  Road
 -  Parcels

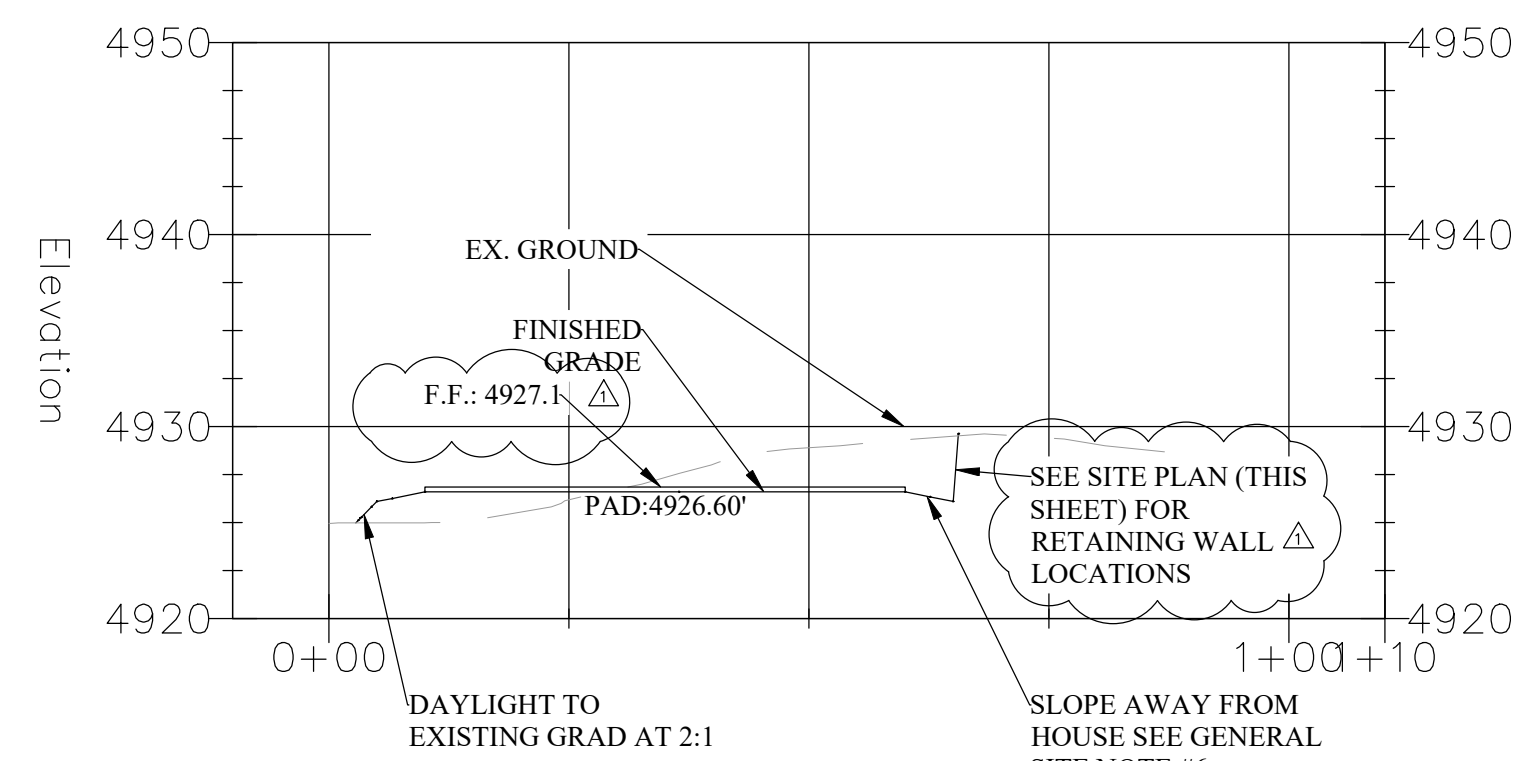
Site Plan



NORTH-SOUTH SECTION PROFILE



WEST-EAST SECTION PROFILE



- GENERAL SITE NOTES:
1. NOTIFY BLUE STAKES (801) 208-2100/(800) 662-4111 OR BLUESTAKES.ORG AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.SEE ARCHITECTURAL PLANS BUILDING DETAILS AND DIMENSIONS.
 2. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS AND LOCATION OF ALL EXISTING UTILITIES (INCLUDING SEWER LATERAL THAT WAS NOT LOCATED) PRIOR TO CONSTRUCTION. IF DIFFERENT THAN SHOWN NOTIFY ENGINEER BEFORE PROCEEDING.
 3. DRAINAGE SWALES TO BE INSTALLED ALONG SIDE AND REAR PROPERTY LINES AS REQUIRED TO DIRECT DRAIN AWAY FROM ADJACENT PROPERTIES. SWALES SHALL REMAIN UNALTERED AND BE MAINTAINED BY PROPERTY OWNER.
 4. NATURAL DRAINAGE SHALL NOT BE FILLED IN WHERE THE POTENTIAL FOR RUNOFF FROM UPSTREAM EXISTS, WITHOUT PROVIDING A PLAN FOR THE POTENTIAL RUNOFF.
 5. ALL CUT AND FILL SLOPES SHOWN ARE 2:1.
 6. THE GRADE AWAY FROM FOUNDATION WALLS SHALL FALL A MINIMUM OF 6 INCHES WITHIN THE FIRST 10 FEET (5%).
 7. PROVIDE LANDINGS ON BOTH SIDES OF ALL EXTERIOR DOORS. LANDINGS MUST BE 36 INCHES DEEP (MIN).
 8. A TRASH DUMPSTER AND PORTABLE CONSTRUCTION TOILET SHALL BE PROVIDED AT ALL NEW CONSTRUCTION SITES.
 9. REFERENCE OREM STANDARDS AND SPECIFICATIONS FOR CONSTRUCTION REQUIREMENTS.
 10. ANY WORK IN THE PUBLIC RIGHT OF WAY SHALL CONFORM TO OREM STANDARD PLANS AND SPECIFICATIONS.
 11. EXISTING LIDAR TOPOGRAPHY PROVIDED BY OWNER - STATED DATUMS FOR LIDAR
HORIZONTAL: (NAD83) 2011
VERTICAL: (NAVD88) GEOID 12A
 12. NO PROPERTY CORNERS OR PROPERTY LINES WERE SET OR SHOULD BE SET FROM THIS DRAWING.
 13. PROPERTY LINES SHOWN FOR GENERAL REFERENCE. PROPERTY BOUNDARY SURVEY PERFORMED BY LAYTON SURVEYS ON 12-16-22
 14. BUILDING LOCATION RELATIVE TO PROPERTY BOUNDARY WILL NEED TO BE SURVEYED BY A PROFESSIONAL LAND SURVEYOR.

- SITE PLAN NOTES:**
1. SEWER SEPTIC DESIGN AND PERMITTING (BY OTHERS) GENERAL LOCATION SHOWN ON SITE PLAN WITH DATA PROVIDED BY OWNER.
 2. BASE FLOOD ELEVATIONS (BFE) FOR THE PROVO RIVER ADJACENT TO THE PROPERTY WHERE CALCULATED BY JUB ENGINEERING. THE REPORT OR TECHNICAL MEMO NARRATIVE IS DATED AUGUST 22, 2022 AND HAS A SUBJECT LINE OF "NARRATIVE FOR FLOMA/LOW FLOOD SUBMISSION WITH LIDAR" A BFE OF 4925.6 WAS PRESENTED IN THE REPORT - SEE FIGURE 5. ON PAGE 4 OF REFERENCE REPORT. A FINISHED FLOOR ELEVATION OF 4627.1 (18" ABOVE CALCULATED BFE) WAS USED FOR THE PROPOSED BUILDING.

LEGEND

FF- FINISHED FLOOR MAIN

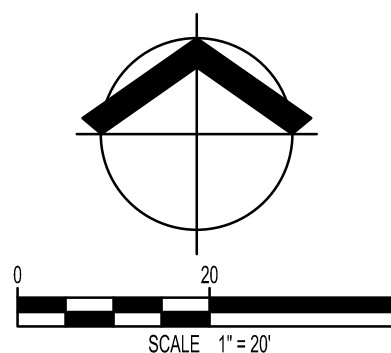
⇒ FLOW DIRECTION

• FINISHED GRADE ELEVATION

EXISTING GRADE ELEVATION

- PROPERTY SETBACKS (SB)

- FRONT: 25'
- SIDE: 12'
- REAR: 12'



**REDWOOD
ENGINEERING** Inc.
291 E. 950 S. OREM, UTAH 84058
P: 801.426.8500 E: info@redwoodeng.com
www.redwoodeng.com

HADLOCK SITE PLAN

SEAN HADLOCK

61 19 W 10550 N St Highland, UT 84003

[illegible]

PROJECT #	L2021-161
CAD DWG FILE:	SP-01 - REV.dwg

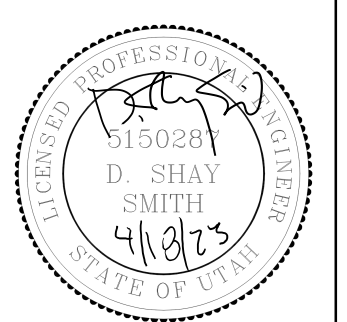
DRAWN BY:

M. GAMEZ

CHECKED BY:

S. SMITH
DESIGNED BY:

DESIGNED BY:
M. GAMEZ



SHEET TITLE:

SITE PLAN

SHEET NAME:

SP-01

SHEET	1	OF	3
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Federal Emergency Management Agency

Washington, D.C. 20472

March 15, 2023

MR. JOHN DE LEON
J-U-B ENGINEERS, INC.
240 WEST CENTER STREET
OREM, UT 84057

CASE NO.: 23-08-0222C
COMMUNITY: CITY OF OREM, UTAH COUNTY,
UTAH
COMMUNITY NO.: 490216

DEAR MR. DE LEON:

This is in reference to a request that the Federal Emergency Management Agency (FEMA) determine if the property described in the enclosed document is located within an identified Special Flood Hazard Area, the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), on the effective National Flood Insurance Program (NFIP) map. Using the information submitted and the effective NFIP map, our determination is shown on the attached Conditional Letter of Map Amendment (CLOMA) Comment Document. This comment document provides additional information regarding the effective NFIP map, the legal description of the property and our comments regarding this proposed project.

Additional documents are enclosed which provide information regarding the subject property and CLOMAs. Please see the List of Enclosures below to determine which documents are enclosed. Other attachments specific to this request may be included as referenced in the Determination/Comment document. If you have any questions about this letter or any of the enclosures, please contact the FEMA Map Insurance eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426.

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

LIST OF ENCLOSURES:

CLOMA COMMENT DOCUMENT



Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP AMENDMENT

COMMENT DOCUMENT

COMMUNITY AND MAP PANEL INFORMATION		LEGAL PROPERTY DESCRIPTION
COMMUNITY	CITY OF OREM, UTAH COUNTY, UTAH	
	COMMUNITY NO.: 490216	
AFFECTED MAP PANEL	NUMBER: 49049C0334F	
	DATE: 6/19/2020	
FLOODING SOURCE: PROVO RIVER		APPROXIMATE LATITUDE & LONGITUDE OF PROPERTY:40.329207, -111.636501 SOURCE OF LAT & LONG: LOMA LOGIC DATUM: NAD 83

COMMENT TABLE REGARDING THE PROPOSED PROPERTY (PLEASE NOTE THAT THIS IS NOT A FINAL DETERMINATION. A FINAL DETERMINATION WILL BE MADE UPON RECEIPT OF AS-BUILT INFORMATION REGARDING THIS PROPERTY.)

LOT	BLOCK/ SECTION	SUBDIVISION	STREET	OUTCOME WHAT WOULD BE REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)
--	--	--	2501 East Provo Canyon Road	Structure	X (unshaded)	4925.8 feet	4926.6 feet	--

Special Flood Hazard Area (SFHA) - The SFHA is an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood).

ADDITIONAL CONSIDERATIONS (Please refer to the appropriate section on Attachment 1 for the additional considerations listed below.)

PORTIONS REMAIN IN THE SFHA CONDITIONAL LOMA DETERMINATION ZONE A	STATE LOCAL CONSIDERATIONS
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This document provides the Federal Emergency Management Agency's comment regarding a request for a Conditional Letter of Map Amendment for the property described above. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we have determined that the proposed structure(s) on the property(ies) would not be located in the SFHA, an area inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) if built as proposed. Our final determination will be made upon receipt of a copy of this document and certified as-built information showing the location of the structure(s), and the elevation of the lowest adjacent grade to the structure(s). This document is not a final determination; it only provides our comment on the proposed project in relation to the SFHA shown on the effective NFIP map.

This comment document is based on the flood data presently available. The enclosed documents provide additional information regarding this request. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration



Federal Emergency Management Agency
Washington, D.C. 20472

**CONDITIONAL LETTER OF MAP AMENDMENT
COMMENT DOCUMENT**

ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

PORTIONS OF THE PROPERTY REMAIN IN THE SFHA (This Additional Consideration applies to the preceding 1 Property.)

Portions of this property, but not the subject of the Determination/Comment document, may remain in the Special Flood Hazard Area. Therefore, any future construction or substantial improvement on the property remains subject to Federal, State/Commonwealth, and local regulations for floodplain management.

CONDITIONAL LOMA DETERMINATION (This Additional Consideration applies to the preceding 1 Property.)

Comments regarding this conditional request are based on the flood data presently available. Our final determination will be made upon receipt of this comment document, certified as-built elevations and/or certified as-built survey. Please note that additional items may be required before a final as-built determination is issued.

This letter does not relieve Federal agencies of the need to comply with Executive Order 11988 on Floodplain Management in carrying out their responsibilities and providing Federally undertaken, financed, or assisted construction and improvements, or in their regulating or licensing activities.

ZONE A (This Additional Consideration applies to the preceding 1 Property.)

The National Flood Insurance Program map affecting this property depicts a Special Flood Hazard Area that was determined using the best flood hazard data available to FEMA, but without performing a detailed engineering analysis. The flood elevation used to make this determination is based on approximate methods and has not been formalized through the standard process for establishing base flood elevations published in the Flood Insurance Study. This flood elevation is subject to change.

STATE AND LOCAL CONSIDERATIONS (This Additional Consideration applies to all properties in the CLOMA COMMENT DOCUMENT)

Please note that this document does not override or supersede any State or local procedural or substantive provisions which may apply to floodplain management requirements associated with amendments to State or local floodplain zoning ordinances, maps, or State or local procedures adopted under the National Flood Insurance Program.

This attachment provides additional information regarding this request. If you have any questions about this attachment, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426.

DATE: August 22, 2022
TO: FEMA Reviewers
CC: Jason Bench, AICP
Mark Christensen, PE
Sean Hadlock
FROM: John De Leon
SUBJECT: Narrative for CLOMA / LOMA Submission with LiDAR

The purpose of this memo is to provide supplemental guidance and justification for the methods and resources used to create a Conditional Letter of Map Amendment / Letter of Map Amendment (CLOMA / LOMA) application for the construction of a structure adjacent to the Provo River that would be acceptable to Federal Emergency Management Agency (FEMA) personnel.

Background Information

A property owner is planning to build a structure on his property at 2501 E Provo Canyon Road, Provo, UT 84604. According to the current effective FEMA Flood Insurance Rate Map (FIRM), the area where he would like to construct is located within a Zone A (See Attachment 1) of the Provo River. Since this zone does not have an associated detailed study, there are no Base Flood Elevations (BFEs) that have been established, and the property owner was unable to determine if his structure footprint would fall below the adjacent BFE. In order to determine the adjacent BFE and extent of the 100-year floodplain, we used Light Detection and Ranging (LiDAR) data that was readily available online for this region to create a 2-Dimensional (2-D) hydraulic model.

Modeling Methods

The interface used to create the 2-D hydraulic model was developed by Aquaveo and is called the Surface-water Modeling System (SMS). The computational program used to calculate flows through the region was developed by the Bureau of Reclamation (BOR) and is called Sediment and River Hydraulics 2-D (SRH-2D). Elevation data in the form of LiDAR was pulled from the United States Geographical Survey (USGS) National Map Download and inserted into the model. We felt that the use of this data was acceptable because it followed the criteria for LiDAR use

outlined in Attachment 2. The LiDAR metadata has been provided in Attachment 3. The flow input parameter was a constant rate of 3,200 cfs, which is the effective 100-year peak flow of the Provo River according to the Flood Insurance Study (FIS) for communities in Utah County (FEMA, 2020). Based on a desktop review of aerial imagery and street views of the area, various manning’s roughness coefficients were determined for every surface that would likely be fully or partially flooded during the model run. The manning’s roughness coefficients came from a well-established table of values (Chow, 1959) and are shown in the screenshot in Figure 1. The regions assigned with these materials in the model are shown in Figure 2 below, with the structure footprint outlined in black.

