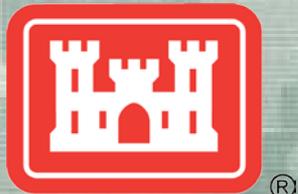


# BUCKEYE

Color Imagery and LIDAR Elevation Data  
Collection, Processing, Dissemination

US Army Geospatial Center



®

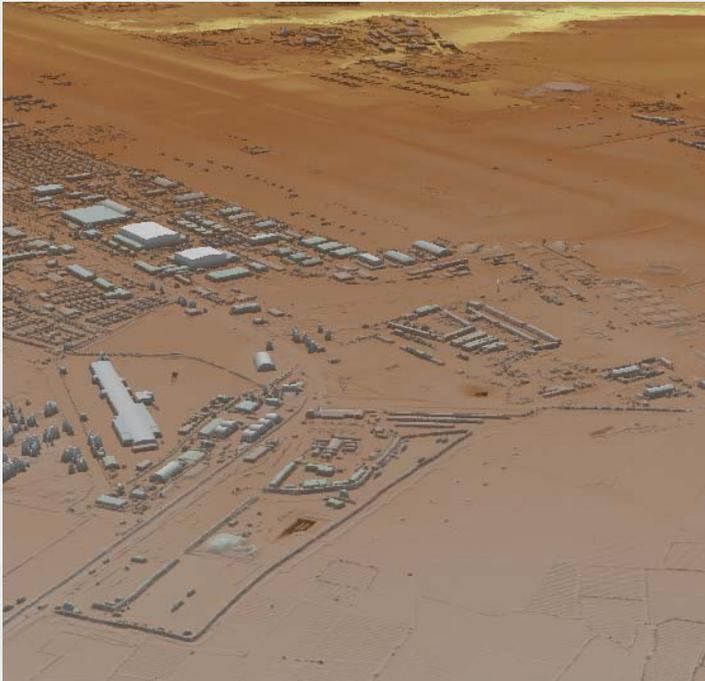
US Army Corps of Engineers  
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# Buckeye Mission

Rapidly Collect, Process and Distribute Unclassified High Resolution and High Accuracy Color Imagery and Elevation Data for:

- Change Detection
- Intelligence, Surveillance, and Reconnaissance (ISR)
- Urban Mapping



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# Buckeye Systems

## Platforms

## 3100 and Orion LIDAR Sensors (OPTECH INC)

### PG-DACS 1B+ (FLIGHTLANDATA INC)



### Digital Camera System (1B+)

- **Day Only Collection**
- **Altitude:** 250m – 3000m platform dependent
- **Ground Speed:** 90-120 knots
- **Swath Width:** ~540 meters
- **Resolution:** 10 cm (capable up to 3 cm based on profile and lenses used)
- **True Color sensor:** easy to use and interpret
- **Unclassified // FOUO:** wide tactical use

### Light Detection and Ranging (LIDAR)

- **Day or Night Collection** (No Clouds)
- **Altitude:** ~3000 m (instead of optimal 1800 m)
- **Ground Speed:** 120 knots
- **Swath Width:** ~500 meters
- **Resolution:** 1 m (capable up to 30 cm at lower altitudes)
- **Elevation Data:** High Geospatial Accuracy
- **Unclassified // FOUO:** wide tactical use



