

LiDAR Mapping of the Levan & Fayette Segments of the Wasatch Fault Zone

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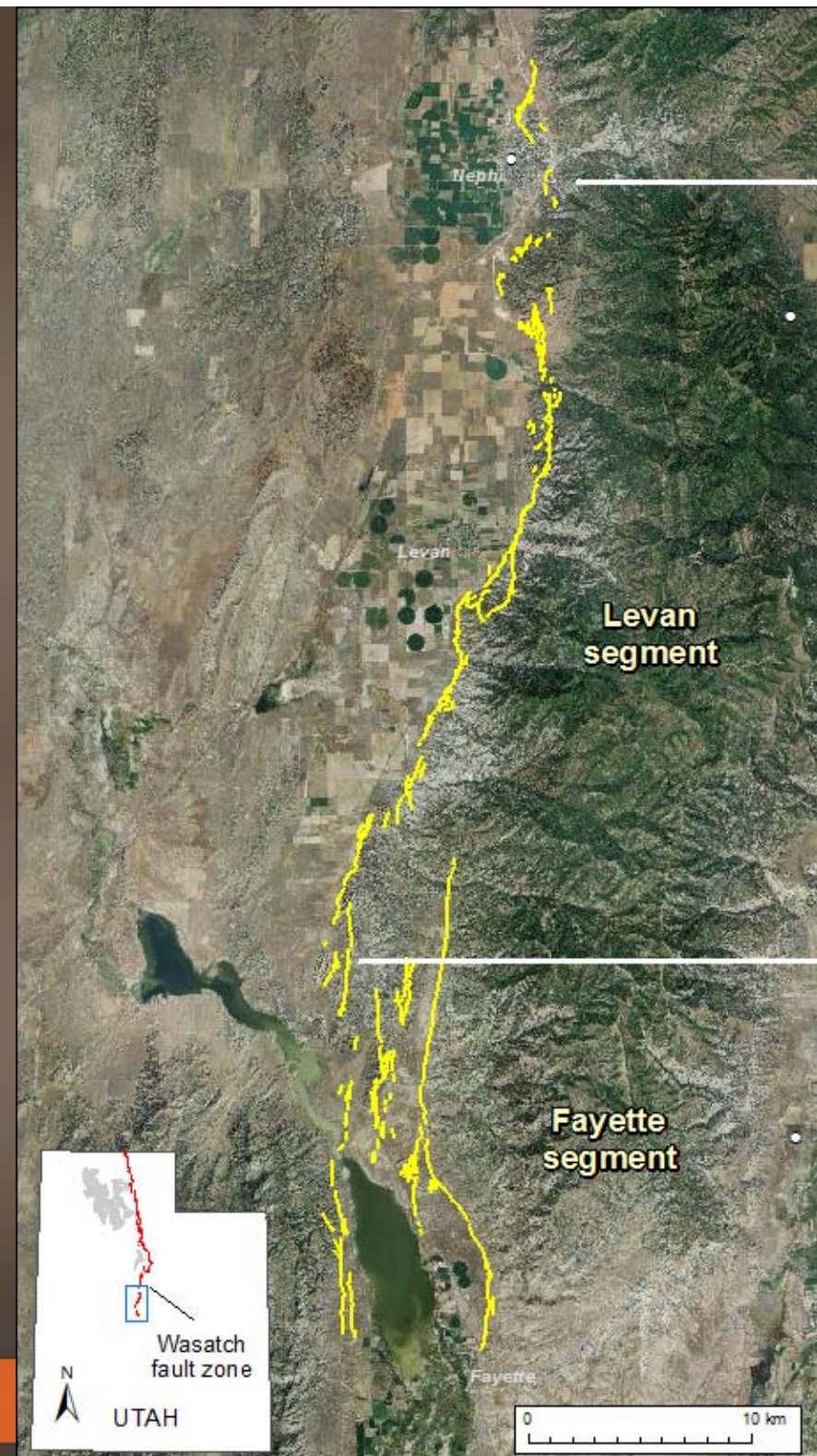