	Color and Texture	Name	Manning's N	Depth Varied Curve	Curve
1		unassigned	0.02	☐	
2		3.D.4 Floodplains, heavy trees, undergrowth	0.1	☐	
3		2.B. Mountain Streams with large boulders...	0.05	☐	
4		5.I. Smooth Asphalt	0.013	☐	
5		OutsideModel	0.04	☐	
6		3.A.1 Floodplains, pasture, no brush, short ...	0.02	☐	
7		3.C.1 Scattered brush, heavy weeds	0.05	☐	

Figure 1: Manning's Roughness Coefficient (N) Values

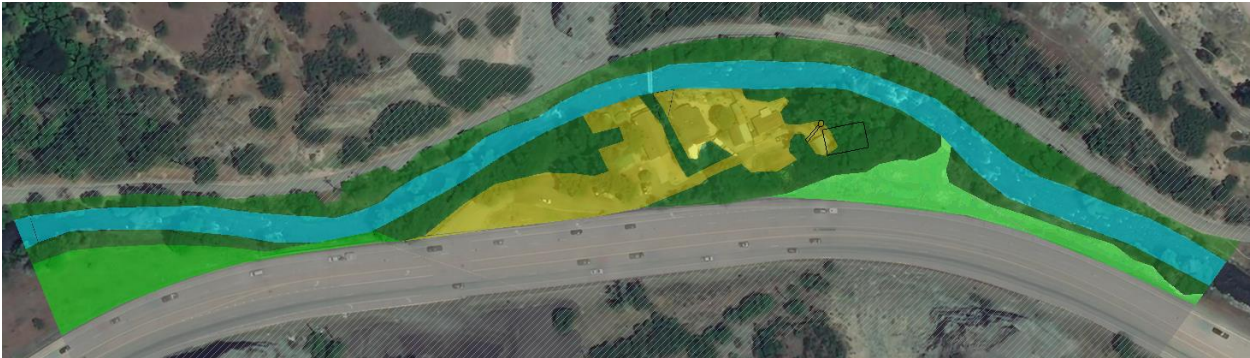


Figure 2: Material regions with different roughness values

The mesh surface that was used for determining the computational points throughout the area had a finer resolution within the channel and along the banks. The spacing of the elements ranged from 1.4 ft to 17.6 ft at the outer most edges. The mesh surface also took obstructions to flow such as the existing buildings into account.

Results

The resulting model generated 2-D floodplain extents that did not intersect with the proposed structure footprint as can be seen in Figure 3.

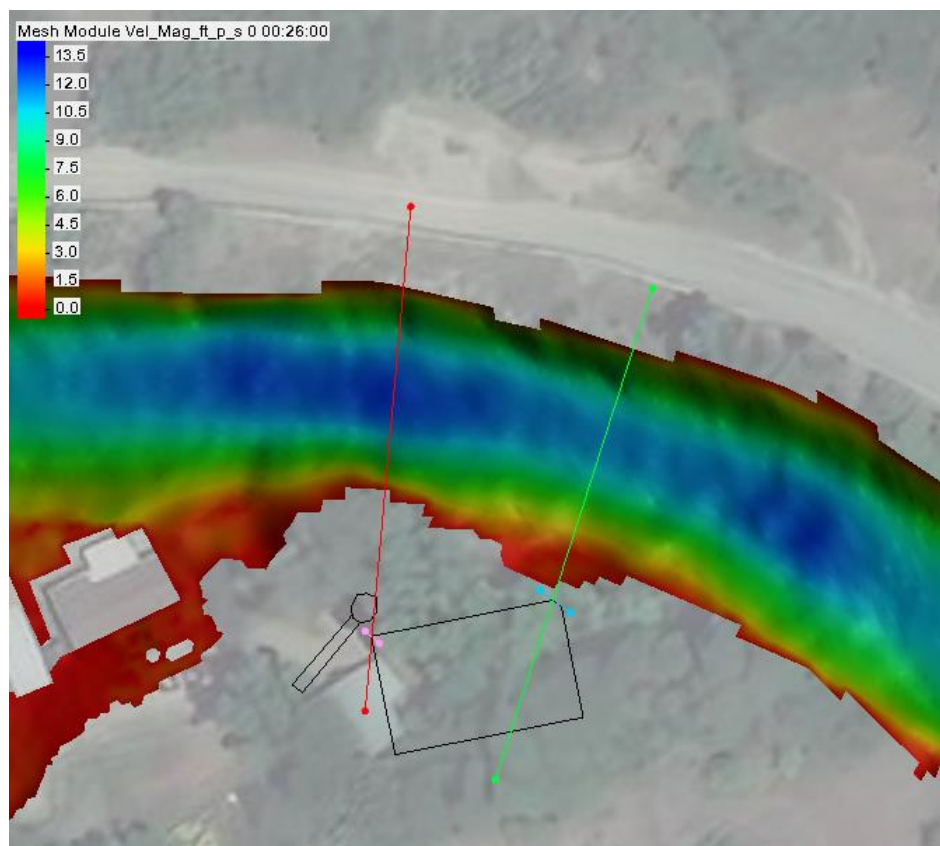


Figure 3: Resulting flood map with velocity color map contours.

To check the BFEs in relation to the Lowest Adjacent Grades (LAGs) of the structure, two cross-sectional profiles perpendicular to the flow were generated along the red and green lines shown in Figure 3 and their plots are shown in Figure 4 and Figure 5. Both of these figures indicate that the LAGs of the structure footprint are 2.2 ft and 1.21 ft above the BFEs, respectively.



Profile Red Line

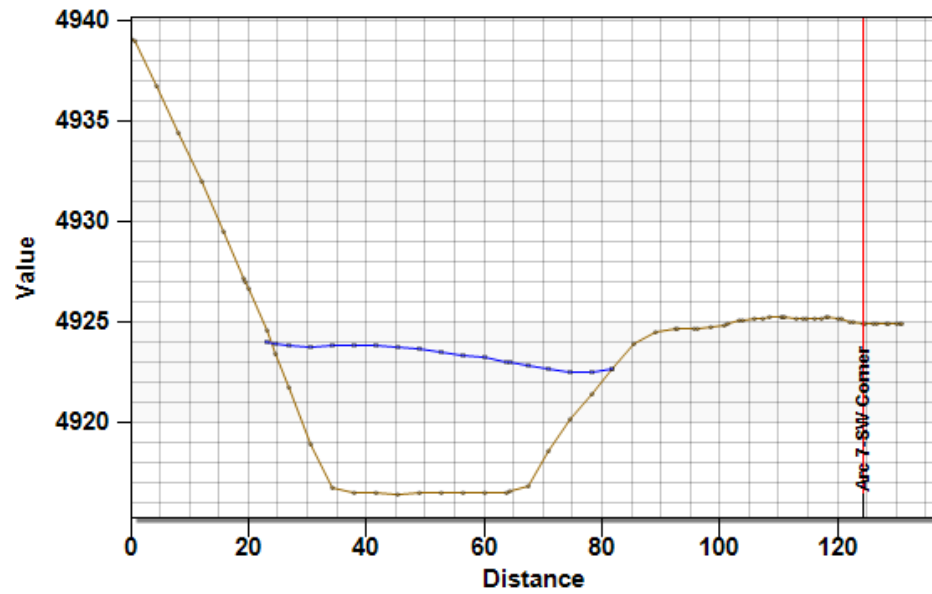


Figure 4: Cross-sectional profile through southwest corner of building.

Profile Green Line

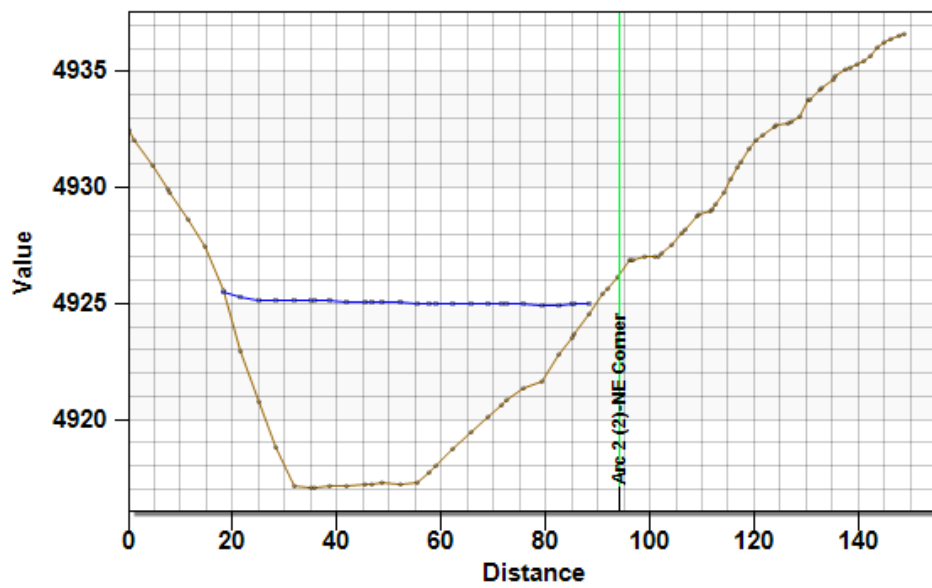


Figure 5: Cross-sectional profile through northeast corner of building.



THE
LANGDON
GROUP



GATEWAY
MAPPING
INC.

J-U-B FAMILY OF COMPANIES

Conclusion

Based on the information previously provided, we have determined that the structure footprint does not fall within the 100-year floodplain extents, nor does it fall below the adjacent BFEs and seek to exclude this structure from the effective FEMA floodplain. The required resulting LOMR Map is shown in Attachment 4.



J-U-B ENGINEERS, INC.



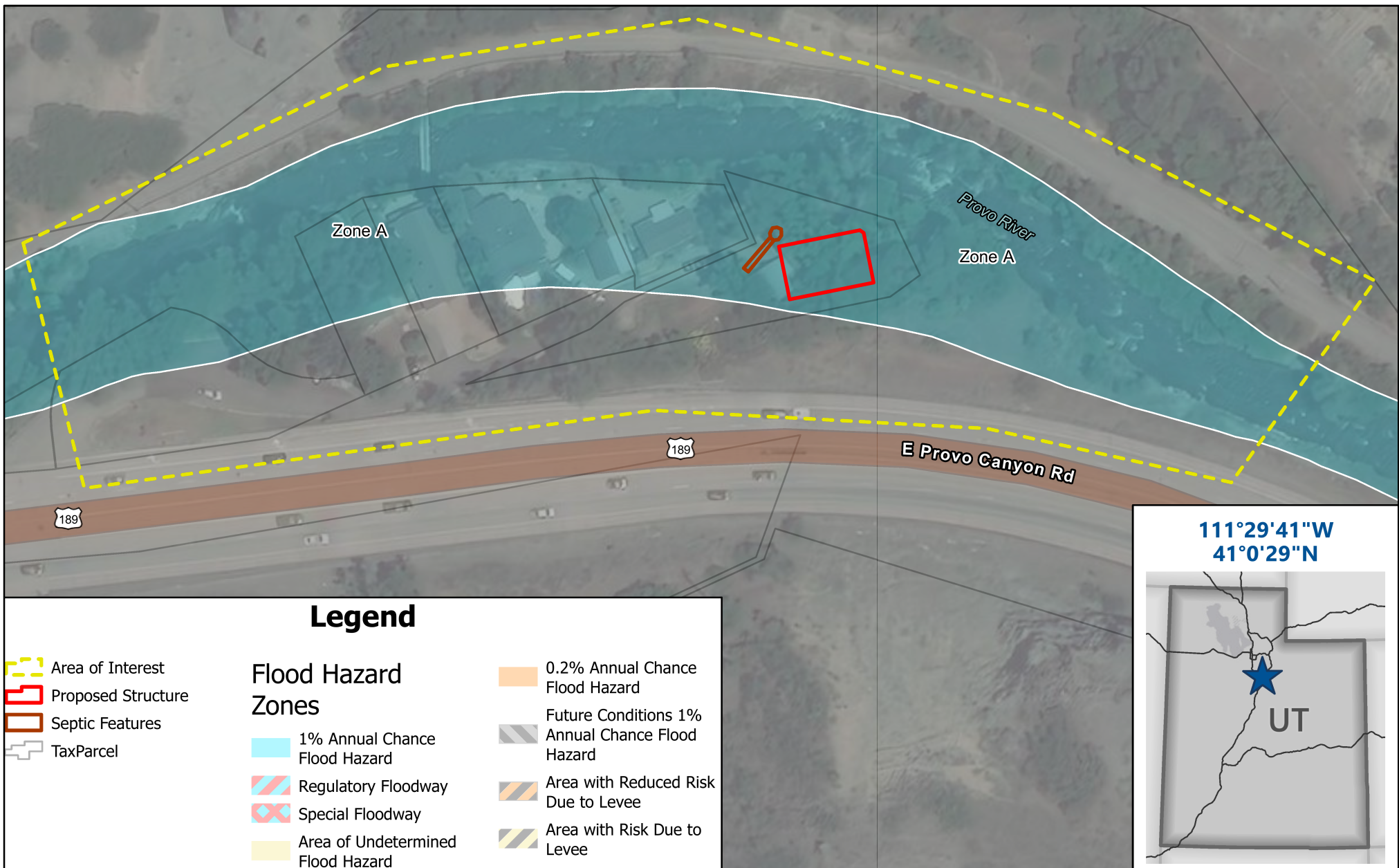
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Attachment 1: Location Map



ATTACHMENT 1 **AREA OF INTEREST** **PROJECT LOCATION**

Part of FEMA Application



August 2022



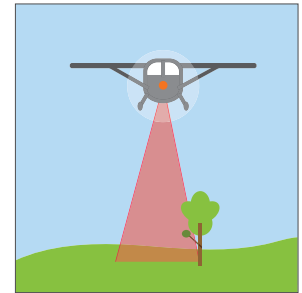


Attachment 2: FEMA LiDAR Guidance

Using LiDAR For Map Amendments

LiDAR data can replace the requirement to submit elevation information certified by a licensed land surveyor or professional engineer, which can create a cost savings for property owners. However, LiDAR data may be less accurate than certified elevations and may not capture the full risk for the building or lot.

For more information on the standard LOMA process and requirements, please refer to [How to Request a Map Amendment Guide](#).



DOES MY COMMUNITY HAVE LIDAR?

Not all communities have LiDAR data available. Talk to your floodplain administrator to find out if your community has LiDAR data.

To be used in a LOMA request, LiDAR data must meet or exceed the U.S. Geological Survey (USGS) Quality Level 3 accuracy requirement. To learn more about this requirement, please use the USGS LiDAR Base Specification Guide.

The USGS plans to collect high quality LiDAR data across the United States using a 3D Elevation Program (3DEP). For more information on the 3DEP program and current USGS LiDAR availability, please visit their [3DEP webpage](#).

WHEN LIDAR CANNOT BE USED

There are situations when LiDAR cannot be used in a LOMA request. These include applications involving the following:

- Buildings or lots elevated using fill
- Buildings or lots in the regulatory floodway
- Buildings or lots in Coastal High Hazard Areas (Zone V, VE, or V1-V30)
- Buildings or lots in Zone AO, AR, or A99
- Buildings under construction. LiDAR would need to show that the lot or portion of the lot on which building will be located is above the Base Flood Elevation (BFE)
- Conditional determinations
- Electronic LOMAs (eLOMAs)
- Potential violations identified through the LOMA process
- Physical changes to the flooding source/Special Flood Hazard Area that require revisions to the Flood Insurance Rate Map
- Requests to supersede previously issued LOMAs based on certified elevation data

Additional information about LiDAR requirements for LOMAs is available in the [MT-1 Technical Guidance](#) document.



WHAT NEEDS TO BE SUBMITTED WITH MY APPLICATION?

When requesting a LOMA using LiDAR data, you must submit a paper map or digital PDF that displays:

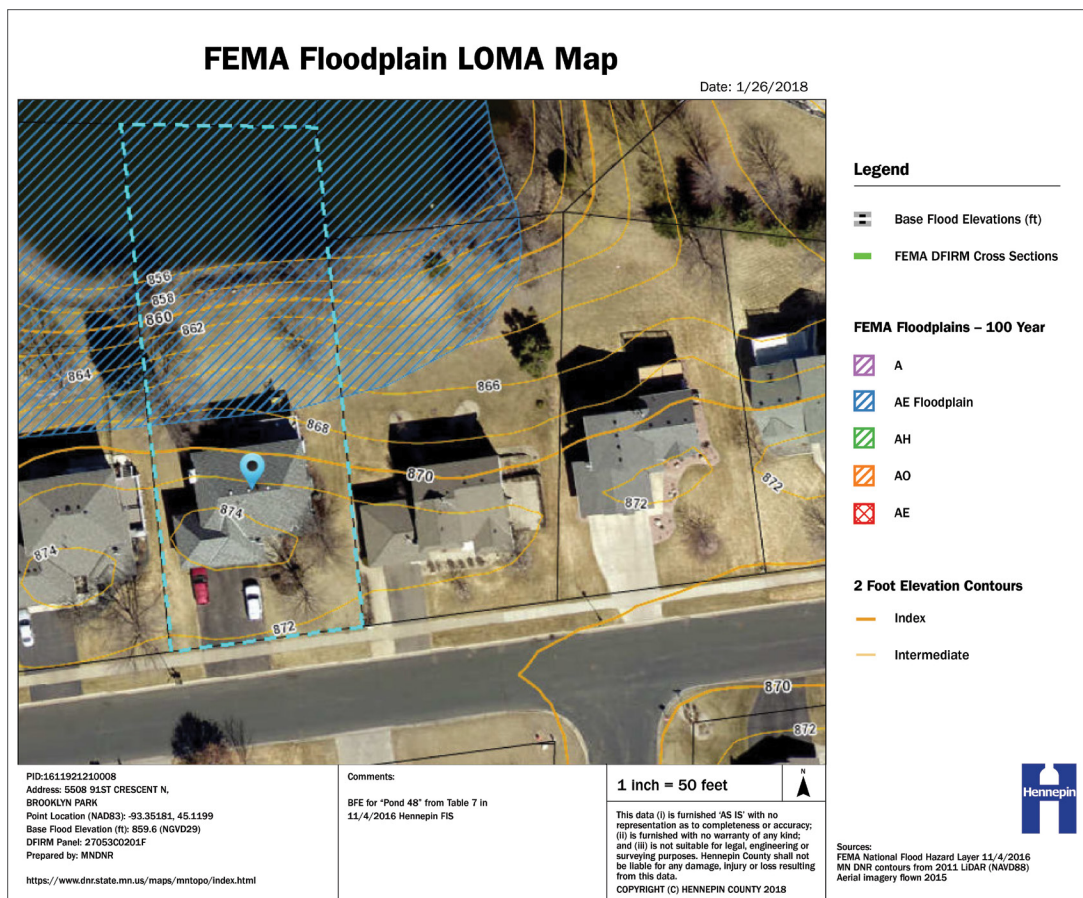
- (1) an overlay of the LiDAR contours (lines of equal elevation), or
- (2) an overlay of the LiDAR points (points with specific elevations).