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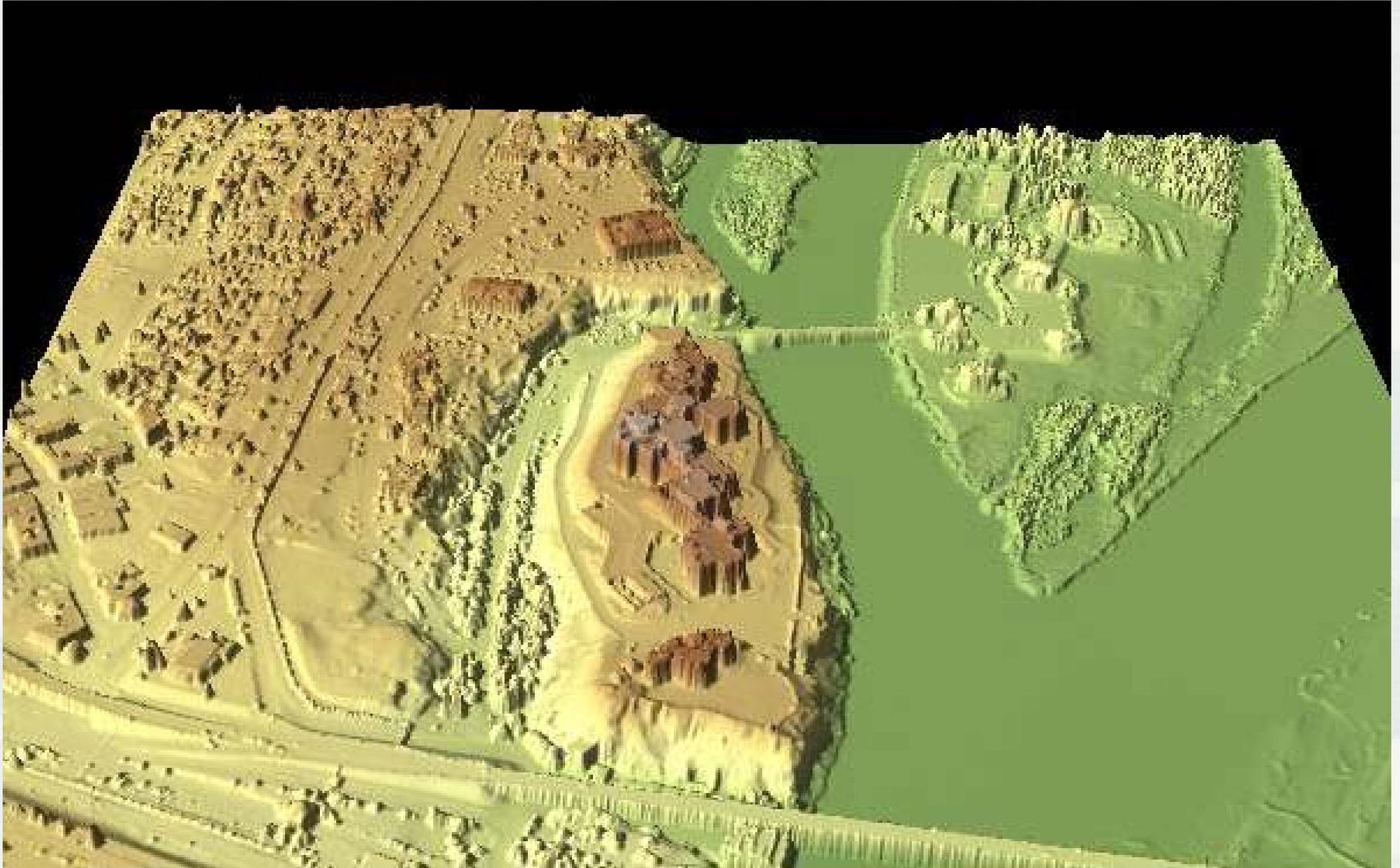
# Buckeye Data / Products

- **LIDAR Elevation Data**
  - **XYZI Point Data – ASCII format or .LAS format**
    - *3D Analysis*
    - *Vertical Obstructions*
    - *Vegetation Analysis*
    - *Feature Extraction*
  - **Gridded / Raster Files – GeoTIFF format - Edited**
    - *3D Views / Mission Planning / Fly-Through Database*
    - *Line of Sight / Viewshed*
    - *Flood Modeling / Slope Analysis*
    - *Contouring*
    - *Volume Calculation*
- **Color Imagery**
  - **Individual images (.jpg format) with a web-based Geo-Index (BIG)**
  - **Ortho-rectified image mosaics – MrSID format**
  - **NITF Geo-referenced Image Frames**
  - **GeoPDF Map Books**