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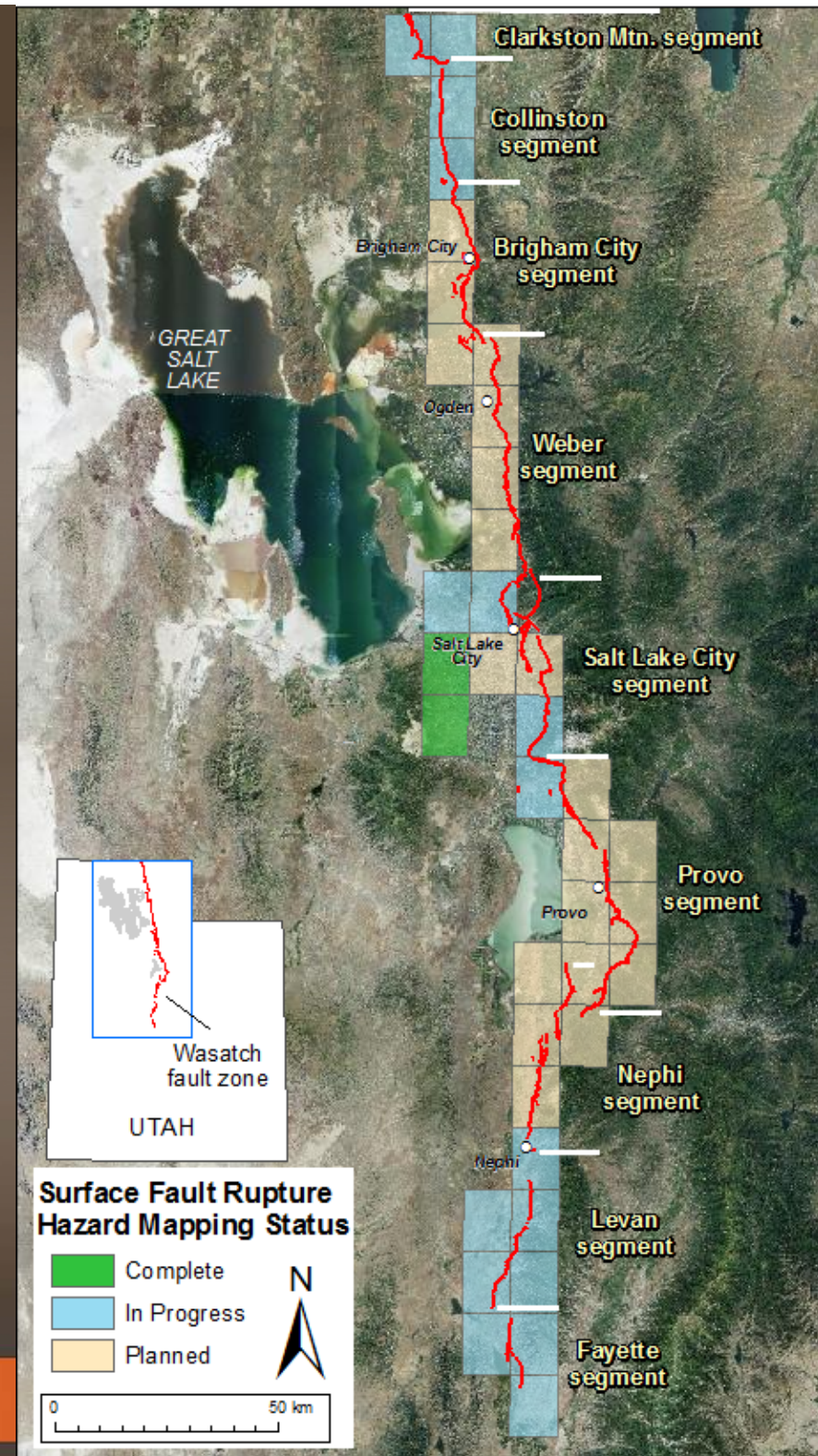
Levan/Fayette Segments

- Southernmost 2 segments of the Wasatch Fault Zone
- Levan – appx. 40 km long
- Fayette – appx. 22 km long
- Both show evidence for Holocene surface faulting
- 1 trench at Skinner Peaks on the Levan Segment, no trenching on Fayette segment.



Wasatch Fault Zone Hazard Mapping Status

- Mapping quad-by-quad at 24K scale
- Publishing as Surface Fault Rupture Hazard Mapping
- 16 quads in progress
- 20 quads planned



Objectives:

- Re-map Levan and Fayette segments of the WFZ at 1:10,000 or better scale. Identify previously un-mapped fault traces
- Use 2013-2014 0.5-meter LiDAR dataset, as well as historical aerial photos, previous geologic mapping, and field reconnaissance
- Create surface fault rupture hazard maps at 1:24000 scale for land-use planning along the southern WFZ