Either overlay must include an aerial image of the building or lot with at least one street intersection shown on the map.

The map must also have:

- Scale and North arrow
- Address or Assessor's Parcel Number (APN) for the building/lot
- Clearly identified building and/or lot boundaries
- Name, organization, and contact information for the map overlay creator
- Aerial imagery that correctly represents the footprint of the building
- Date the LiDAR was collected
- Source of the LiDAR, including public website address. LiDAR must be provided by a Federal, State, or local government agency.
- LiDAR accuracy information (Does it meet Quality Level 3 standards?)
- Vertical Datum of elevation data (e.g., NAVD 88)
- Location of the data archive or metadata file (must be available for independent verification through a publicly available website or metadata)

Your floodplain administrator or a mapping professional can help you develop the map for your application. For other requirements, please use the How to Request a Map Amendment Guide.

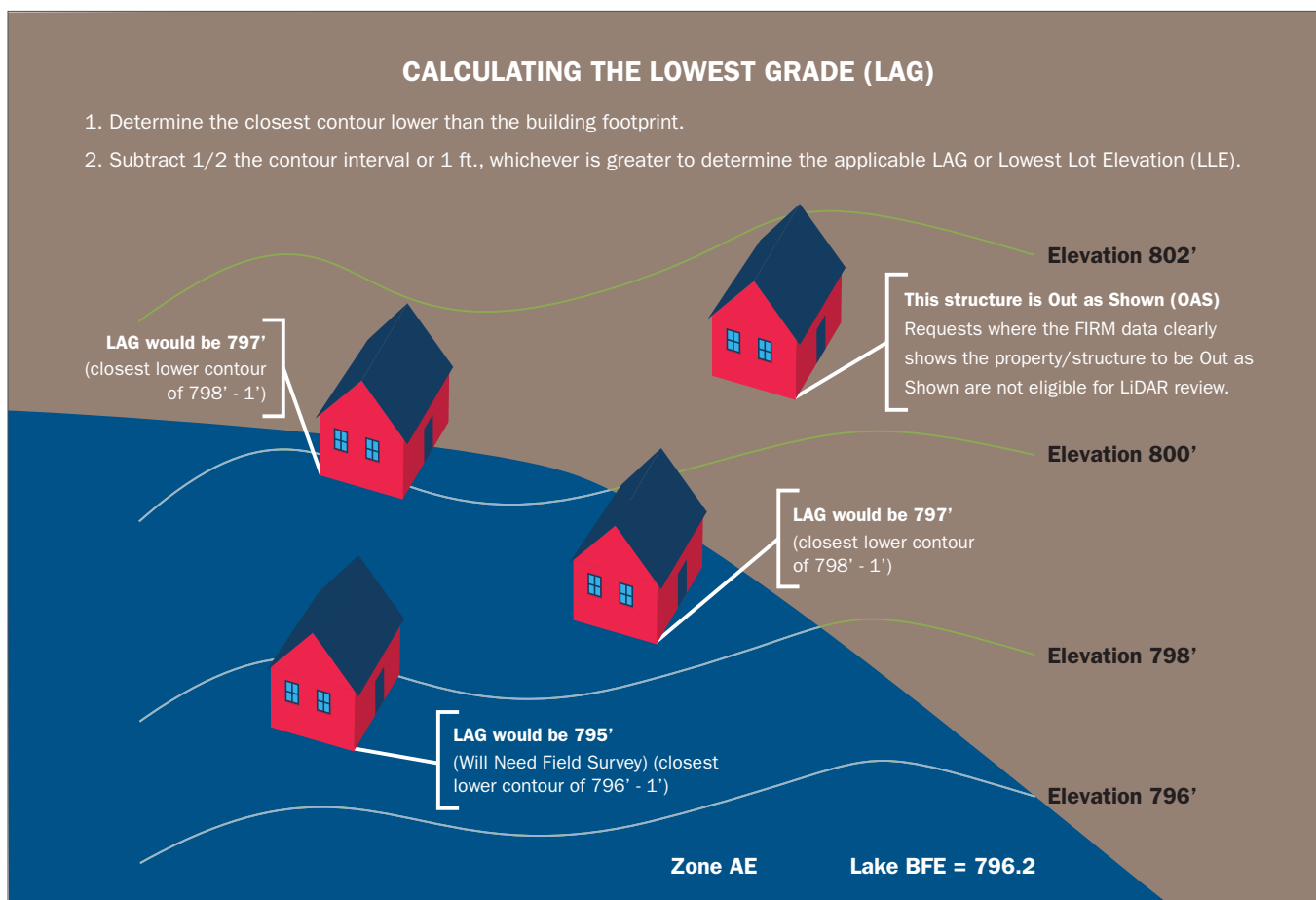


CALCULATING ELEVATIONS USING LIDAR

The lowest adjacent grade (LAG) for a building, or the lowest lot elevation (LLE) for a lot, will be compared to the effective Base Flood Elevation (BFE) to determine the flood zone. If LAG/LLE is at or above the BFE on the current flood map, FEMA can issue a removal determination. For buildings or lots that cannot be removed from the high-risk zone using LiDAR, certified elevation data will be required for a standard LOMA determination.

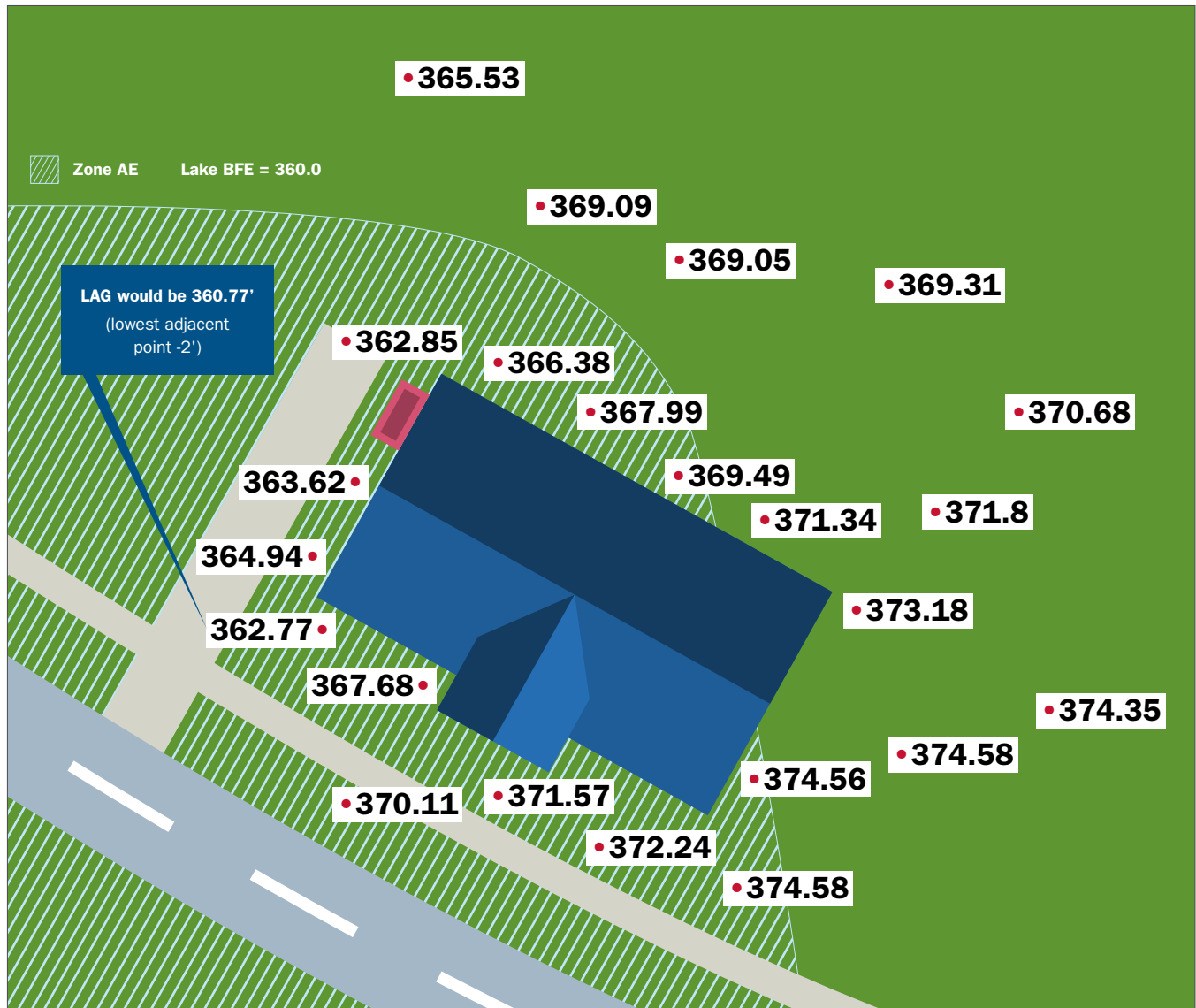
Using LiDAR Contours

For LOMA submittals that include LiDAR data contours, FEMA will subtract half the contour interval or 1 foot, whichever is greater, from the lowest contour closest to (but not going through) the building (to determine the LAG) or the lot (to determine the LLE).



Using LiDAR Point Data

For submittals that include LiDAR point data, FEMA will subtract 2 feet from the lowest point closest to the building (to determine the LAG) or the lowest point on the lot (to determine the LLE). Multiple points must cover the building/lot for this method.



WHERE DO I GO IF I NEED HELP?

To speak with a Map Specialist about the amendment process, contact the FEMA Map Information eXchange (FMIX) at 877-FEMA-MAP (877-336-2627) or FEMAMapSpecialist@riskmapcds.com



THE
LANGDON
GROUP



GATEWAY
MAPPING
INC.

J-U-B FAMILY OF COMPANIES

Attachment 3: LiDAR Metadata Report

DECEMBER 20, 2013



State of Utah Utah LiDAR 2013

Delivery 3

Technical Data / Project History Report

Prepared For:

State of Utah
Division of Integrated Technology
Automated Geographic Reference Center
1 State Office Building, Room 5130
Salt Lake City, UT 84114

Prepared by:

Watershed Sciences, Inc. (WSI)
421 SW 6th Ave. Suite 800
Portland, OR 97204
PH: 503-505-5100



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Overview

WSI is pleased to report that data collection, processing, and reporting is complete for Delivery Area 3 of the Utah LiDAR 2013 project. The total project area is 1,352 square miles along the Wasatch Front geographic area in the greater Salt Lake County, greater Utah County, and areas along the Wasatch Fault in Sanpete, Juab, Davis, Weber, Box Elder, and Oneida (Idaho) counties. Data acquisition, and all derivative products, met or exceeded all specifications outlined in the Scope of Work finalized on September 12, 2013.

Delivery Area 3 encompasses 265.8 square miles around Utah Lake.

The provided Quality Level 1 LiDAR can be used in the detection of earthquake faults and related hazard modeling, to prepare for and mitigate flooding hazards through FEMA's Risk Map, and to delineate building and structure footprints for general purpose mapping.

See Table 1 (below) for a summary of data acquisition for data delivered to date.

PROJECTION

Universal Transverse Mercator,
Zone 12N

DATUM

Horizontal:

North American Datum of 1983
(NAD83) 2011

Vertical:

North American Vertical Datum 1988
(NAVD88), GEOID 12A

UNITS

Meters

Table 1 Acquisition dates

Utah LiDAR 2013 Summary			
Delivery	Area of Interest (AOI)	Acquisition Dates	Delivery Date
Delivery 1	190.6 square miles	10/18 - 10/19, 10/22 - 10/23, 10/25 - 10/27/2013	11/22/2013
Delivery 2	250.5 square miles	10/21, 11/02, 11/06-11/11/2013	12/06/2013
Delivery 3	265.8 square miles	11/08, 11/11-11/14, 11/17-11/20, 11/26, 11/30, 12/01/2013	12/20/2013

Deliverables

LiDAR Data

- Raw Flightline LAS 1.2 files
- Fully classified LAS 1.2 files
 - RGB extraction
 - LAS Headers

Vector Data

- Data extent (Area of Interest)
- USNG Tiling schemes
 - LAS: 1,000 x 1,000m
 - Rasters: 2,000 x 2,000m
- Hydro Breaklines

Rasters (0.5 meter resolution)

- Hydro flattened bare earth DEM
- Highest hit DEM
- Intensity images
- Ground density images

Acquisition Data

- Ground Check Points
 - Hard surface, Land Cover Classes, Withheld Checkpoints
- Survey Control Monuments
- Flightlines (SBET and *.trj)

AGRC Control Procedures

Per control monument:

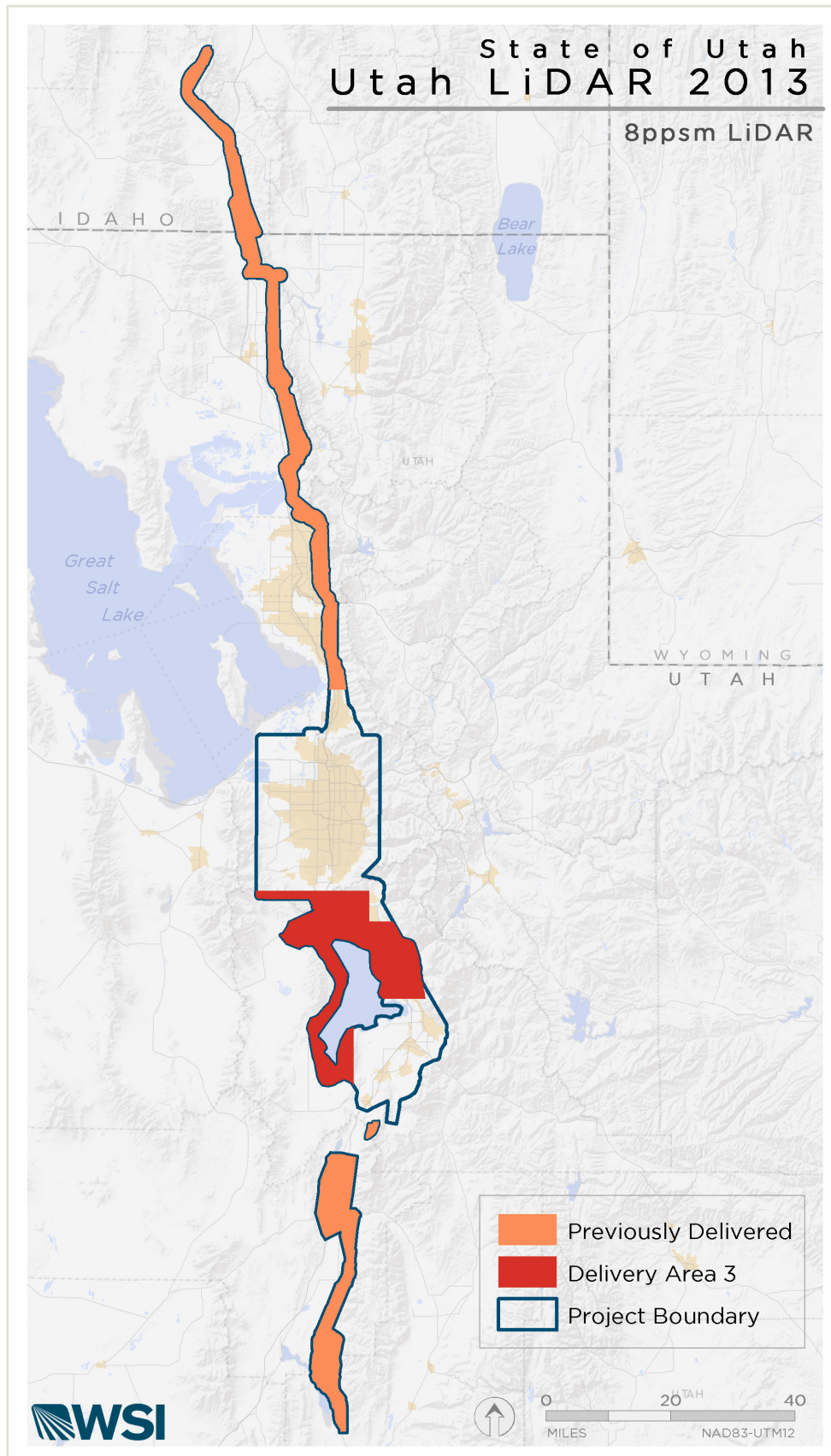
- 1 photo looking at the tripod over the point facing north
- 1 photo looking at the tripod over the point facing east
- 1 photo looking at the tripod over the point facing south
- 1 photo looking at the tripod over the point facing west
- 1 photo close-up of the point on the ground
- 1 Field Observation Sheet filled out completely
- 1 Raw GPS observation file for control point in RINEX format
- 1 National Geodetic Survey Online Positioning User Service (OPUS) Report

Metadata

Metadata for all deliverable shapefiles and rasters meet or exceed National Spatial Data Infrastructure Content Standards for Digital Geospatial Metadata (FGDC, 1998) and LiDAR Base Specifications Version 1.0 (USGS, 2012).