# LIDAR Elevation Data

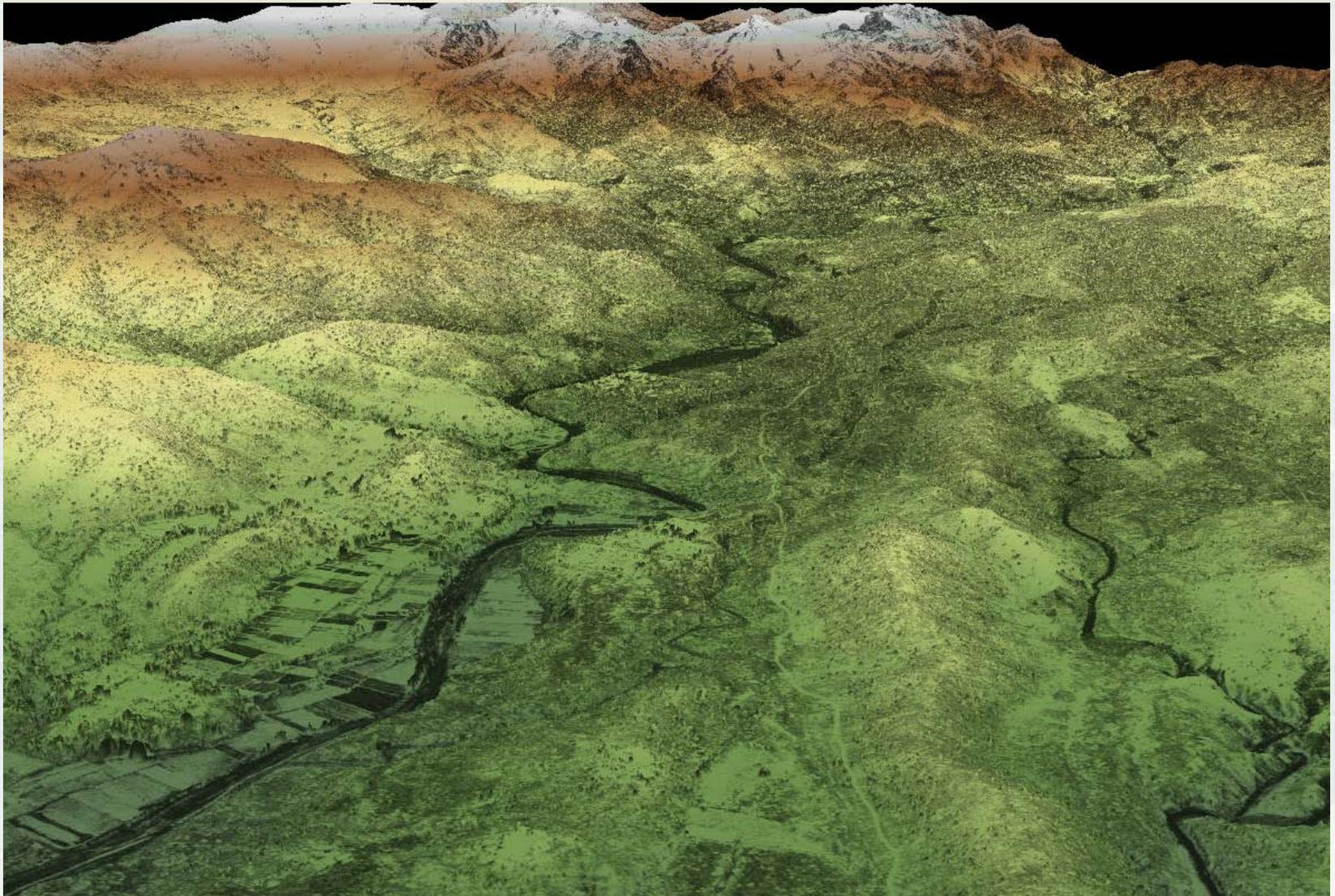
## 3D Shaded Relief of Tikrit, Iraq



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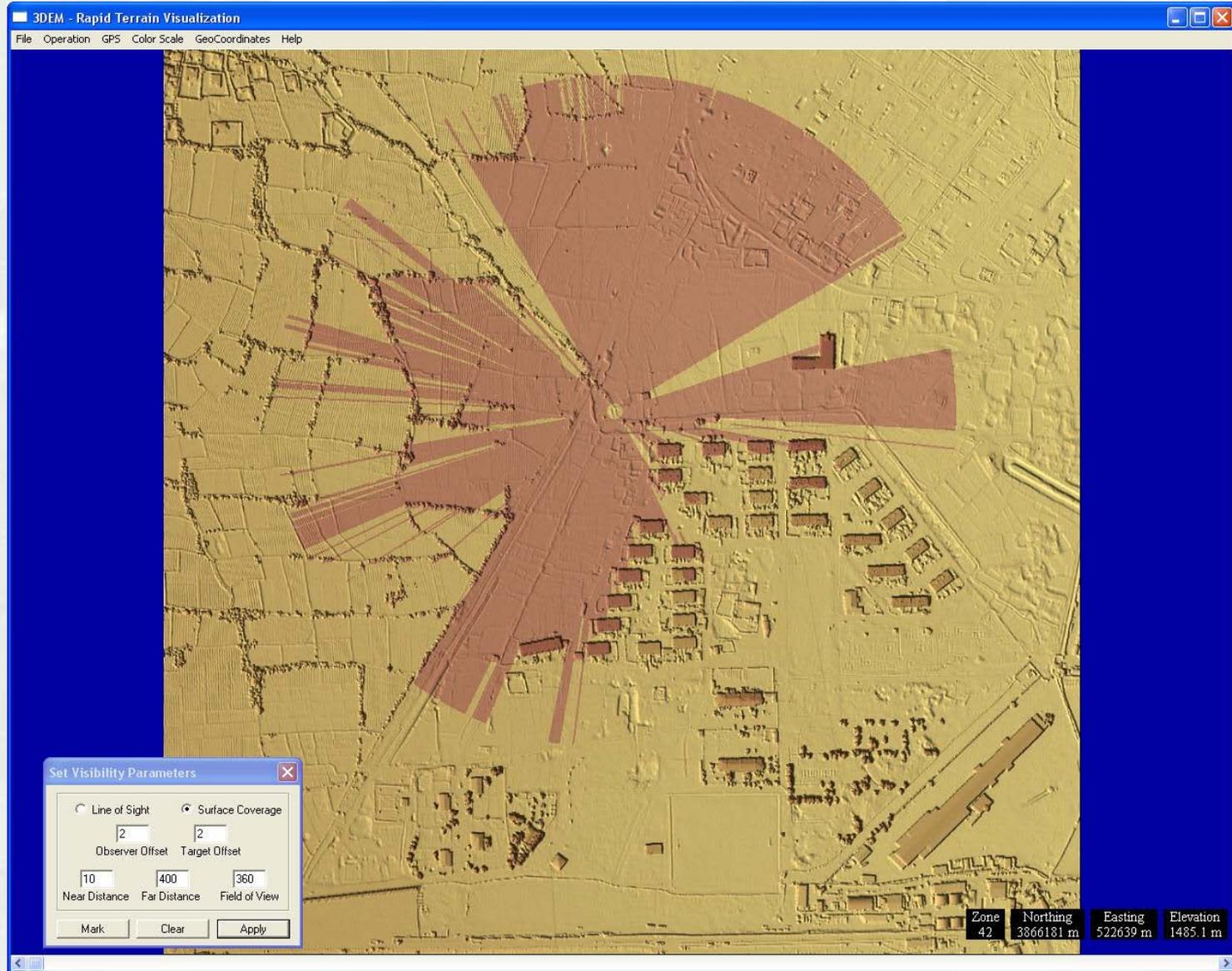
# LIDAR Elevation Data