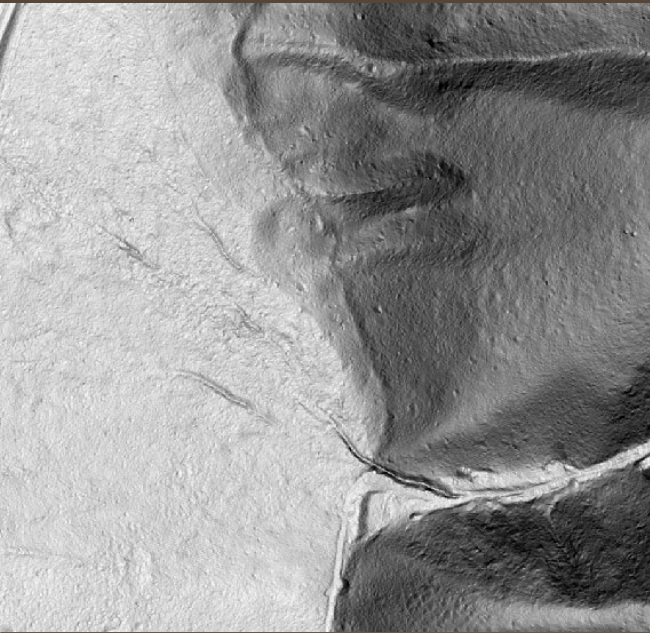
2013/2014 0.5-meter LiDAR Dataset

- Collected in 2013/2014 by a consortium of local, state, and federal government agencies, including UGS and USGS.
- Includes entire WFZ, from Fayette, Utah to north of Malad City, Idaho.
- Extremely high-resolution, great for mapping subtle fault scarps.
- Availability – Utah AGRC (point cloud data) & NSF OpenTopography (point cloud data, Google Earth DEM generation)

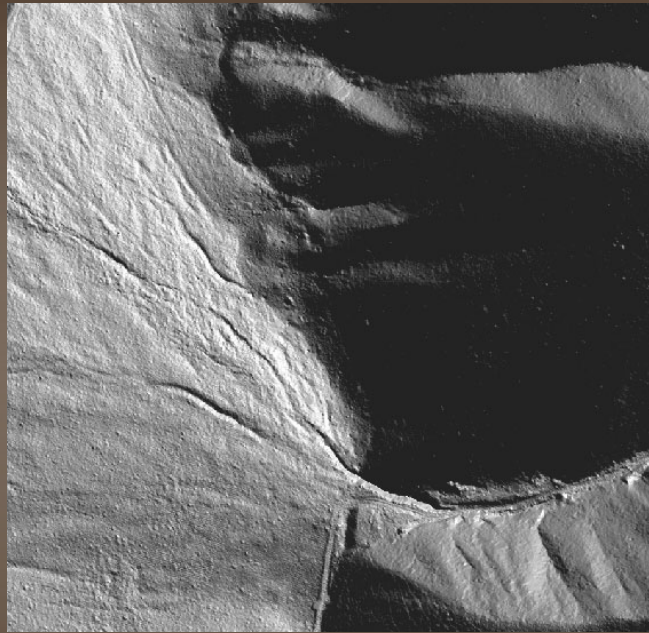


- AGRC - gis.utah.gov
- NSF OpenTopography - www.opentopography.org

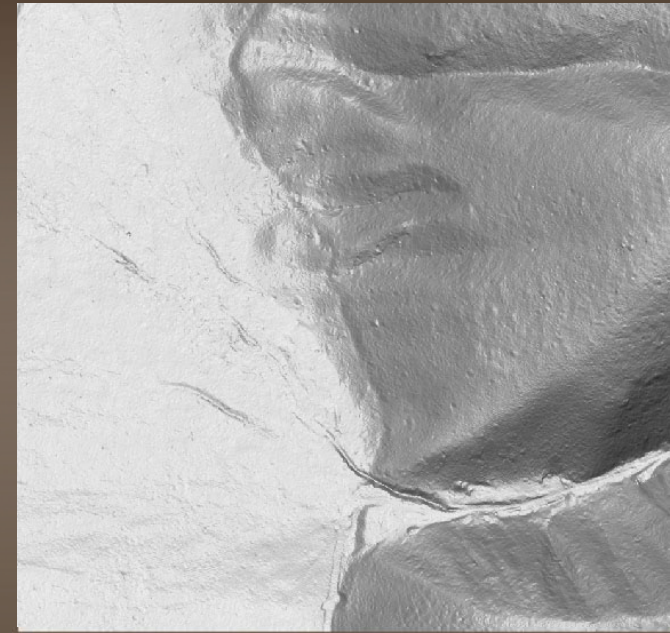
LiDAR Products Used



0-45° Slopeshade



Altitude 50°, Azimuth 045° Hillshade



Altitude 80°, Azimuth 315° Hillshade

- All products created in GlobalMapper then brought into ArcGIS for mapping
- Variety of hillshades with different sun azimuth and altitude values used
- Contour lines generated from DEM also used
- Slopeshade product was the most useful for mapping fault scarps