LiDAR Point Classifications	
1	Processed unclassified
2	Bare earth ground
7	Noise
9	Water
10	Ignored Ground
11	Withheld

Overview Map



Acquisition

Planning

After receiving the proposed study area from the State of Utah, WSI began the flight planning process.

Flightlines were developed using ALTM-NAV Planner (v.3.0) software. Careful planning of the pulse rate, flight altitude, and ground speed ensured that data quality and coverage conditions (8 pulses per square meter) were met while optimizing flight paths for minimal flight times.

The mission planning conducted at WSI was designed to optimize flight efficiency while meeting or exceeding project accuracy and resolution specifications. During this process, WSI prepared for known factors, such as GPS constellation availability, acquisition windows, and

resource allocation. In addition, a variety of logistical barriers were anticipated, namely required permitting, air space restrictions, and acquisition personnel logistics.

While in the field, weather hazards and conditions affecting flight were continuously monitored due to their impact on the daily success of airborne and ground operations.

WHPacific provided oversight of the GPS ground operations and post-processing, including independently collected RTK check points, for evaluation of the WSI calibrated dataset.

Ground Survey

Monumentation

The ground survey conducted by WSI serves to establish GPS positions that are used in processing to ensure the accuracy of the data. The survey for Utah LiDAR 2013 included establishing and occupying survey control, collecting static positional data, and collecting ground check points (GCPs) using GPS real-time kinematic (RTK) survey with a roving radio relayed unit.

Using the High Accuracy Reference Network (HARN) and the Continuous Operation Reference System (CORS), WSI tied to a network of points with orthometric heights determined by differential leveling. Where available, First Order National Geodetic Survey (NGS) published monuments with NAVD88 were used. In the absence of NGS benchmarks, WSI produces our own monuments. Every effort is made to keep monuments established by WSI within the public right of way or on public lands. If monuments are necessary on private

property, consent from the owner is required. All monumentation is done with 5/8" x 30" rebar topped with a two inch diameter aluminum cap stamped "Watershed Sciences, Inc."

WSI owns and operates multiple sets of Trimble Global Navigation Satellite System (GNSS) dual-frequency L1-L2 receivers, which were used in both static and RTK surveys (see table below).

During each LiDAR mission, a ground-based technician was deployed, outfitted with two Trimble Base Stations (R7) and one RTK Rover (R8).

Receiver Equipment Specifications:

Receiver Model	Antenna	OPUS Antenna ID	Use
Trimble R7 GNSS	Zephyr GNSS Geodetic Model 2	TRM55972.00	Static
Trimble R8 GNSS	Integrated Antenna R8 Model 2	TRM_R8_Model 2	Static & RTK

GPS Specifications

GPS Satellite Constellation	≥ 6
GPS PDOP	≤ 3.0
GPS Baselines	≤ 13 nm

Final Monument Positions

All static control points were observed for a minimum of one two-hour session and one four-hour session. At the beginning of the session the tripod and antenna were reset, resulting in two independent instrument heights and data files. Data were collected at a recording frequency of one hertz using a 10-degree mask on the antenna.

GPS data were uploaded to WSI servers for WSI PLS QA/QC and oversight. OPUS processing triangulated the monument position using three CORS stations resulting in a fully adjusted position. After multiple sessions of data collection at each monument, accuracy was calculated. Blue Marble Geographics Calculator 2013 SP1 software was used to convert the geodetic

positions from the OPUS reports. A total of 11 control monuments were surveyed for Delivery Area 3.

Upon completion of Delivery Area 3, a total network adjustment was performed. All occupied monuments were certified by a Utah PLS (see page 16). The final monument positions are presented in the table below.

List of Monuments

PID	Latitude	Longitude	Ellipsoid (m)
SEC_COR_T6S_R7E_S29-30-31-32	40° 15' 38.29227"	-111° 52' 01.77352"	1387.532
UT_18	40° 28' 44.19303"	-111° 53' 38.61986"	1438.122
UT_19	40° 32' 38.48614"	-111° 54' 03.15291"	1325.180
UT_22	40° 05' 53.66263"	-111° 43' 43.45816"	1364.287
UT_23	40° 04' 39.84914"	-111° 39' 34.87433"	1397.984
UT_24	40° 17' 12.73589"	-111° 44' 17.86749"	1363.422
UT_25	40° 21' 18.44809"	-111° 45' 54.80816"	1360.740
UT_26	40° 23' 02.66071"	-111° 49' 57.04077"	1365.627
UT_27	40° 22' 36.00475"	-112° 00' 33.20535"	1507.444
UT_28	40° 10' 15.98146"	-111° 56' 02.61666"	1400.467
UT_29	40° 01' 31.49199"	-111° 50' 48.87816"	1355.487

Monument Accuracy

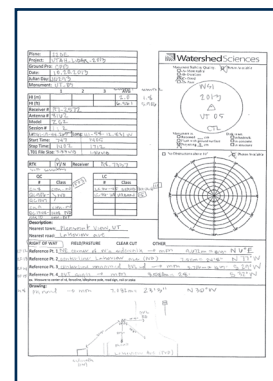
FGDC-STD-007.2-1998 Rating

Standard Deviation Northing, Easting	0.050 m
Standard Deviation Z	0.020 m

DELIVERABLES FOR EACH MONUMENT

- 1 photo looking at the tripod over the point facing north
- 1 photo looking at the tripod over the point facing east
- 1 photo looking at the tripod over the point facing south
- 1 photo looking at the tripod over the point facing west
- 1 photo close-up of the point on the ground
- 1 raw GPS observation file for control point in RINEX format
- 1 National Geodetic Survey Online Positioning User Service (OPUS) report

WSI Field Log for UT_05



Ground Check Points

RTK (Real Time Kinematic)

A Trimble R7 base unit was set up over an appropriate monument to broadcast a real-time correction to a roving R8 unit. This RTK rover survey allows for precise location measurement (1.5 centimeter RMSEz). All RTK measurements were made during periods with a Position Dilution of Precision (PDOP) of 3.0 and in view of at least six satellites by the stationary reference and roving receiver. For RTK data, the collector recorded at least a five-second stationary observation, and then calculated the pseudorange position from three one-second epochs with the relative error less than 1.5 centimeter horizontal and 2.0 centimeter vertical.

RTK positions were collected on bare earth locations such as paved, gravel or stable dirt roads, and other locations where the ground was clearly visible (and was likely to remain visible) from the sky during the data acquisition and RTK measurement periods. In order to facilitate comparisons with LiDAR data, RTK measurements were not taken on highly reflective surfaces such as center line stripes or lane markings on roads.

For each control monument, at least 25 RTK points were taken within five nautical miles of the base. The planned locations for these control points were determined prior to field deployment, and the suitability of these locations was verified on site. The distribution of RTK points depended on ground access constraints, and may not be equitably distributed throughout the survey area.

PPK (Post-Processed Kinematic)

Similar to an RTK survey, a roving GPS unit is paired with a static GPS base station and deployed to collect true ground points, but a radio connection to the base need not be established. This potentially allows greater dispersion of ground data beyond the limit of radio communication, though no real-time correction is available. All geometry is identical to that of a real-time survey, but baselines are post-processed and point values are determined afterward using applicable software. Precision thresholds are equal to RTK thresholds and out-of-tolerance points are discarded.

Land Class Cover Checkpoints

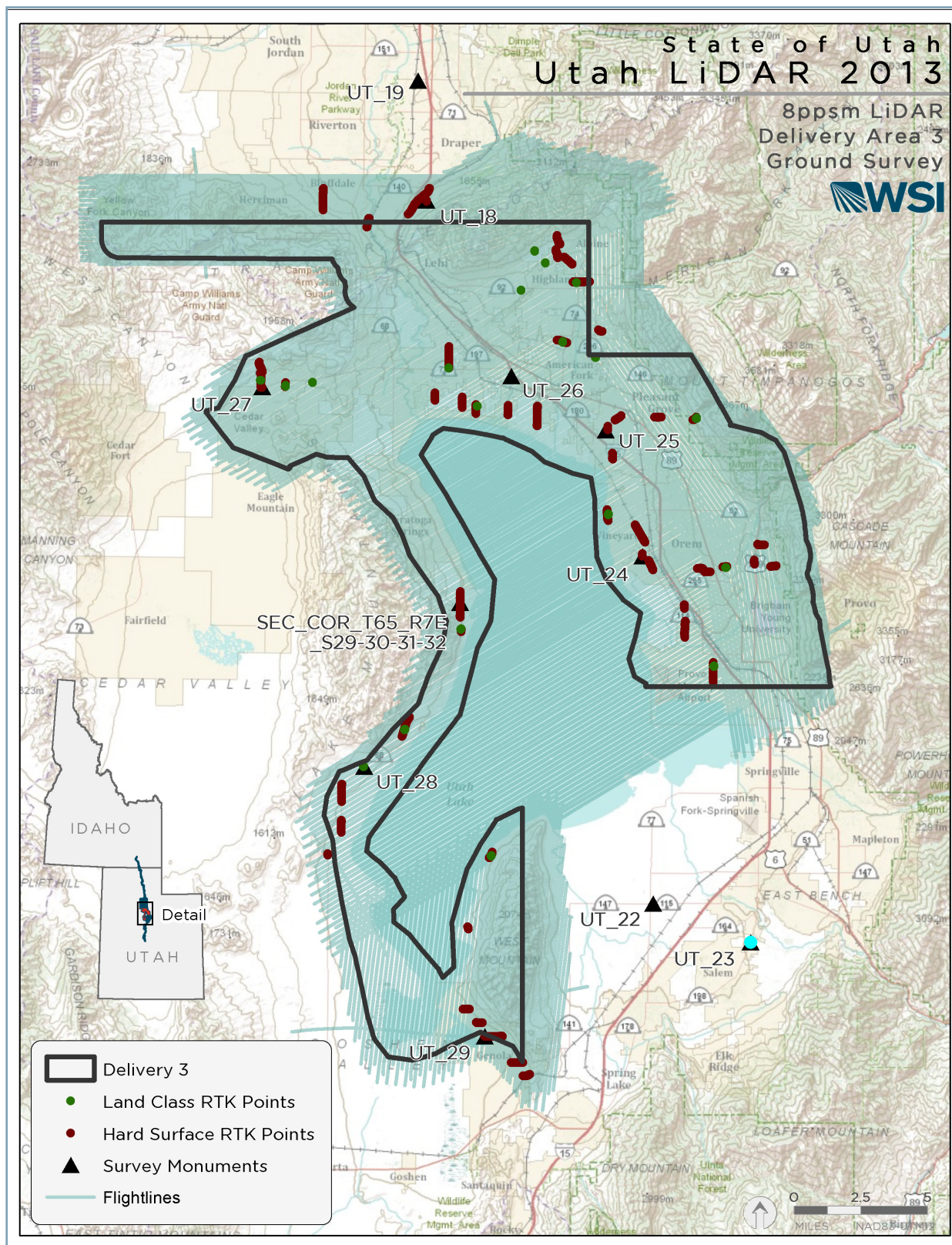
In addition to the hard-surface GCP data collection, check points were also collected across the delivery area on three different land class cover types to provide Supplemental Vertical Accuracy (SVA) statistics in accordance with National Standard for Spatial Data Accuracy (NSSDA) guidelines and used the U.S. Geological Survey's Land Cover Institute's land cover class definitions as a guideline (USGS LCI).

The dominant land cover classes within the project area are Urban, Shrub and Forest. A total of 15 individual land class checkpoints were collected for the Pilot Delivery.

The accuracies reported in the table below describe the positional variability associated with geodetic control. Static monument positions are described in horizontal and vertical space, which can be summarized as RMSExyz.

GPS Specifications	Survey Control Monuments	Ground Check Points (GCPs)
Accuracy	RMSExy $\leq$ 1.5 cm (0.6 in.)	RMSExyz $\leq$ 1.5 cm (0.8 in.)
	RMSEz $\leq$ 1.5 cm (0.6 in.)	Deviation from monument coordinates
Resolution	Minimum of one per 13 nautical mi. spacing	$\geq$ 4,500 total hard surface GCPs
	Minimum independent occupation of 4 hrs. & 2 hrs.	100 total GCPs per land cover class
Equipment	R7 GNSS	R7 GNSS
	R8 GNSS	R8 GNSS

Ground Survey



Airborne Survey

LiDAR Survey

The LiDAR survey occurred between November 8th and December 1st, 2013, using a Leica ALS 70 sensor mounted in a Piper Navajo aircraft. The system was set to acquire a variable number of laser pulses per second and flown at a variable height above ground level (AGL). The laser captured a scan angle of 15 degrees from nadir (field of view equal to 30 degrees). The LiDAR system settings and flight parameters were designed to yield high-resolution data of >8 pulses per square meter over terrestrial surfaces.

To solve for laser point position, an accurate description of aircraft position and attitude is vital. Aircraft position is described as x, y, and z and was measured twice per second (two hertz) by an onboard differential GPS unit. Aircraft attitude is described as pitch, roll, and yaw (heading) and was measured 200 times per second (200 hertz) from an onboard inertial measurement unit (IMU).

The LiDAR sensor operators constantly monitored the data collection settings during acquisition of the data, including pulse rate, power setting, scan rate, gain, field of view, and pulse mode. For each flight, the crew performed airborne calibration maneuvers designed to improve the calibration results during the data processing stage. They were also

in constant communication with the ground crew to ensure proper GPS coverage for data quality. The LiDAR coverage was completed with no data gaps or voids, barring non-reflective surfaces (e.g., open water, wet asphalt).

All necessary measures were taken to acquire data under conditions (e.g., minimum cloud decks) and in a manner (e.g., adherence to flight plans) that prevented the possibility of data gaps. All WSI LiDAR systems are calibrated per the manufacturer and our own specifications, and tested by WSI for internal consistency for every mission using proprietary methods.

The acquisition occurred under clear conditions with no cloud cover, and less than 10 percent cloud shadow. Weather conditions were constantly assessed in-flight, as adverse conditions not only affect data quality, but can prove unsafe for flying. The survey area was surveyed with opposing flight line side-lap of ≥ 50 percent to reduce laser shadowing and increase surface laser painting. The system allows up to four range measurements per pulse, and all discernible laser returns were processed for the output data set.



Above: Piper Navajo



Above: Leica ALS70 mounted in the Navajo

Processing

This section describes the processing methodologies for all data acquired by WSI for the Utah LiDAR 2013 Delivery Area 3. All of our methodologies and deliverables are compliant with federal and industry specifications and guidelines (USGS v.13, FGDC NSSDA, and ASPRS).