3D Shaded Relief of DEM with Intensity Image – Khowst, Afghanistan



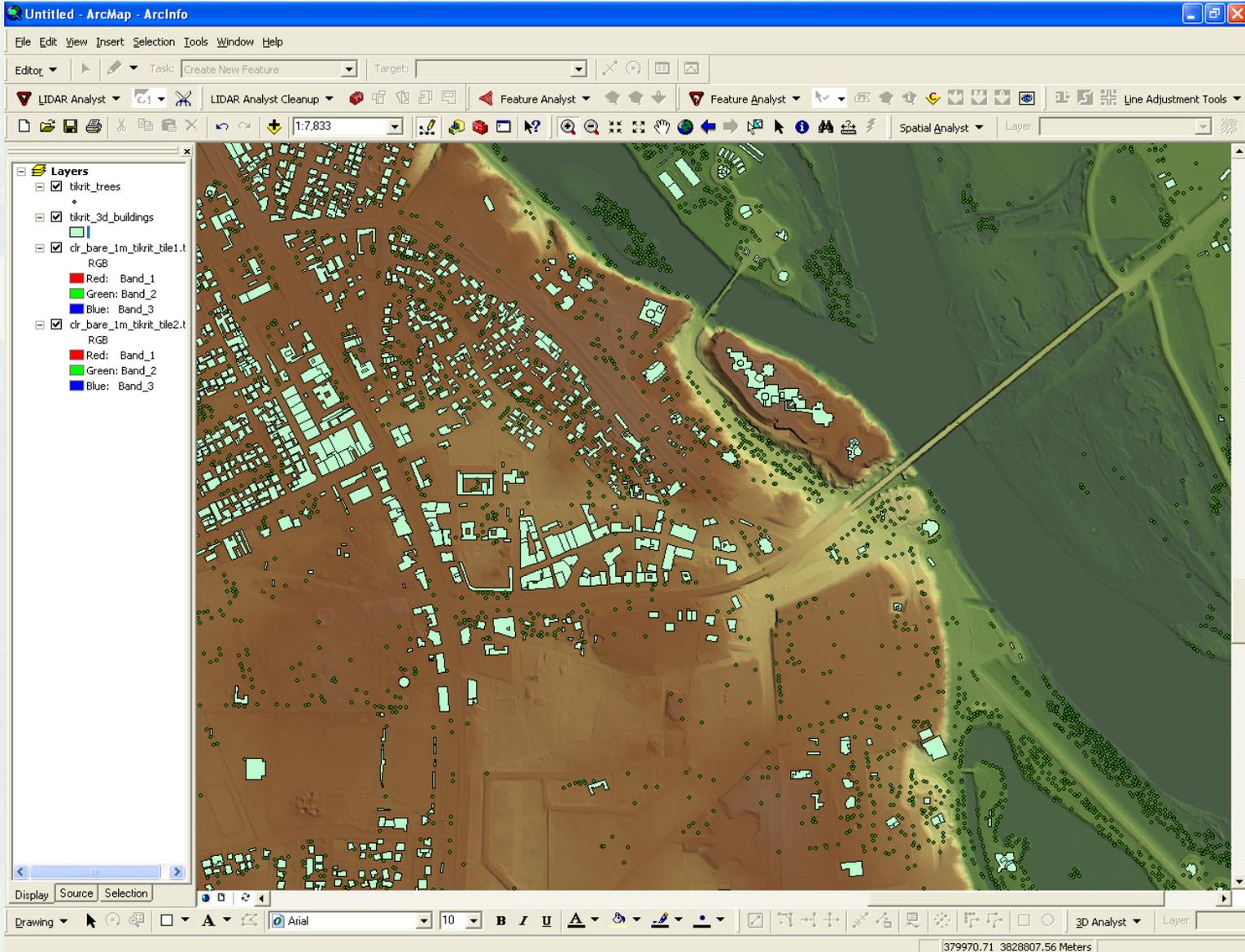
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# Line of Sight Using LIDAR