Other Data Used

- Woodward-Lundgren & Associates 1970's low-sun angle aerial photography
- Levan and Fayette Surficial Geologic Map, Hylland and Machette, 2008
- Existing geologic quad mapping
- Field reconnaissance of scarps



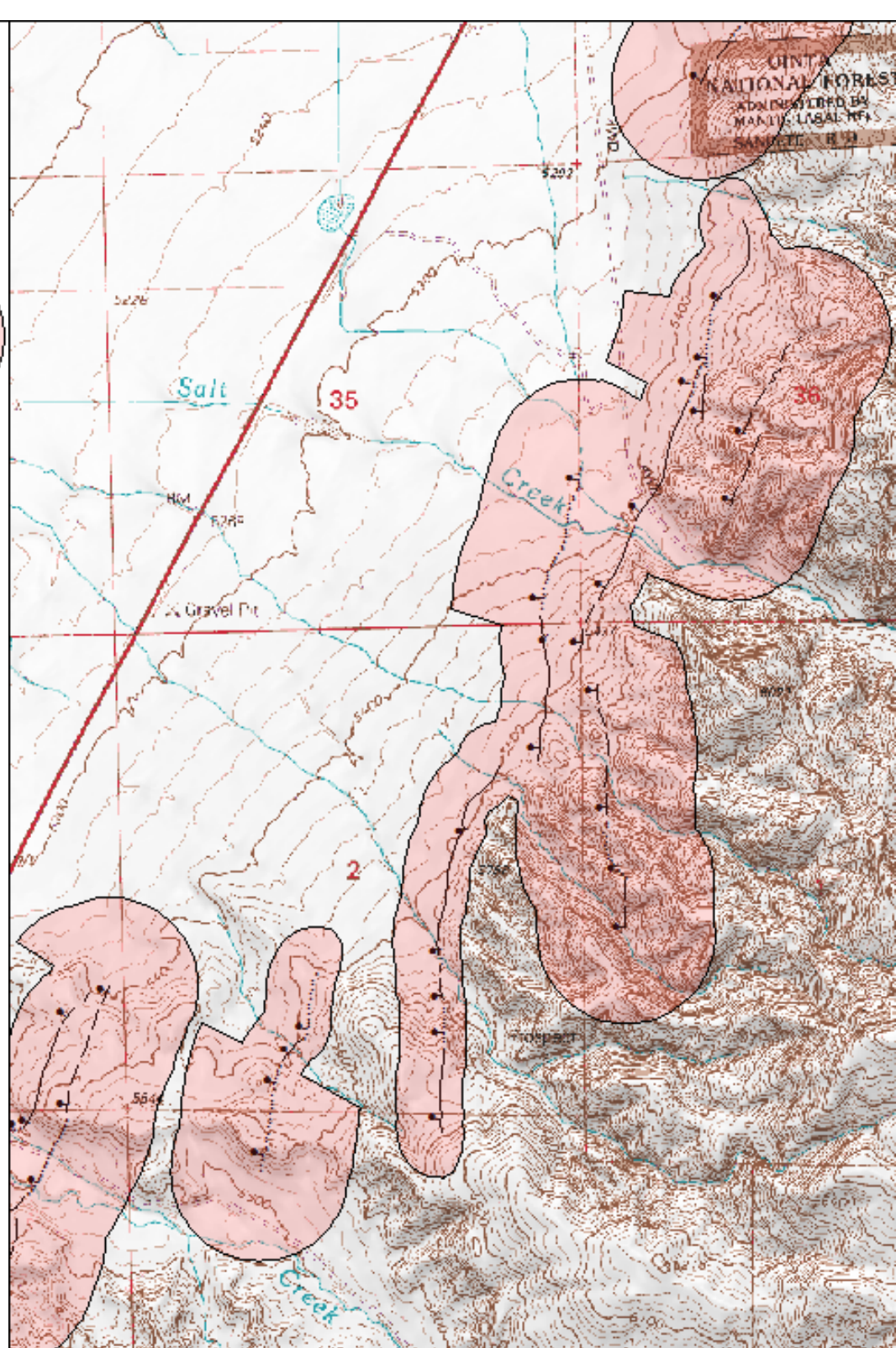
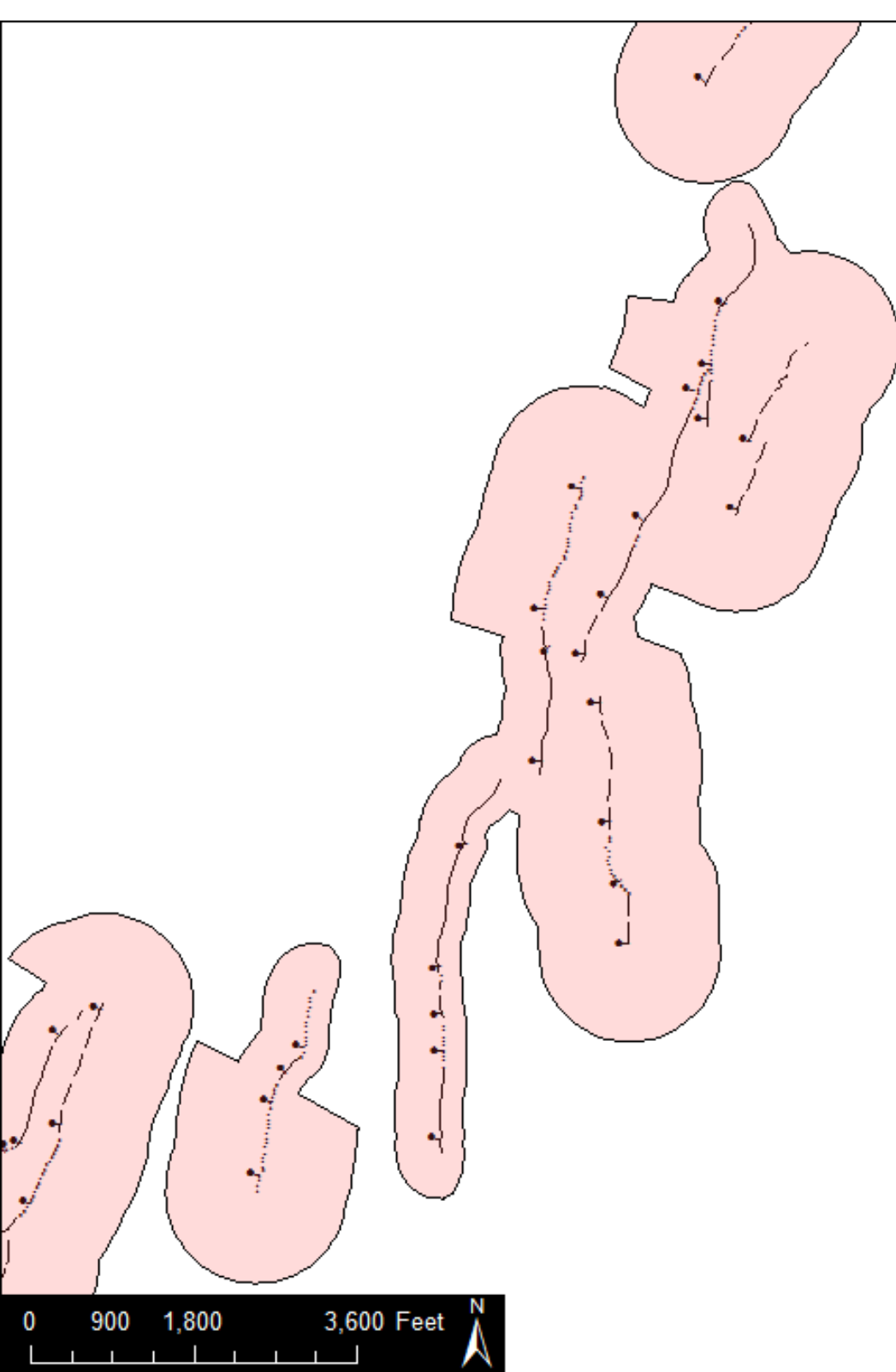


New Fault Trace Mapping

Special Study Zones

- For well-located faults, zone extends from the trace of the fault 250 feet on footwall, and 500 feet on hanging wall
- For moderately well-located and inferred faults, zone extends 1000 feet on either side of fault trace
- Mapper must use geologic knowledge and judgment while creating zones





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Results

- Refined mapping of the Levan and Fayette segments of the Wasatch Fault Zone
- Added new fault traces as well as refined existing traces and complex faulting zones
- All new mapping will eventually be added to Utah Quaternary Fault Database
- Created a set of Surface Fault Rupture hazard maps for the southernmost Wasatch Fault – an area that will likely experience population growth in the future
- Utah Geological Survey Open-File Report 640: Surface Fault Rupture Hazard Maps of the Levan and Fayette Segments of the Wasatch Fault Zone, Juab and Sanpete Counties, Utah.