LiDAR Data Processing

Calibration

Once the LiDAR data arrived at the Portland office, WSI employed a suite of techniques to calibrate it. Processing tasks included: GPS, kinematic corrections, calculation of laser point position, relative accuracy testing and calibrations, classification of ground and non-ground points, and assessments of statistical fundamental and supplemental vertical accuracy. The general workflow for calibration of the LiDAR data was as follows:

Below: Hillshade/intensity image of a portion of the Pilot Delivery area



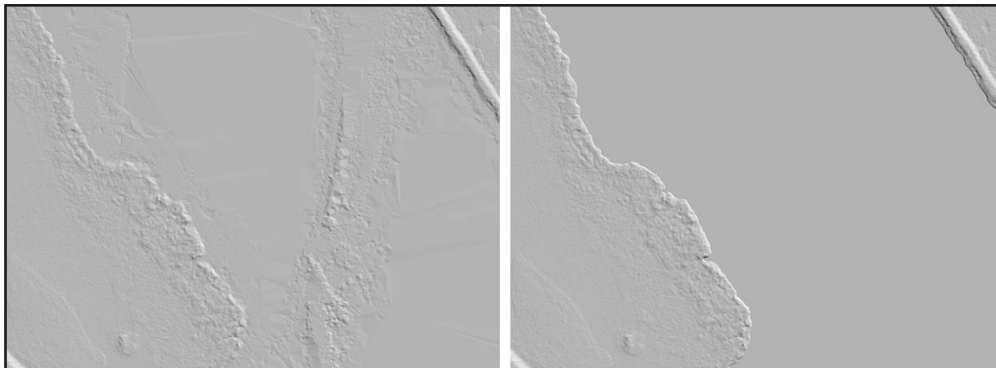
LiDAR Processing Step	Software Used
Resolve GPS kinematic corrections for aircraft position data using kinematic aircraft GPS (collected at two hertz) and static ground GPS (one hertz) data collected over geodetic controls.	IPAS TC v. 3.2, Trimble Business Center v. 3.10
Develop a smoothed best estimate of trajectory (SBET) file that blends post-processed aircraft position with attitude data. Sensor heading, position, and attitude are calculated throughout the survey.	IPAS TC v. 3.2
Calculate laser point position by associating SBET information to each laser point return time, with offsets relative to scan angle, intensity, etc. included. This process creates the raw laser point cloud data for the entire survey in *.las (ASPRS v. 1.2) format, in which each point maintains the corresponding scan angle, return number (echo), intensity, and x, y, z information. These data are converted to orthometric elevation (NAVD88) by applying a Geoid 12A correction.	Leica ALSPP 2.75 Build #9
Import raw laser points into subset bins (less than 500 megabytes, to accommodate file size constraints in processing software). Filter for noise and perform manual relative accuracy calibration.	TerraScan v. 13, Custom WSI software
Classify ground points and test relative accuracy using ground classified points per each flight line. Perform automated line-to-line calibrations for system attitude parameters (pitch, roll, heading), mirror flex (scale), and GPS/IMU drift. Calibrations are performed on ground classified points from paired flight lines. Every flight line is used for relative accuracy calibration.	TerraMatch v. 13, TerraScan v. 13, Custom WSI software
Assess fundamental and supplemental vertical accuracy via direct comparisons of ground classified points to ground RTK survey data.	TerraScan v. 13
Assign headers (e.g., projection information, variable length record, project name, GEOTIFF tags) to *.las files.	Las Monkey v. 1.4.6

Hydro Flattening

All bare-earth hydro flattened digital elevation models (DEMs) have been hydro flattened according to the U.S. Geological Survey's National Geospatial Program's "LiDAR Guidelines and Base Specification" Version 1, 2012 (USGS NGP). For all water bodies perceived to be "flat," LiDAR points were sampled to arrive at an elevation threshold defining the water surface at a uniform elevation where the water edge meets the surrounding terrain. 3-D breaklines were then created to encompass all areas considered to be water and were assigned the water surface elevation value determined previously. All "flat" water bodies greater than 2 acres were considered for hydro flattening. All "islands" greater than 100 square meters were retained in the DEMs.

The bare-earth DEMs were created by triangulating all ground classified points and inserting 3-D breaklines utilizing TerraSolid's TerraScan and TerraModeler software. Any ground points within 1 meter of the breaklines were reclassified to "ignored ground" (ASPRS code: 10) before triangulation. The highest-hit DEMs were generated from "ground" and "default" classified points. In instances where "water" classified points had the highest elevation value, the water surface elevation from the bare-earth raster was used.

Regular
hillshade
DEM



Hillshade DEM
with
hydro flattening

*.las Files with RGB Extraction

Recently acquired AGRC aerial imagery with a 5 inch resolution was used to color LiDAR points. Where AGRC imagery was not available, USDA NAIP imagery was used.



LiDAR imagery with RGB extraction in the Pilot Delivery area, including Lagoon amusement park.

Results

Fundamental Vertical Accuracy

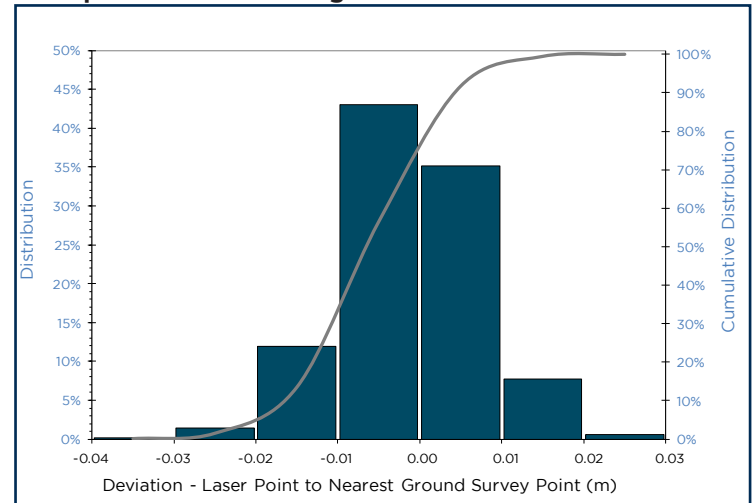
Fundamental Vertical Accuracy (FVA) reporting is designed to meet guidelines presented in the National Digital Elevation Program (NDEP), National Standard for Spatial Data Accuracy (NS-SDA) (FGDC, 1998), and the ASPRS Guidelines for Vertical Accuracy Reporting for LiDAR Data V1.0 (ASPRS, 2004).

The statistical model compares known Ground Check Points (GCPs) to the closest laser point. FVA statistical analysis uses hard surface GCPs in open areas where the LiDAR system has a “very high probability” that the sensor will measure the ground surface and is evaluated at the 95% confidence level. For the Utah LiDAR 2013 survey area, 4,057 GCPs were used to calibrate Delivery Area 3.

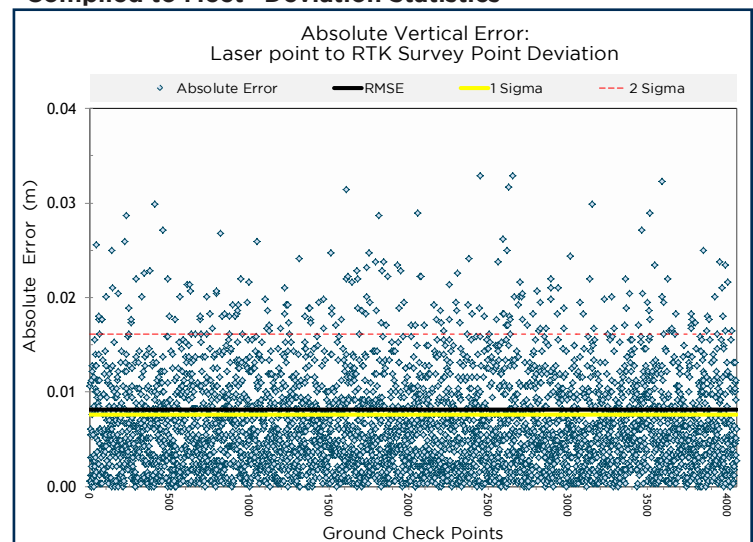
Vertical accuracy statistics are reported as “Compiled to Meet” and GCPs were also withheld and will be delivered with the dataset for reporting accuracy as “Tested to Meet.” Additional land class accuracies are reported as “Compiled to Meet,” as no independent survey data was gathered and withheld specifically for land classes.

Ground survey data to be delivered with this report includes all GCP’s, withheld checkpoints, and land class checkpoints.

“Compiled to Meet” Histogram



“Compiled to Meet” Deviation Statistics



“Compiled to Meet” Accuracy Results

	LiDAR Swath	DEM	Spec
Sample Size (n)	4,057	3,502	N/A
95% Confidence Level	1.60 cm	5.44 cm	18.10 cm
Root Mean Square Error (RMSEz)	0.82 cm	2.77 cm	9.25 cm
1 Sigma	0.76 cm	2.69 cm	N/A
2 Sigma	1.62 cm	5.60 cm	N/A
Minimum Deviation	-3.29 cm	-10.70 cm	N/A
Maximum Deviation	2.90 cm	11.80 cm	N/A

Supplemental & Consolidated Vertical Accuracy

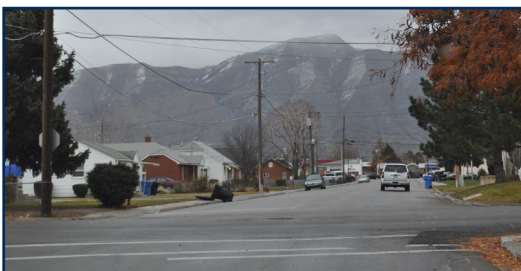
In addition to the hard surface land class, checkpoints were also collected across the project area for additional land cover classes to provide Supplemental Vertical Accuracy (SVA) statistics in accordance with NSSDA guidelines. All data collection was completed by WSI. As such, SVA statistics are reported as "Compiled to meet" in accordance with the ASPRS Guidelines Vertical Accuracy Reporting for LiDAR Data V1.0 (ASPRS, 2004).

The dominant land cover classes within the present project area are listed at right. This analysis demonstrates that the vertical accuracy of the interpolated ground surface, across all land cover classes, meets or exceeds vertical accuracy specifications.

Consolidated Vertical Accuracy (CVA) based on the DEM was compiled to meet at the 95th percentile based on both hard surface and land cover GCPs. The resulting CVA (sample size 3,597) is 5.60 cm.

Land Class Vertical Accuracy Results (DEM)					
	Hard Surface N = 3,502	Urban N = 50	Shrub N = 45	Forest N = 0	Spec
95th Percentile	5.60 cm	5.32 cm	7.96 cm	N/A	26.90 cm
Bias (Average Dz)	0.46 cm	-0.75 cm	1.47 cm	N/A	N/A
Minimum	-10.70 cm	-7.20 cm	-3.40 cm	N/A	N/A
Maximum	11.80 cm	2.80 cm	17.10 cm	N/A	N/A
Average Magnitude	0.46 cm	1.87 cm	2.86 cm	N/A	N/A
1 Sigma	2.69 cm	1.98 cm	2.85 cm	N/A	N/A
2 Sigma	5.60 cm	5.32 cm	7.96 cm	N/A	26.90 cm

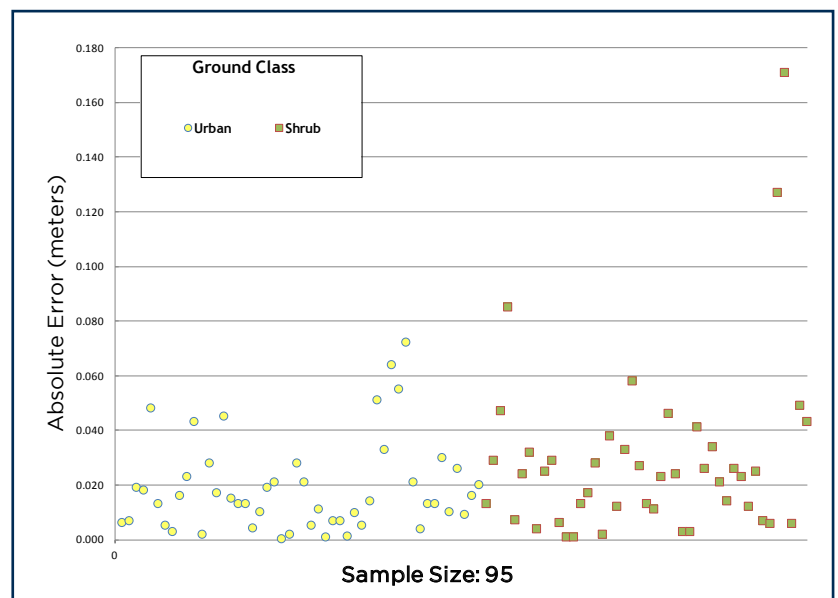
Supplemental Vertical Accuracy



Above: Urban



Below: Shrub



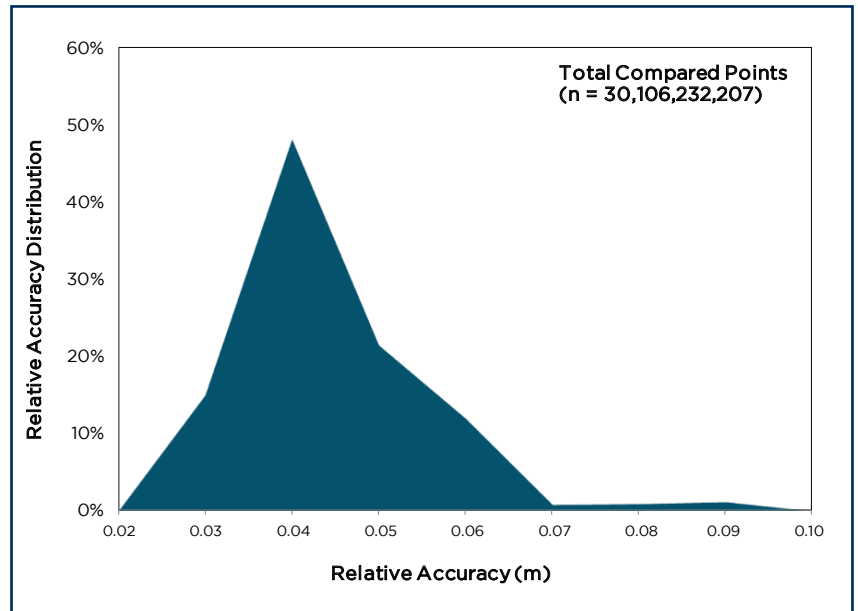
Relative Accuracy

Swath to Swath

Relative accuracy refers to the internal consistency of the data set and is measured as the divergence between points from different flightlines within an overlapping area. Divergence is most apparent when flightlines are opposing. When the LiDAR system is well calibrated the line-to-line divergence is low (<10 centimeters). Internal consistency is affected by system attitude offsets (pitch, roll, and heading), mirror flex (scale), and GPS/IMU drift.

Relative accuracy statistics for Delivery Area 3 are based on the comparison of 558 flightlines and over 30 billion points.

Swath to swath relative accuracy distribution results



Within Swath

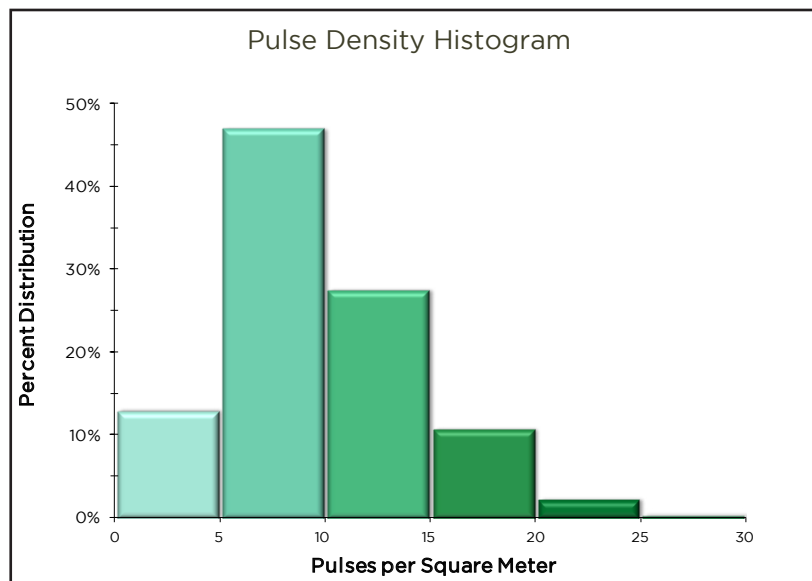
WSI defines within swath relative accuracy as a measure of the point-to-point consistency across the width of a LiDAR swath. The statistic is derived through a GCP survey of flat pavement (typically airport tarmac) measured orthogonal to the direction of flight. The measure evaluates tilting or warping of the raw data, as well as “smiles” and “frowns” at the edge of scan. This test is performed with each system calibration upon installation of the sensor in the aircraft, as well as periodically during a sensor’s residence within a specific aircraft.