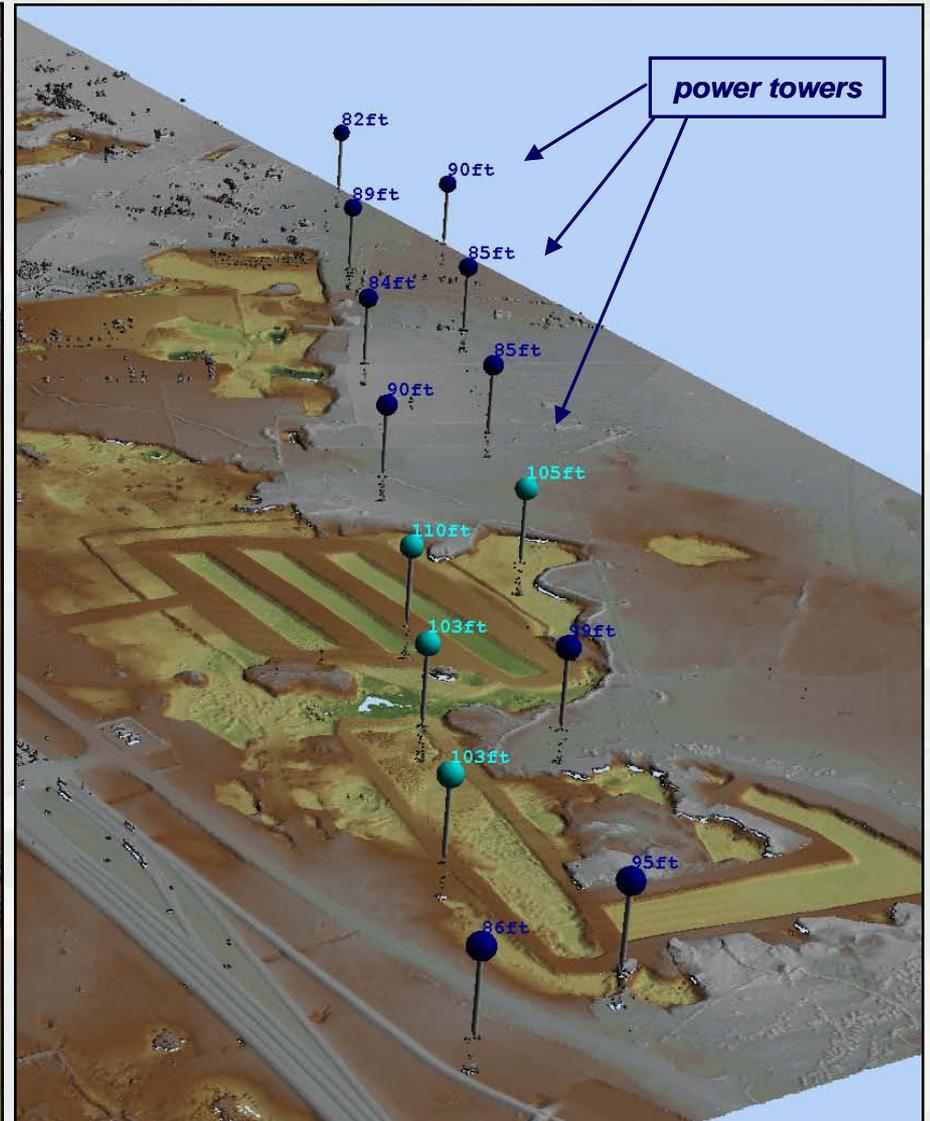
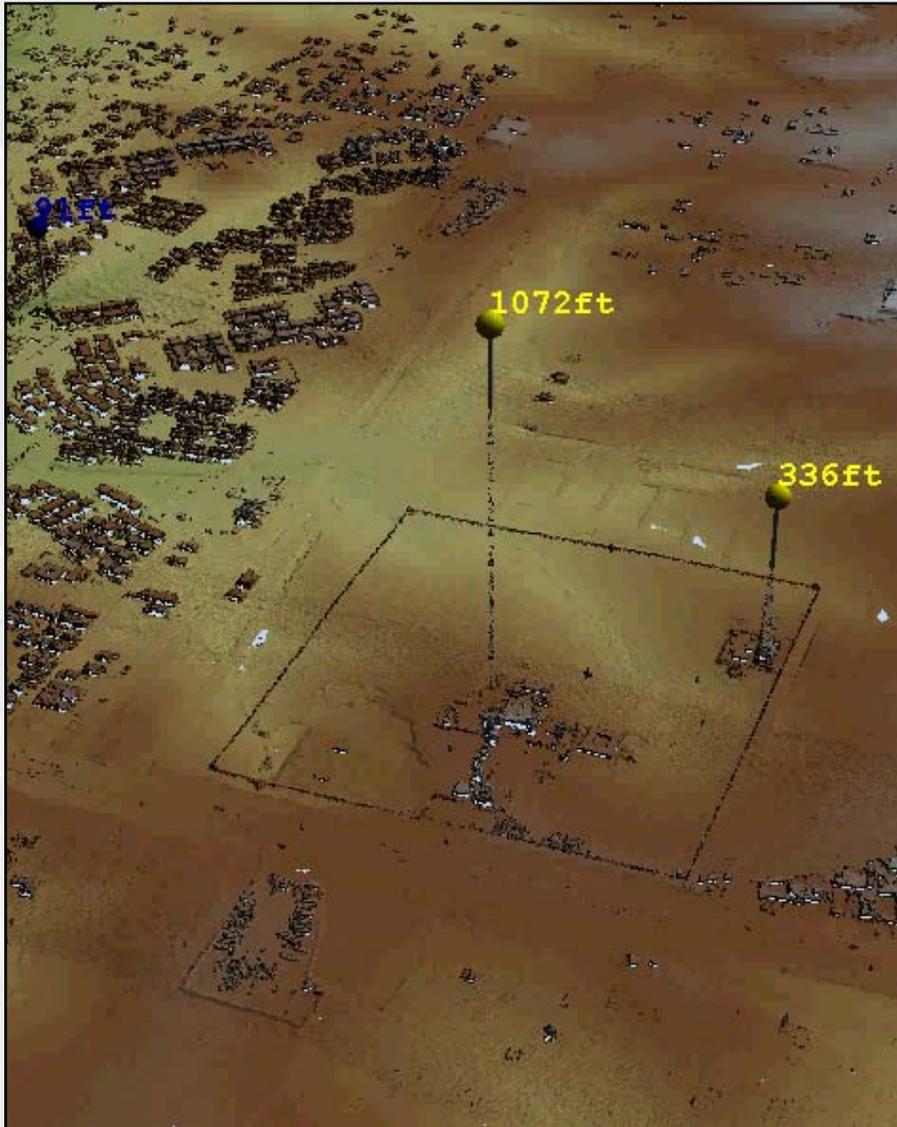
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# Feature Extraction from LIDAR