Future Fault Mapping

- Continue working north from Levan – Nephi segment next
- Scott Bennett (USGS) – Provo segment fault trace mapping
- Adam McKean (UGS) – Salt Lake City & Brigham City segments fault trace mapping
- Kimm Harty and Adam McKean (UGS) – Collinston & Clarkston Mtn. segments fault trace mapping



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Summary

- 0.5-meter LiDAR data is a great tool for high-resolution mapping of fault scarps
- Allows us to more accurately map fault traces and generate better Hazard Maps for future development and planning



Update on planned trenching on the Taylorsville Fault



Overview

- UGS with assistance from the USGS Golden Office
- Tentative dates: August 24 – September 4th, 2015



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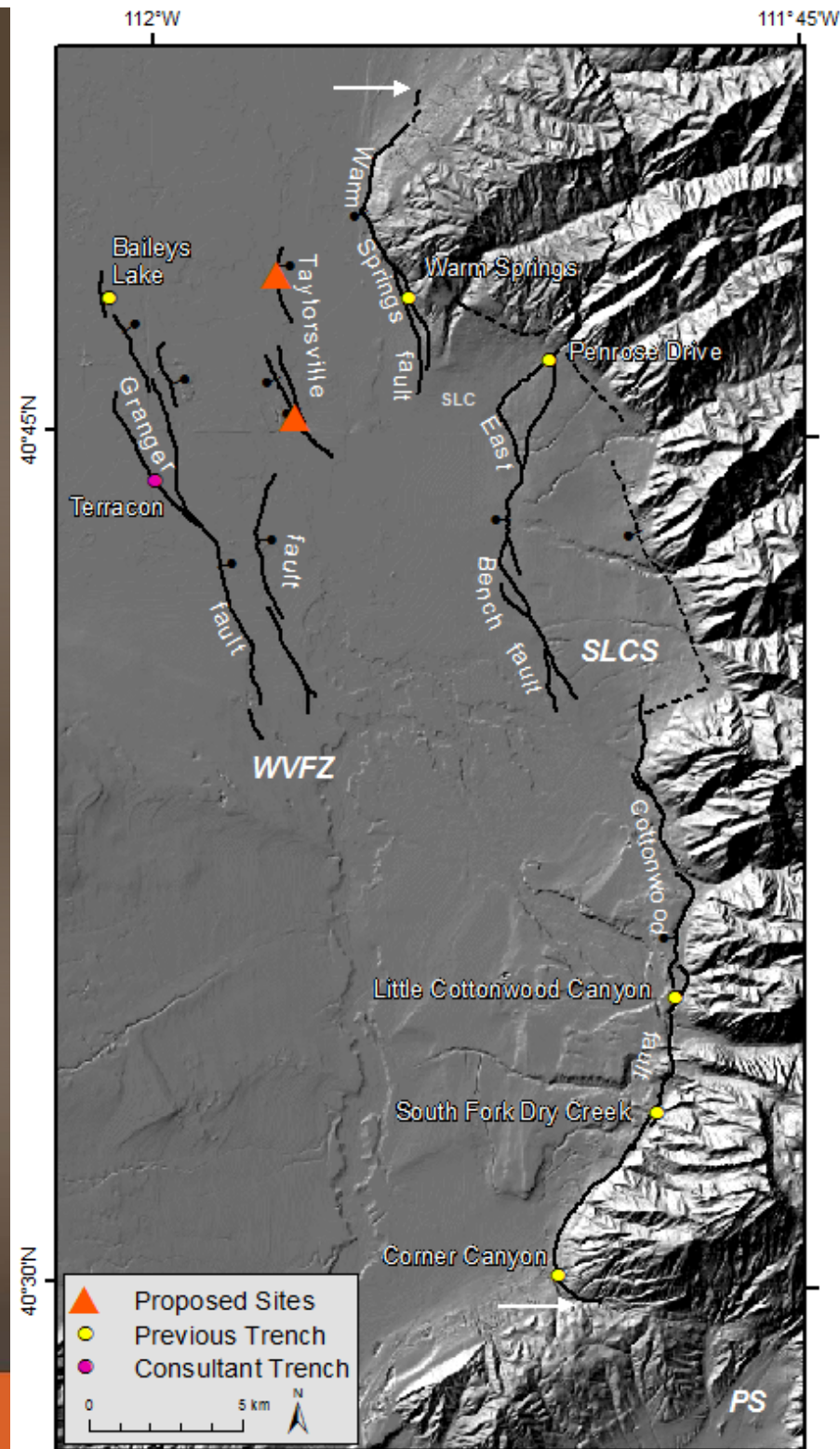
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Site Location