Swath to Swath Relative Accuracy		Spec
Average	3.94 cm	N/A
Median	3.64 cm	N/A
1 Sigma	4.17 cm	N/A
2 Sigma	5.63 cm	N/A
RMSDz	1.09 cm	7.00 cm
95% Confidence Level	2.13 cm	N/A

Within Swath Relative Accuracy		Spec
RMSDz	2 cm	5 cm
95% Confidence Level	4 cm	N/A

LiDAR Density

Pulse Density	Pulses per square meter: 10.09
Ground Point Density	Ground points per square meter: 4.77



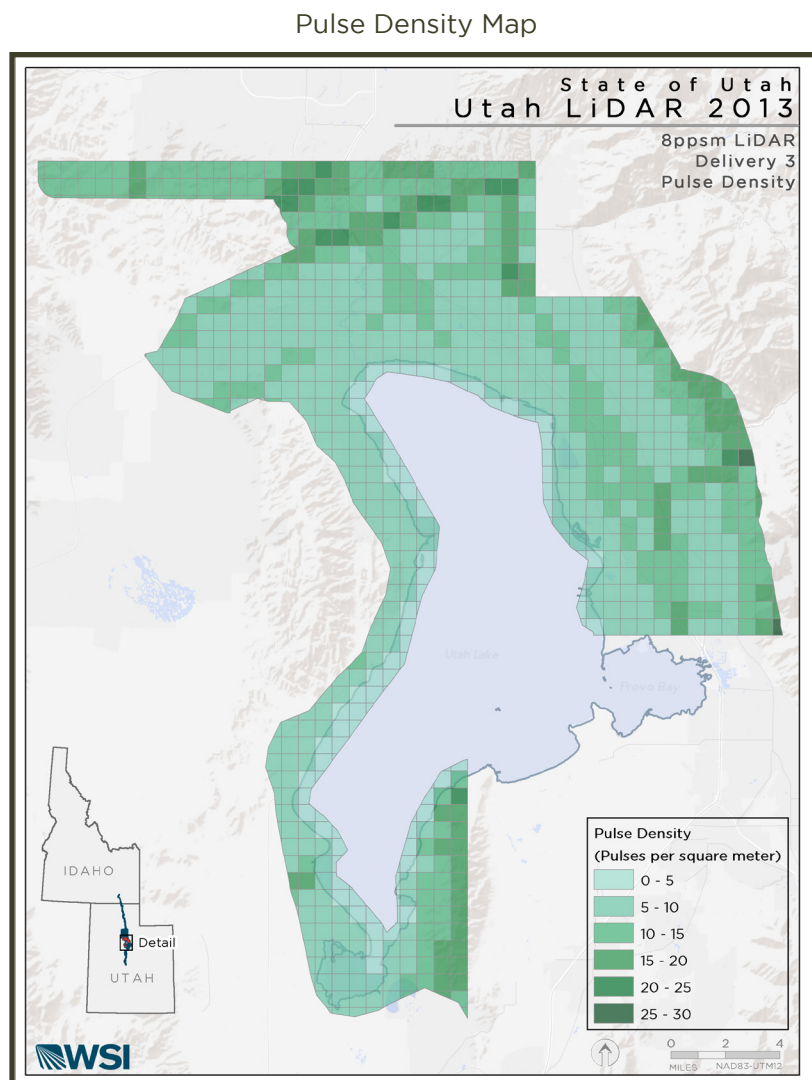
Pulse Density

The native pulse density is the number of pulses emitted by the LiDAR system. Some types of surfaces (e.g. dense vegetation or water) may return fewer pulses than the laser originally emitted. Therefore, the delivered density can be less than the native density and lightly variable according to distributions of terrain, land cover, and water bodies.

Images below and to the right show pulse densities for Utah LiDAR 2013 Delivery Area 3. The density histogram was calculated based on first return laser point density.

Water returns few laser pulses so areas along the shoreline of Utah Lake have a lower pulse density than the rest of the delivery area.

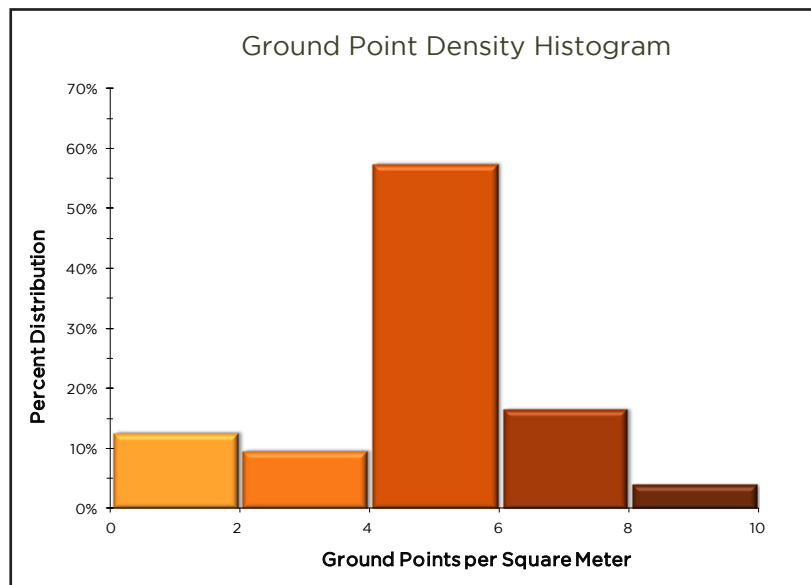
Section 7.3 (Completeness) of the Scope of Work specifies that for the entire project area, ≥85% design aggregate pulse density, 8 ppsm, must be achieved. WSI surpassed this requirement with an aggregate pulse density of 10.09 ppsm.



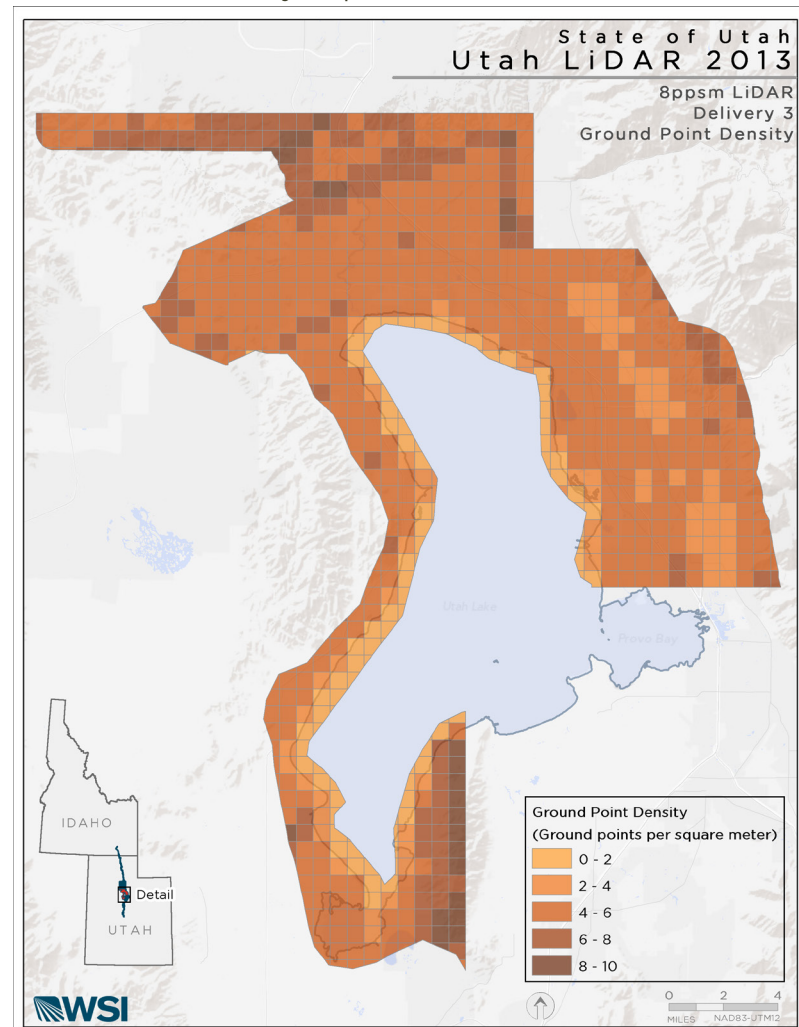
Ground Point Density

WSI achieved an average of 4.77 ground density points per square meter.

Images below and to the right show pulse densities for Utah LiDAR 2013 Delivery Area 3. The density histogram was calculated based on ground classified point density.



Ground Point Density Map



Hillshade/intensity image of a portion of the Pilot Delivery area



PLS Certificate

WHPacific

December 18, 2013

I, undersigned, being duly sworn, say that I certify that the survey base stations used during the "Acquisition" portion of this report for Blocks 18, 19, 22 and 23 that lie within the State of Utah were surveyed under my supervision using commonly accepted Standard Practices. Field work was conducted from November 11th through November 15th, 2013.

Accuracy statistics shown in the Accuracy Section have been reviewed by me and found to meet the National Standard for Spatial Data Accuracy.

Mike Hart, PLS – Utah #8051637-2201
WHPacific, Inc
San Diego, CA 92123



Best Practices

WSI has high standards and adheres to best practices in all efforts. In the laboratory, quality checks are built in throughout processing steps, and automated methodology allows for rapid data processing. There is no offshoring, which allows for in-house data collection and processing.

WSI's innovation and adaptive culture rises to technical challenges and the needs of clients like the state of Utah. Reporting and communication to our clients are prioritized through regular updates and meetings.

WSI appreciates the opportunity to assist the state of Utah and welcomes any future assignments.

POINT OF CONTACT

Susan Jackson
Chief Marketing Officer
Oakland, CA
PH: 510-910-8669
E: sjackson@quantumspatial.com

Thank You

Portland Office
421 SW 6th Ave.
Suite 800
Portland, OR 97204
PH: 503-505-5100
FX: 503-546-6801



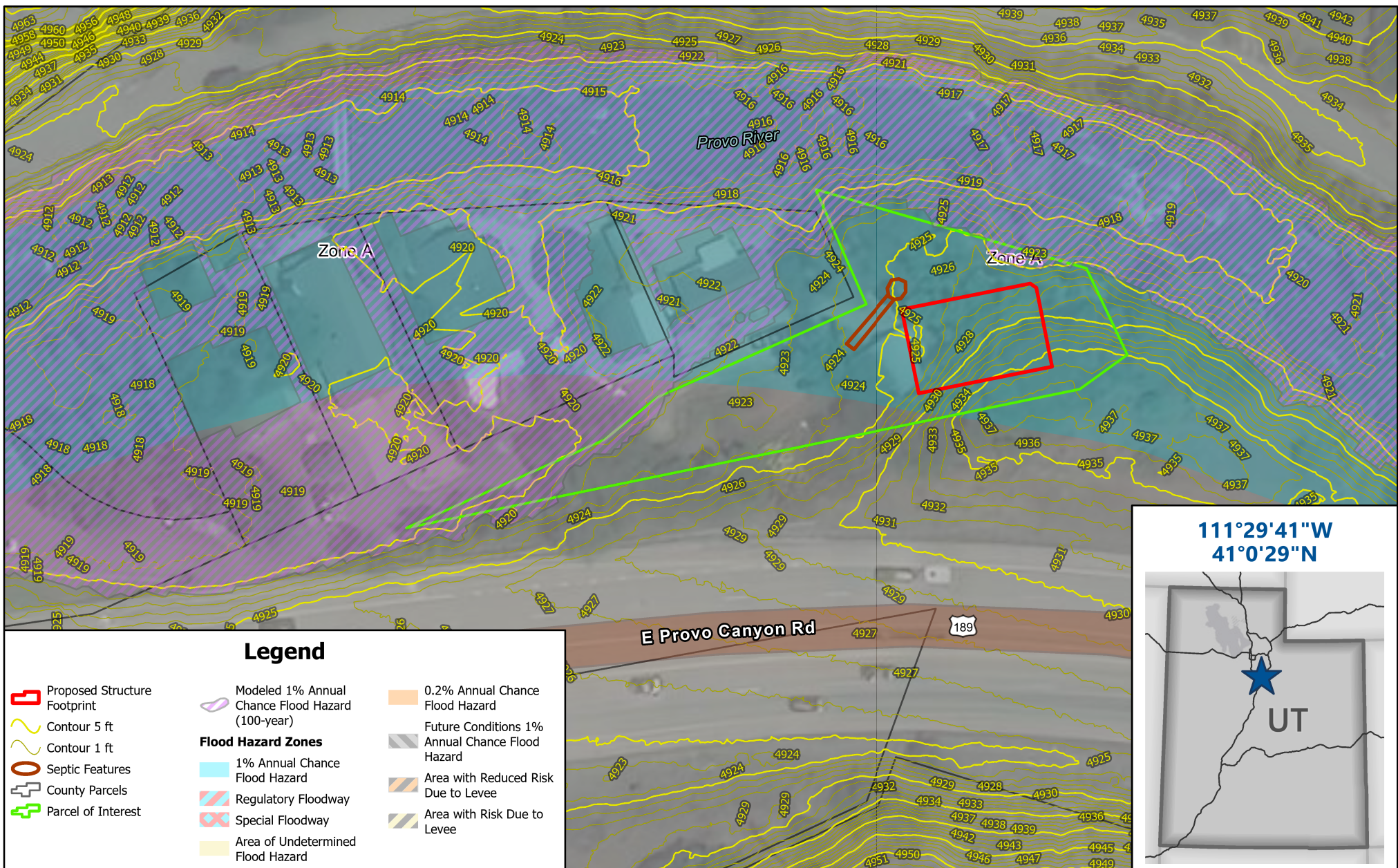
THE
LANGDON
GROUP



GATEWAY
MAPPING
INC.

J-U-B FAMILY OF COMPANIES

Attachment 4: Required LOMA Map





151 S. University Ave
Provo, UT 84601
Phone (801) 851-7525
Fax (801) 851-7521

Permit To Install Septic System

Home Owner: SEAN HADLOCK

Property Address: 2501 E PROVO CANYON RD OREM UT 84097

Tax ID: 28832

Telephone: (801) 473-3462

Subdivision:

Phase: **Lot:**

Type of Septic System: Conventional Chamber

Minimum Tank Size: 1000

Maximum Depth of Trenches: 3

Minimum Length of Drainfield: 70

Comments: Existing house is to be torn down and a new 2 bedroom home to be installed and connected to existing 1000 gallon tank. Existing drainfield to be abandoned and 70' of new chamber drainfield to be installed.
Contact UCHD for inspection prior to backfill.

Permit expires one year from date of approval. By signing this permit, the owner agrees to install system as specified and approved by the Health Department in accordance with all applicable regulations and ordinances. Any changes must be approved by the Health Department before construction. This permit is based on minimum design standards, and in no case does it guarantee against the failure of the installed system. The performance of the system is affected by many other factors, such as operation, maintenance, wastewater contents, etc., not addressed by the standards. All installations shall be completed by a licensed contractor pursuant to R317-4-2.

Signature: Sean Hadlock

Date: 11-14-22

Plan Approved By: [Signature]

Date: 11-9-22

Note: All systems will require inspection by this office before backfilling.



City Council Chambers, 56 N State Street

***** IMPORTANT DEVELOPMENT NOTICE *****

PUBLIC HEARING – The Board of Adjustment will consider a variance to Section 10-5-1 of the Orem City Code which requires all new construction located within a flood plain shall connect to a sanitary sewer system. The applicant requests a variance to install a septic tank on a parcel located at 2501 East Provo Canyon Road in the OS5 zone.

Additional information can be viewed on orem.org/planning under "Current Planning (Public Hearing Notices)" tab.

MIKE CARPENTER
1734 NORTH 350 WEST
OREM, UT 84057

Board of Adjustment
Wed, May 24, 2023
6:00 pm



City Council Chambers, 56 N State Street

***** IMPORTANT DEVELOPMENT NOTICE *****

PUBLIC HEARING – The Board of Adjustment will consider a variance to Section 10-5-1 of the Orem City Code which requires all new construction located within a flood plain shall connect to a sanitary sewer system. The applicant requests a variance to install a septic tank on a parcel located at 2501 East Provo Canyon Road in the OS5 zone.

Additional information can be viewed on orem.org/planning under "Current Planning (Public Hearing Notices)" tab.

JEFF LAMBSON
156 E 1060 N
OREM, UT 84057

Board of Adjustment
Wed, May 24, 2023
6:00 pm



orem.org/planning under "Current Planning (Public Hearing Notices)" tab



orem.org/planning under "Current Planning (Public Hearing Notices)" tab

PROVO CITY
PO BOX 1849
PROVO, UT 84603

JAMES HAWKES
55 WEST 500 SOUTH
OREM, UT 84058

HELENA KLEINLEIN
103 WEST 2170 SOUTH
OREM, UT 84058

JEFF LAMBSON
156 E 1060 N
OREM, UT 84057

DAVE YOUNG
173 S COUNTRYSIDE LANE
OREM, UT 84058

LANAE MILLETT
288 W 1500 N
OREM, UT 84057

THOMAS MACDONALD
489 NORTH PALISADES DR
OREM, UT 84097

DEBBY LAURET
641 S 1920 W
OREM, UT 84059

MADELINE KOMEN
653 W. 1360 NORTH
OREM, UT 84057

DAVID SPENCER
899 NORTH 550 EAST
OREM, UT 84097

MURRAY LOW
904 S. 725 WEST
OREM, UT 84058

GERALD CRISMON
1069 S. 545 EAST
OREM, UT 84097

TERRY PETERSON
1125 LYNNWOOD DRIVE
OREM, UT 84097

HAYSAM SAKAR
1194 E. 1090 NORTH
OREM, UT 84097

RYAN CLARK
1405 N. 1430 WEST
PLEASANT GROVE, UT 84062

UTAH STATE DEPT OF NATURAL
RESOURCES
%DIVISION OF STATE LANDS AND
FORESTRY
1594 W NORTH TEMPLE
SALT LAKE CITY, UT 84116

MIKE CARPENTER
1734 NORTH 350 WEST
OREM, UT 84057

RMR HOLDINGS LLC
1840 N STATE # 100
PROVO, UT 84604

JASON BENCH
1911 N MAIN STREET
OREM, UT 84057-2101

ROOS, BONNIE & RAYMOND
--OR CURRENT RESIDENT--
2469 E PROVO CANYON
OREM, UT 84097

RENNER, KATHERINE M (ET AL)
--OR CURRENT RESIDENT--
2475 E PROVO CANYON
OREM, UT 84097

RENNER, KATHERINE M (ET AL)
2475 E PROVO CANYON RD
PROVO, UT 84604

GARRICK, CHAD H & AMY E
--OR CURRENT RESIDENT--
2481 E CANYON RD
OREM, UT 84097

GARRICK, CHAD H & AMY E
2481 E PROVO CANYON RD
PROVO, UT 84604

TURNER, JACQUELINE L (ET AL)
--OR CURRENT RESIDENT--
2487 E PROVO CANYON RD
OREM, UT 84097

TURNER, JACQUELINE L (ET AL)
2487 E PROVO CANYON RD
PROVO, UT 84604

HADLOCK, SEAN
--OR CURRENT RESIDENT--
2501 E PROVO CANYON RD
OREM, UT 84097

HADLOCK, SEAN
2501 E PROVO CANYON RD
PROVO, UT 84604

ROOS, BONNIE & RAYMOND
2870 N 2050 E
LOGAN, UT 84341

UTAH DEPARTMENT OF
TRANSPORTATION
4501 S 2700 W
SALT LAKE CITY, UT 84119



CODE OF ORDINANCES

CHAPTER 10. FLOOD DAMAGE PREVENTION

Contents:

- Article 10-1. Purposes.
- Article 10-2. Definitions
- Article 10-3. General Provisions
- Article 10-4. Administration
- Article 10-5. Provisions for Flood Hazard Reduction

Article 10-1. Purposes.