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# Vertical Obstructions from LIDAR



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# Improved Tactical Imagery



**CIB 1**



**Buckeye Color Image**



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# Buckeye Imagery GeoIndex (BIG)

Buckeye Imagery - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Stop

Address: E:\Buckeye\_Imagery\Baghdad\_Imagery\Baghdad\_Buckeye\_Imagery\_Geoindex\Data\11\_16.html

Google Go Bookmarks 129 blocked Check AutoLink AutoFF Send to Settings

<b>Baghdad</b>	Location: WGS84 UTM 38		<b>These Buckeye images are NOT orthorectified</b>		
	X 430777.92	Y 3685279.11	X Enter Coord	Y Enter Coord	Go To Point
	Lat 33.304390	Long 44.256434	Lat Enter Coord	Long Enter Coord	Go To Point
	MGRS 38 S MB 30777 85279	MGRS Enter Coord	format: 38 S LC 85433 00428	Go To Point	



04-51-33-Image\12-29@05\_04-51-33\_10308.jpg

file:///E:/Buckeye\_Imagery/Baghdad\_Imagery/Baghdad\_Buckeye\_Imagery\_Geoindex/data/04-51-33-Image/12-29@05\_04-51-33\_10308.jpg My Computer



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# Buckeye Imagery GeoIndex (BIG)



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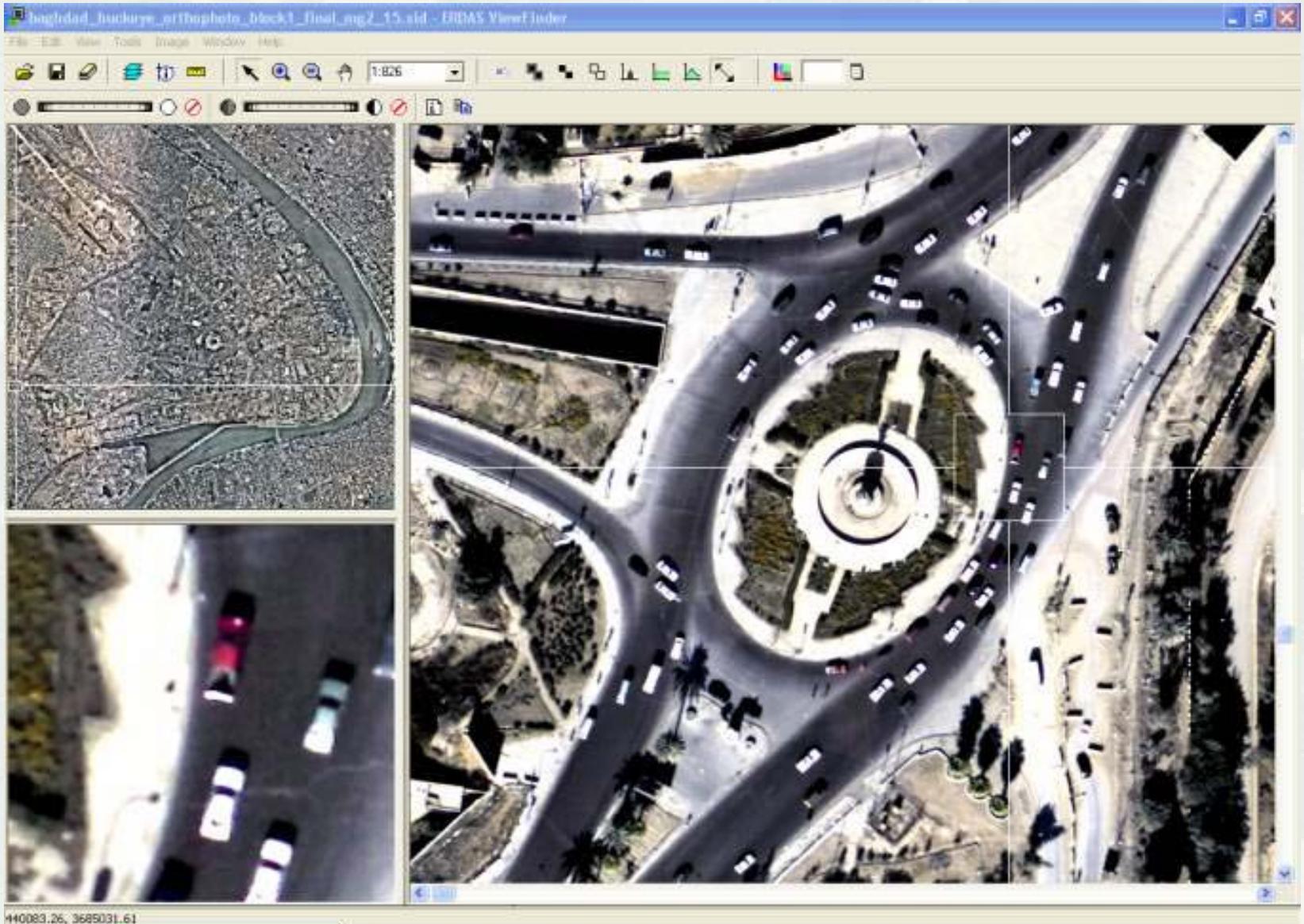
# Buckeye Rapid Ortho-Mosaic Processing