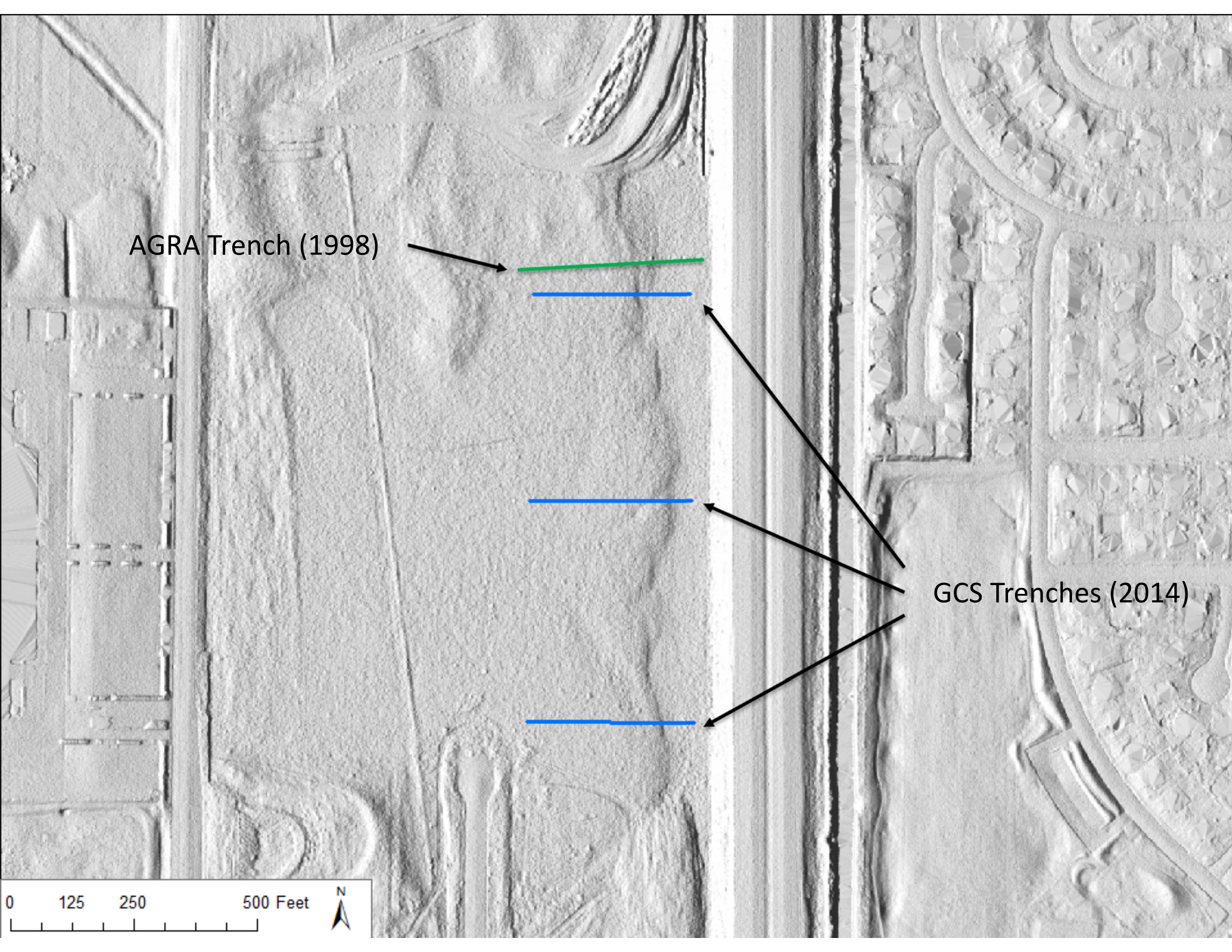
- Taylorsville strand of the West Valley Fault Zone
- North site is primary site, south site is backup site
- North site – appx. 0.5m scarp, east dipping
- Backup site – appx. 1.5m scarp, west dipping