Contents:

- 10-1-1. Statement of Purpose and Authorization
- 10-1-2. Methods of Reducing Flood Losses.
- 10-1-3. Statutory Authorization.
- 10-1-4. Findings of Fact.

10-1-1. Statement of Purpose and Authorization

- A. It is the purpose of this Chapter to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions to specific areas by provisions designed:
1. To protect human life and health;
 2. To minimize expenditure of public money for costly flood control projects;
 3. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
 4. To minimize prolonged business interruptions;
 5. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;
 6. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize blight to future flood-prone areas;
 7. To ensure that potential buyers are notified that property is in an area of special flood hazard; and,
 8. To ensure that those who occupy the areas of special flood hazards assume responsibility for their actions.



- B. The City of Orem elects to comply with the requirements of the National Flood Insurance Act of 1968 (P.L. 90-488, as amended) which is a voluntary program administered by the Federal Emergency Management Agency (FEMA), a component of the U.S. Department of Homeland Security, and the City of Orem has elected to join the program, participate, and enforce this Flood Damage Prevention Ordinance and the requirements and regulations of the NFIP. The NFIP, established in the aforesaid act, provides that areas of the City of Orem have a special flood hazard identified by FEMA, and that floodplain management measures should be applied in such flood hazard areas. Furthermore, the City of Orem may elect to administer the Flood Damage Prevention Ordinance to areas not identified as Special Flood Hazard Areas (SFHAs) by FEMA on the City's effective Flood Insurance Rate Map (FIRM), if the City has documentation to support that there is an inherent risk of flooding in such areas.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

10-1-2. Methods of Reducing Flood Losses.

- A. In order to accomplish its purposes, this Chapter includes methods and provisions for:
1. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
 2. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
 3. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;
 4. Controlling filling, grading, dredging, and other development which may increase flood damage; and,
 5. Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

(Ord. No. 661, Revised, 04/10/90)

10-1-3. Statutory Authorization.

Utah Code - Section 10-9a-505 authorizes a municipality to enact an ordinance regulating land use and development in a floodplain to protect life and to prevent substantial damage or loss to real property.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

10-1-4. Findings of Fact.

- A. The flood hazard areas of the City of Orem are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety, and general welfare.
- B. These flood losses are created by the cumulative effect of obstructions in floodplains that cause an increase in flood heights and velocities, and by the occupancy of flood hazards areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed, or otherwise protected from flood damage.



(Ord. No. O-2020-0011, Enacted 5/16/2020)

Article 10-2. Definitions

Contents:

10-2-1. Definitions.

10-2-1. Definitions.

Unless specifically defined below, words or phrases used in this Chapter shall be interpreted so as to give them the meaning they have in common usage and to give this Chapter its most reasonable application. As used in this Chapter, the terms below shall have the following meanings:

Area of shallow flooding shall mean a designated AO, AH, AR/AO, AR/AH, or VO zone on the City's Flood Insurance Rate Map (FIRM) with a 1 percent or greater annual chance of flooding to an average depth of 1 to 3 feet where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

(Ord. No. 20-2020-0011, Enacted 5/16/2020)

Areas of special flood hazard is the land in the flood plain within the City subject to a 1 percent or greater chance of flooding in any given year. The area may be designated as Zone A on the Flood Hazard Boundary Map (FHBM). After detailed ratemaking has been completed in preparation for publication of the flood insurance rate map, Zone A usually is refined into Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, or V1-30, VE, or V. For purposes of these regulations, the term "special flood hazard area" is synonymous in meaning with the phrase "area of special flood hazard".

(Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

Base flood shall mean the flood having a one percent chance of being equaled or exceeded in any given year.

Base Flood Elevation (BFE) is the water surface elevation of the one (1) percent annual chance flood. The height in relation to mean sea level expected to be reached by the waters of the base flood at pertinent points in the floodplains of coastal and riverine areas.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Development shall mean any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, demolition of buildings or structures, fences, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials located within the area of special flood hazard.

(Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990



Existing construction means for the purposes of determining rates, structures for which the “start of construction” occurred before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. “Existing construction” may also be referred to as “existing structures.”

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Existing manufactured home park or subdivision means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by a community.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Expansion to an existing manufactured home park or subdivision means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufacturing homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Flood or flooding shall mean a general and temporary condition of partial or complete inundation of normally dry land areas from:

1. The overflow of inland or tidal waters and/or
2. The unusual and rapid accumulation or runoff of surface waters from any source.
3. Mudslides (i.e., mudflows) which are proximately caused by flooding as defined in paragraph (2) of this definition and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.

(Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

Flood Insurance Rate Map (FIRM) shall mean an official map of a community on which the Flood Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community.

(Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

Flood Insurance Study or Flood Elevation Study means an examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards.

(Ord. No. O-2020-0011, Enacted 5/16/2020)



Flood proofing means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents. Wet floodproofing includes permanent or contingent measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwaters to enter the structure or area and may be applied to residential or non-residential structures. Dry floodproofing is making a structure watertight below the level that needs flood protection to prevent floodwaters from entering. Making the structure watertight requires sealing the walls with waterproof coatings, impermeable membranes, or a supplemental layer of masonry or concrete and can only be used for non-residential structures.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Floodway (Regulatory Floodway) means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Highest adjacent grade means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Historic Structure means any structure that is:

- A. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- B. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- C. Individually listed on a state inventory of historic places in states with historic reservation programs which have been approved by the Secretary of the Interior; or
- D. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
 - 1. By an approved state program as determined by the Secretary of the Interior or
 - 2. Directly by the Secretary of the Interior in states without approved programs.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Lowest Floor means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor.

(Ord. No. O-2020-0011, Enacted 5/16/2020)



Manufactured home shall mean a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. The term “manufactured home” does not include a “recreational vehicle”.

(Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

Manufactured home park or subdivision means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

New construction means, for the purposes of determining insurance rates, structures for which the “start of construction” commenced on or after the effective date of an initial FIRM or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For floodplain management purposes, new construction means structures for which the start of construction commenced on or after the effective date of a floodplain management regulation adopted by the City and includes any subsequent improvements to such structures.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Recreational vehicle means a vehicle which is:

- A. Built on a single chassis;
- B. 400 square feet or less when measured at the largest horizontal projection;
- C. Designed to be self-propelled or permanently towable by a light duty truck; and
- D. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Regulatory floodway means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Special flood hazard area: see “area of special flood hazard”.

(Ord. No. O-2020-0011, Enacted 5/16/2020)



Special hazard area means an area having special flood, mudslide (i.e., mudflow), or flood-related erosion hazards, and shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, A99, AH, VO, V1-30, VE, V, M, or E.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Start of Construction (for other than new construction or substantial improvements under the Coastal Barrier Resources Act (Pub. L. 97-348)), includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Structure means, for floodplain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.

(Ord. No. O-2022-0011, Amended 5/16/2020)

Effective on: 4/10/1990

Structure for insurance purposes, means:

- A. A building with two or more outside rigid walls and a fully secured roof, that is affixed to a permanent site;
- B. A manufactured home ("a manufactured home," also known as a mobile home, is a structure - built on a permanent chassis, transported to its site in one or more sections, and affixed to a permanent foundation); or
- C. A travel trailer without wheels, built on a chassis and affixed to a permanent foundation, that is regulated under the community's floodplain management and building ordinances or laws.

For the latter purpose, "structure" does not mean a recreational vehicle or a park trailer or other similar vehicle, except as described in paragraph (3) of this definition, or a gas or liquid storage tank.

(Ord. No. O-2020-0011, Enacted 5/16/2020)



Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to it's before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Substantial improvement means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

- A. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or
- B. Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure."

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

Violation means the failure of a structure or other development to be fully compliant with the provisions of this Chapter 10 and/or the failure to obtain and maintain the elevation certificate, other certifications, or other evidence of compliance for a structure or other development.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Article 10-3. General Provisions

Contents:

- 10-3-1. Application of this Chapter.
- 10-3-2. Basis for establishing the areas of Special Flood Hazard.
- 10-3-3. Compliance.
- 10-3-4. Abrogation and Greater Restrictions.
- 10-3-5. Interpretation.
- 10-3-6. Warning and Disclaimer of Liability.
- 10-3-7. Severability

10-3-1. Application of this Chapter.

This Chapter shall apply to all areas of special flood hazards identified by FEMA within the City of Orem.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)



Effective on: 4/10/1990

10-3-2. Basis for establishing the areas of Special Flood Hazard.

The areas of special flood hazard identified by the Federal Emergency Management Agency in a scientific and engineering report entitled, "The Flood Insurance Study for Utah County and Incorporated Communities," dated June 19, 2020, with accompanying FIRMs, and any revisions thereto are hereby automatically adopted by reference and declared to be a part of this ordinance.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

Annexation. This Chapter 10 shall be applicable to any land annexed into the City.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

10-3-3. Compliance.

No structure or land shall hereafter be constructed, located, extended, or altered or have its use changed without full compliance with the terms of this Chapter and other applicable regulations.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

10-3-4. Abrogation and Greater Restrictions.

This Chapter is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this Chapter and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

(Ord. No. 661, Revised, 04/10/90)

10-3-5. Interpretation.

In the interpretation of this Chapter, all provisions shall be:

- A. Considered as minimum requirements;
- B. Liberally construed in favor of the governing body; and
- C. Deemed neither to limit nor repeal any other powers granted under State statutes.

(Ord. No. 661, Revised, 04/10/90)

Effective on: 4/10/1990

10-3-6. Warning and Disclaimer of Liability.



This Chapter is not intended to and shall not create liability on the part of the City of Orem, any officer or employee thereof, or the Federal Emergency Management Agency for any flood damages that result from reliance on this Chapter or any administrative decision lawfully made thereunder including, but not limited to, a decision related to the enforcement or non-enforcement of the provisions of this Chapter. This Chapter shall not be construed to create any duties on the part of the City, FEMA or any of the employees and officers of either to any private person or entity. The degree of flood protection required by this Chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This Chapter does not imply that land outside the areas of special flood hazards or uses permitted within such areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

10-3-7

If any section, provision, or portion of this ordinance is adjudged unconstitutional or invalid by a court, the remainder of the ordinance shall not be affected.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Article 10-4. Administration

Contents:

- 10-4-1. Designation of the Floodplain Administrator
- 10-4-2. Duties & Responsibilities of the Floodplain Administrator
- 10-4-3. Establishment of Development Permit.
- 10-4-4. Permit Review Procedures.
- 10-4-5. Variance Procedures

10-4-1

The Development Services Director or his/her designee is hereby appointed the Floodplain Administrator to implement the provisions of this Chapter and other applicable sections of 44 CFR (National Flood Insurance Program Regulations) pertaining to floodplain management.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

10-4-2

Floodplain Administrator shall:

- A. Maintain and hold open for public inspection all records pertaining to the provisions of this Chapter.
- B. Review permit applications to determine whether proposed building sites, including the placement of manufactured homes, will be reasonably safe from flooding.



- C. Review, approve or deny all applications for development permits required by adoption of this ordinance.
- D. Review permits for proposed development to assure that all necessary permits have been obtained from those Federal, State or local governmental agencies (including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334) from which prior approval is required.
- E. Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the Floodplain Administrator shall make the necessary interpretation.
- F. Notify, in riverine situations, adjacent communities and the State Coordinating Agency, which is the Utah Division of Emergency Management, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency.
- G. Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.
- H. When base flood elevation data has not been provided, the Floodplain Administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a Federal, State or other source, in order to administer the provisions of this ordinance.
- I. When a regulatory floodway has not been designated, the Floodplain Administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the City's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the City.
- J. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, a City may approve certain development in Zones A1-30, AE, AH, on the City's FIRM which increases the water surface elevation of the base flood by more than one foot, provided that the City first applies for a conditional FIRM revision through FEMA (Conditional Letter of Map Revision).

(Ord. No. O-2020-0011, Enacted 5/16/2020)

10-4-3. Establishment of Development Permit.

- A. A development permit (a preliminary plat, site plan and or building permit as applicable) shall be obtained before construction or development begins within any area of special flood hazard established in Section [10-3-2](#). Application for a development permit shall be made on forms furnished by the City of Orem and may include, but not be limited to:
 - 1. Plans in duplicate drawn to scale showing the location, dimensions, and elevation of proposed landscape alterations, existing and proposed structures, including the placement of manufactured homes, and the construction of fences, and the location of the foregoing in relation to areas of special flood hazard and areas of special erosion hazard;
 - 2. Elevation in relation to mean sea level of the lowest floor (including basement) of all structures;
 - 3. Elevation in relation to mean sea level to which any structure has been floodproofed;
 - 4.



Certification by a registered professional engineer or architect that the floodproofing methods for any non-residential structure meet the floodproofing criteria in Section 10-5-2(B); and

5.

Description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development.

B.

A record of all of the above information shall be maintained by Floodplain Administrator.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

Effective on: 4/10/1990

10-4-4. Permit Review Procedures.

A. The Development Review Committee shall review all development permits to determine:

1. That the permit requirements of this Chapter have been satisfied.
2. That all necessary permits have been obtained from those Federal, State or local governmental agencies from which prior approval is required.
3. If the proposed development adversely affects the flood carrying capacity of the area of special flood hazard. For the purposes of this Chapter, "adversely affects" means damage to adjacent properties because of rises in flood stages attributed to physical changes of the channel and the adjacent overbank areas.
 - a. If it is determined that there is no adverse effect and the development is not a building, then the permit shall be granted without further consideration.
 - b. If it is determined that there is an adverse effect, then technical justification, such as a registered professional engineer's certification, for the proposed development shall be required.
 - c. If the proposed development is a building, then the provisions of this Chapter shall apply.

(Ord. No. 661, Revised, 04/10/90)

B. When base flood elevation data has not been provided in accordance with Section 10-3-2, the Development Review Committee shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source as criteria for requiring that new construction, substantial improvements, or other development in Zone A are administered in accordance with Section 10-5-2 of this Chapter.

(Ord. No. 661, Revised, 04/10/90)

C. The following information shall be furnished to the City and kept on file with each development permit:

1. The actual elevation in relation to mean sea level of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.



2. For all new or substantially improved floodproofed structures verification of the actual elevation in relation to mean sea level to which the structure has been floodproofed.
3. Verification that adjacent communities and the Utah State Coordinator for Emergency Management have been notified prior to any alteration or relocation of a watercourse. Evidence of such notification shall be furnished to the Federal Emergency Management Agency.

(Ord. No. 661, Revised, 04/10/90)

- D. The developer shall provide maintenance within the altered or relocated portion of such watercourse, described in subparagraph (3) above, so that the flood carrying capacity is not diminished.

(Ord. No. 661, Revised, 04/10/90)

- E. The Development Review Committee shall make interpretations, where needed, as to the exact location of the boundaries of the areas of special flood hazards. For example: where there appears to be a conflict between a mapped boundary and actual field conditions.

(Ord. No. 661, Revised, 04/10/90)

Effective on: 4/10/1990

10-4-5

The Board of Adjustment shall hear and render judgment on requests for variances from the requirements of this Chapter.

- A. Any person or persons aggrieved by the decision of the Board of Adjustment may appeal such decision to courts of competent jurisdiction.
- B. The Floodplain Administrator shall maintain a record of all actions involving an appeal and shall report variances to the Federal Emergency Management Agency and the State Office of Emergency Management upon issuing a variance.
- C. Variances may be issued for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in section 10-4-3 of this Article have been fully considered. As the lot size increases beyond the one-half acre, the technical justification required for issuing the variance increases.
- D. Upon consideration of the factors noted above and the intent of this ordinance, the Board of Adjustment may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this ordinance.
- E. Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.
- F. Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.
- G. Prerequisites for granting variances:
 1. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
 2. Variances shall only be issued upon:
 - a. showing a good and sufficient cause;



- b. a determination that failure to grant the variance would result in exceptional hardship to the applicant, and
 - c. a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, the creation of nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.
3. Any application to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

Variances may be issued by the Board of Adjustment for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that:

- H. The structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

Article 10-5. Provisions for Flood Hazard Reduction

Contents:

- 10-5-1. General Standards.
- 10-5-2. Specific Standards.
- 10-5-3. Standards for Subdivision Proposal.
- 10-5-4. Standard for Areas of Shallow Flooding (AO/AH Zones).
- 10-5-5. Floodways.
- 10-5-6. Penalties for Violation

10-5-1. General Standards.