Automatically ortho-rectify image frames to LIDAR DEM's and mosaic



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# Buckeye Imagery Ortho-mosaic



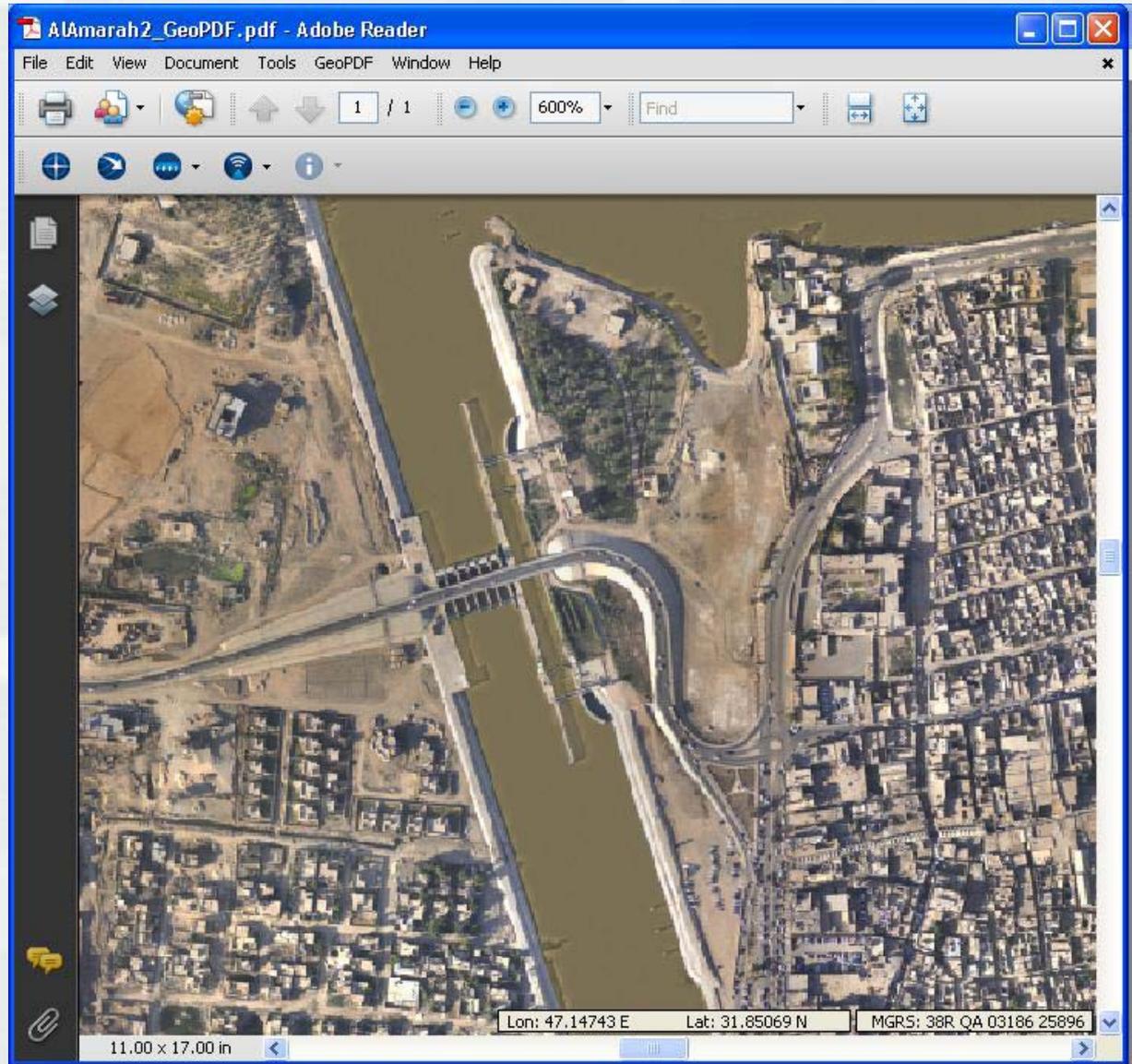
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# Buckeye GeoPDF Mapbook