North Site – GCS Geoscience Trenches

- Trenched in August 2014 by Greg Schlenker of GCS Geoscience for industrial land pre-sale feasibility study
- Dug 3 trenches along scarp, encountered ground water at appx. 3 foot depth.
- North and South trenches showed good fault exposure, middle trench showed broad zone of down to east warping with a couple of possible small shears

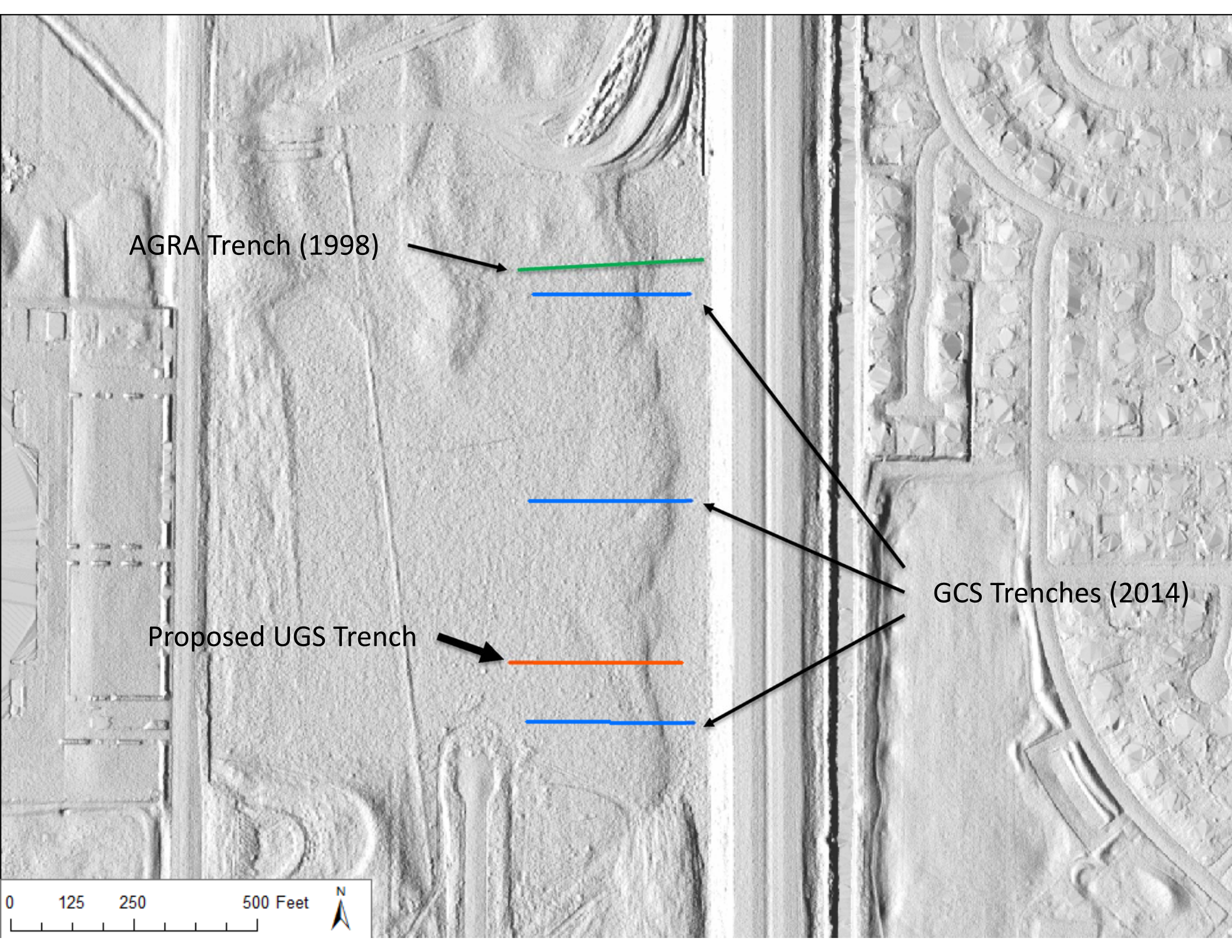




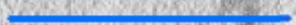
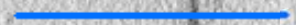
AGRA Trench (1998)

GCS Trenches (2014)

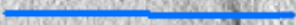




AGRA Trench (1998)



Proposed UGS Trench



GCS Trenches (2014)