General Standards. The following are required for all new construction and substantial improvements in areas of special flood hazards.

- A. All new construction and substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure and resulting from hydrostatic and hydrodynamic loads, including the effect of buoyancy.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

- B. All manufactured homes must be elevated and anchored to resist flotation, collapse or lateral movement and capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces. Specific requirements may be:

- 1. Over-the-top ties be provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than fifty feet (50') long requiring one additional tie per side.



2. Frame ties be provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than fifty feet (50') long requiring four additional ties per side.
3. All components of the anchoring system be capable of carrying a force of 4,800 pounds.
4. Any additions to the manufactured home be similarly anchored.

(Ord. No. 661, Revised, 04/10/90)

C. All new construction and substantial improvements shall be constructed:

1. With materials and utility equipment resistant to flood damage.
2. Using methods and practices that minimize flood damage.
3. With electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(Ord. No. 661, Revised, 04/10/90)

D. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

(Ord. No. 661, Revised, 04/10/90)

E. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters. All new construction shall be required to connect to City's sanitary sewer system.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

F. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

(Ord. No. 661, Revised, 04/10/90)

G. Base flood elevation data shall be provided for subdivision proposals and other proposed development which contain at least fifty (50) lots or five (5) acres, whichever is less. All subdivision proposals shall:

1. Be consistent with the need to minimize flood damage.
2. Have public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage.
3. Have adequate drainage provided to reduce exposure to flood damage.

(Ord. No. 661, Revised, 04/10/90)

H. Encroachments, including fill, new construction, substantial improvements, and other development shall be prohibited in any floodway unless a technical evaluation demonstrates that the encroachments will not result in any increase in flood levels during the occurrence of the base flood discharge. No solid walls, solid fences, or other structures that could disrupt flowing water in an area of special flood hazard shall be constructed in a position or direction contrary to the direction of flowing water.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)



Effective on: 4/10/1990

10-5-2. Specific Standards.

In all areas of special flood hazards where base flood elevation data has been provided as required by this Chapter, the following standards are required:

- A. Residential Construction. New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to one foot above the base flood elevation. A registered professional engineer, architect, or land surveyor shall submit a certification to the Floodplain Administrator that the standards of this ordinance are satisfied.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)

- B. Nonresidential Construction. New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor (including basement) elevated to the level of one foot above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:

1. Be floodproofed so that below the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water.
2. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
3. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this paragraph. Such certifications shall be provided to the official as set forth in Section 10-4-4(C). A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Floodplain Administrator.

- C. Enclosed Areas – including enclosures, crawlspaces, subgrade crawlspaces, and attached garages - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to:

1.
Automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters.
2.
Flood vents meeting ICC-ES standards may be used with the bottom of all openings no higher than one foot above grade and a minimum of two openings, or
3.
Vents certified by a registered professional engineer or architect must meet or exceed the following minimum criteria:
 - a.
A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - b.



The bottom of all openings shall be no higher than one foot above grade.

- c. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

Enclosures are areas that have a height greater than five feet from the enclosure floor to the finish floor elevation above.

Crawlspaces have at least one side of the crawlspace floor at or above the exterior grade. The crawlspace floor must be less than 5 feet from the finish floor elevation above.

Subgrade crawlspaces have an exterior grade that cannot be more than 2' above crawlspace floor elevation and a finish floor elevation of floor immediately above cannot be more than 5' above the crawlspace floor.

D. Manufactured Homes -

1. All manufactured homes to be placed within Zone A in the City's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.
2. Manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the City's FIRM on sites (i) outside of a manufactured home park or subdivision, (ii) in a new manufactured home park or subdivision, (iii) in an expansion to an existing manufactured home park or subdivision, or (iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood, shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.
3. In the A-1-30, AH, and AE Zones, manufactured homes that are placed or substantially improved in an existing manufactured home park shall be elevated so that the lowest floor is at or above the Base Flood Elevation; OR the chassis is supported by reinforced piers no less than 36 inches in height above grade and securely anchored.

E. Recreational Vehicles - Recreational vehicles placed on sites within Zones A1-30, AH, and AE on the City's FIRM shall either:

1. be on the site for fewer than 180 consecutive days and be fully licensed and ready for highway use, or
2. meet the permit requirements of Section 10-4-2 and the elevation and anchoring requirements for "manufactured homes" of this section.

A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices and has no permanently attached additions.

(Ord. No. 661, Revised, 04/10/90; Ord. No. O-2020-0011, Amended 5/16/2020)



Effective on: 4/10/1990

10-5-3. Standards for Subdivision Proposal.

- A. All subdivision proposals including the placement of manufactured home parks and subdivisions shall be consistent with the provisions of this Chapter 10.
- B. All proposals for the development of subdivisions including the placement of manufactured home parks and subdivisions shall meet the Development Permit requirements of this Chapter 10.
- C. Base flood elevation data shall be generated for subdivision proposals and other proposed development including the placement of manufactured home parks and subdivisions which are greater than 50 lots or 5 acres, whichever is less.
- D. All subdivision proposals including the placement of manufactured home parks and subdivisions shall have adequate drainage provided to reduce exposure to flood hazards.
- E. All subdivision proposals including the placement of manufactured home parks and subdivisions shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage.

(Ord. No. O-2020-0011, Amended 5/16/2020)

10-5-4. Standard for Areas of Shallow Flooding (AO/AH Zones).

Located within the areas of special flood hazard established in section 10-3-2, are areas designated as shallow flooding. These areas have special flood hazards associated with base flood depths of 1 to 3 feet where a clearly defined channel does not exist and where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply in areas designated as shallow flooding:

- A. All new construction and substantial improvements of residential structures shall have the lowest floor (including basement) elevated above the highest adjacent grade a height equal to or greater than the depth number specified in feet on the City's FIRM (at least two feet if no depth number is specified).
- B. All new construction and substantial improvements of non-residential structures;
 - 1. Shall have the lowest floor (including basement) elevated above the highest adjacent grade a height equal to or greater than the depth number specified in feet on the City's FIRM (at least two feet if no depth number is specified), or;
 - 2. together with attendant utility and sanitary facilities be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy.
- C. A registered professional engineer shall submit a certification to the Floodplain Administrator that the standards of section 10-4-3 are satisfied.
- D. Require within Zones AH or AO adequate drainage paths around structures on slopes, to guide flood waters around and away from proposed structures.
 - 1. FIRMs may also identify areas of shallow flooding hazards with an average depth less than 1 foot deep (shaded Zone X). These areas may be between the flood hazard boundaries defined for the 1- and 0.2-percent chance-annual-flood or associated with base flood depths less than 1 foot where a clearly defined



channel does not exist and where the path of flooding is unpredictable and where velocity may be evident. Such flooding is generally characterized by sheet flow; therefore

- a. all new construction or substantial improvements of residential and nonresidential structures in such areas shall:
 - i. have the lowest floor (including basement) elevated above the estimated depth of the base flood and above the highest groundwater level that is anticipated to occur during periods of flooding.
 - ii. within shaded X zones, have positive ground slopes away from structures and adequate drainage paths around structures on sloping ground to guide flood water around and away from proposed structures.

A registered professional engineer shall submit certification to the Floodplain Administrator that the standards of this Section are satisfied.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

10-5-5. Floodways.

Floodways located within areas of special flood hazard established in Article 10-3 are extremely hazardous areas due to the velocity of flood waters which carry debris, potential projectiles and erosion potential.

- A. All new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of this Article 10-5. A designated regulatory floodway may not increase the Base Flood level more than 1 foot.
- B. Encroachments are prohibited in floodways, including fill, new construction, substantial improvements and other development within an adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the City during the occurrence of the base flood discharge.
- C. The Floodplain Administrator may, pursuant to the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Regulations, permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the City first applies for a conditional FIRM and floodway revision through FEMA.

(Ord. No. O-2020-0011, Enacted 5/16/2020)

10-5-6. Penalties for Violation.

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this Chapter 10 and other applicable regulations. Violation of any provision of this Chapter 10 (including violations of conditions and safeguards established in connection with conditions) shall constitute a Class C misdemeanor. Nothing contained herein shall prevent the City from taking such other lawful action as is necessary to prevent, or remedy or abate any violation.

(Ord. No. O-2020-0011, Enacted 5/16/2020)















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CITY OF OREM
DRAFT BOARD OF ADJUSTMENTS MINUTES
June 22, 2022

STUDY SESSION

Place: City Council Conference Room

At 5:30 p.m. Mr. Bench called the Study Session to order.

Those present: Ott Dameron, Carlos Iglesias, Karen Jeffreys, David Moulton and Leslie Nelson, Board of Adjustment members; Jason Bench, Planning Division Manager; Cheryl Vargas, Associate Planner, Grant Allen and Matt Taylor, Senior Planners; Steve Earl and Aaron McKnight, Legal Counsel

Those excused: Rachel Stevens, Associate Planner

The Board members elected Karen Jeffreys as their Chair.

REGULAR MEETING

Place: City Council Chambers ([Click here for recording](#))

At 6:00 p.m. Chair Jeffreys called the meeting to order and asked Mr. Moulton to give the invocation.

Those present: Ott Dameron, Carlos Iglesias, Karen Jeffreys, David Moulton and Leslie Nelson, Board of Adjustment members; Jason Bench, Planning Division Manager; Cheryl Vargas, Associate Planner; Grant Allen and Matt Taylor, Senior Planners; Steve Earl and Aaron McKnight, Legal Counsel

Those excused: Rachel Stevens, Associate Planner

Agenda Item 3.1 is a request by Sean Hadlock for the Board of Adjustment consider granting a variance for the property located at 2501 East Provo Canyon Road in the OS5 zone. This meeting will be for discussion only. ([Click here for recording](#))

Staff Presentation: The applicant is requesting to modify or rebuild an existing structure on a parcel located at 2501 East Provo Canyon Road. The parcel contains an older one-story structure built in 1924 containing 285 square feet. The applicant is requesting to build a new home containing approximately 1,008 square feet according to a concept floor plan submitted.

The parcel is located in the Flood Plain (adjacent to the Provo River) and is designated as Zone A on the Flood Insurance Rate Map (FIRM) dated June 19, 2020. Development in the flood plain is regulated by Orem City Code Chapter 10. *Flood Damage Prevention* and requires strict development standards within the flood plain. The ordinance requires (Section 10-3-3) that “No structure or land shall hereafter be constructed, located, extended, or altered or have its use changed without full compliance with the terms of this Chapter and other applicable regulations.”

Section 10-3-5 *Interpretation*. Outlines how the ordinances outlined in Chapter 10 should be interpreted:

In the interpretation of this Chapter, all provisions shall be:

- A. Considered as minimum requirements;
- B. Liberally construed in favor of the governing body; and
- C. Deemed neither to limit nor repeal any other powers granted under State statutes.

A complete video of the meeting can be found at www.orem.org/meetings

DRAFT Board of Adjustment Minutes June 22, 2022

1 In order for the applicant to remodel or reconstruct a home at this location the Board of Adjustment must grant a
2 variance as outlined below:

3
4 Section 10-5-1 outlines that "All new construction shall be required to connect to City's sanitary sewer system."
5 Since this parcel is located approximately two (2) miles from the nearest connection it seems impracticable to
6 require the applicant to connect to an existing sewer line. The current older cabin is using an existing septic system.
7 The applicant suggests that "*Without a variance for connecting to the city sanitary waste system, we cannot build,*
8 *add on or renovate on this property, and neither could any of the homeowners on Provo Canyon Road.*" According
9 to the applicant, an inspection of the existing septic system was completed and it was in excellent condition
10 according to the report provided. The report is part of the agenda for your review. However, according to the Utah
11 County Health Department if a new structure is built on the site the applicant will be required to bring the site into
12 compliance with all applicable requirements outlined by the Utah County Health Department. Those requirements
13 will be the construction of a new septic tank, if a variance is granted. If the existing structure is remodeled the
14 existing septic tank would be allowed to remain.

15
16 Prior to granting a variance additional information is needed to determine several issues pertaining to this property.
17 These include:

18
19 The ordinance (Section 10-4-4 *Permit Review Procedures*) requires all new or substantially improved floodproof
20 structures verification of the actual elevation in relation to mean sea level to which the structure has been
21 floodproofed.

22
23 In addition, Section 10-5-2 *Specific Standards*. Requires new construction and substantial improvement of any
24 residential structure to have the lowest floor, including basement, elevated to one foot above the base flood elevation
25 and a certification provided by a registered professional engineer, architect, or land surveyor to certify that this
26 requirement is satisfied. This would require the applicant to hire a professional as outlined above to determine the
27 base flood elevation in order to certify that any new construction would be the one foot above base flood
28 requirement. The applicant has indicated the cost for the study is between \$10,000 - \$15,000.

29
30 Based on the above requirements and before the applicant completes the study, the applicant has requested a
31 discussion with the Board of Adjustment before hiring a professional engineer to determine the base flood elevation
32 and certify the proposed elevation of the existing structure and/or proposed structure. The applicant understands this
33 is a requirement prior to the Board granting any variance for this property. Staff supports a discussion with the
34 board, however, would require the base flood elevation determination before recommending that a variance be
35 granted to not require a connection to the City's sanitary sewer system.

36
37 In addition, the engineered plans must also show the improvements including any addition or new structure shall
38 demonstrate that the encroachment will not result in any increase in flood levels during the occurrence of the base
39 flood discharge as required in Section 10-5-1(H).

40
41 Chapter 10 also outlines specific factors the Board of Adjustment must consider in the determination for granting
42 variances to Chapter 10. The applicant has addressed these questions and the information provided is part of the
43 staff report for your review.

44
45 Section 10-4-5(G)

46 G. Prerequisites for granting variances:

- 47 1. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering
48 the flood hazard, to afford relief.
- 49 2. Variances shall only be issued upon:
 - 50 a. showing a good and sufficient cause;
 - 51 b. a determination that failure to grant the variance would result in exceptional hardship to the applicant, and

A complete video of the meeting can be found at www.orem.org/meetings

DRAFT Board of Adjustment Minutes June 22, 2022

c. a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, the creation of nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

3. Any application to whom a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

Variances may be issued by the Board of Adjustment for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that:

H. The structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.

Based on the factors outlined above the Board of Adjustment must decide whether the request for a variance meets the strict requirements for granting a variance in a flood plain.

Additional information will be provided by the applicant at a future Board of Adjustment based on the outcome of the discussion. Additional items would include:

1. Engineered drawings of the base flood elevation and supporting documentation supporting the determination.
2. An application to the Utah County Health Department for a new septic system, if a new structure or an addition is proposed.
3. Review by the Provo Water Users and/or other affected parties related to a new septic system, if applicable.

Chair Jeffreys asked the applicant to introduce himself. Sean Hadlock introduced himself. There was a discussion regarding the capacity of the current septic tank. ([Click here for recording](#))

- Specifics will have to be worked out with Utah County. ([Click here for recording](#))

Mr. Bench said the issue for tonight is to see if the Board would grant a variance for this property to not have to connect to the City sewer system but remain on a septic tank. There was a discussion regarding the possibility of having to relocate the current septic tank. ([Click here for recording](#))

Ms. Jeffreys asked what the plan is for the property. Mr. Hadlock said his family would use it and it would also be an Airbnb. ([Click here for recording](#))

Mr. Moulton asked how high the slope is as it goes toward the river. Mr. Hadlock thought it was about a 10' drop. Options to bring the new house up and out of the flood plain were discussed. ([Click here for recording](#))

Mr. Earl made a comment to make sure Mr. Hadlock understood that the Board was making no commitment to approve this item when this comes back before them. ([Click here for recording](#))

Board of Adjustment Action: Chair Jeffreys called for a motion to continue this item. Mr. Dameron moved to continue this item to an undetermined date. Ms. Nelson seconded the motion. Those voting aye: Ott Dameron, Carlos Iglesias, Karen Jeffreys, David Moulton and Leslie Nelson. The motion passed unanimously. ([Click here for recording](#))

Minutes: Chair Jeffreys called for a motion to approve the draft minutes of the July 17, 2019 meeting. Ms. Nelson moved to approve the meeting minutes for July 17, 2019. Ms. Jeffreys seconded the motion. Those voting aye: Ott Dameron, Carlos Iglesias, Karen Jeffreys, David Moulton and Leslie Nelson. The motion passed unanimously.

DRAFT Board of Adjustment Minutes June 22, 2022

1 **Adjourn:** Chair Jeffreys called for a motion to adjourn. Ms. Nelson moved to adjourn. Mr. Moulton seconded the
2 motion. Those voting aye: Ott Dameron, Carlos Iglesias, Karen Jeffreys, David Moulton and Leslie Nelson. The
3 motion passed unanimously.
4

5 **Adjourn:** 6:25 p.m.
6
7

8 _____
9 Jason Bench
10

11
12 Approved:

A complete video of the meeting can be found at www.orem.org/meetings