Leverage the portability of PDF files with the Free GeoPDF Toolbar

Display images with coordinates in a highly compressed image

872 MB MrSID shrinks to 81 MB GeoPDF



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# Improved Products – Fused Data



**Buckeye Imagery  
over DTED2**

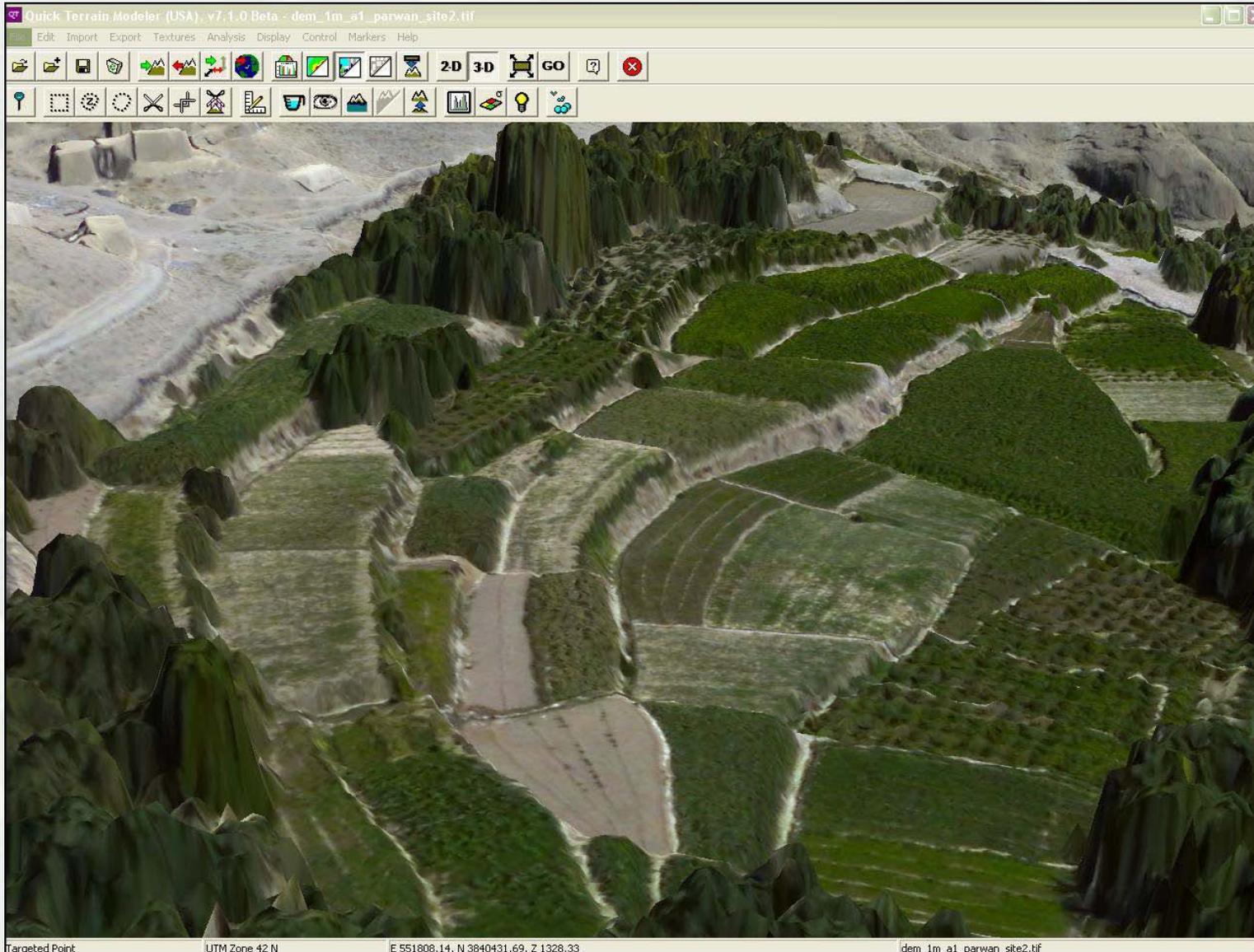


**Buckeye Imagery  
over LIDAR**



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# Buckeye Data – 3D Visualization

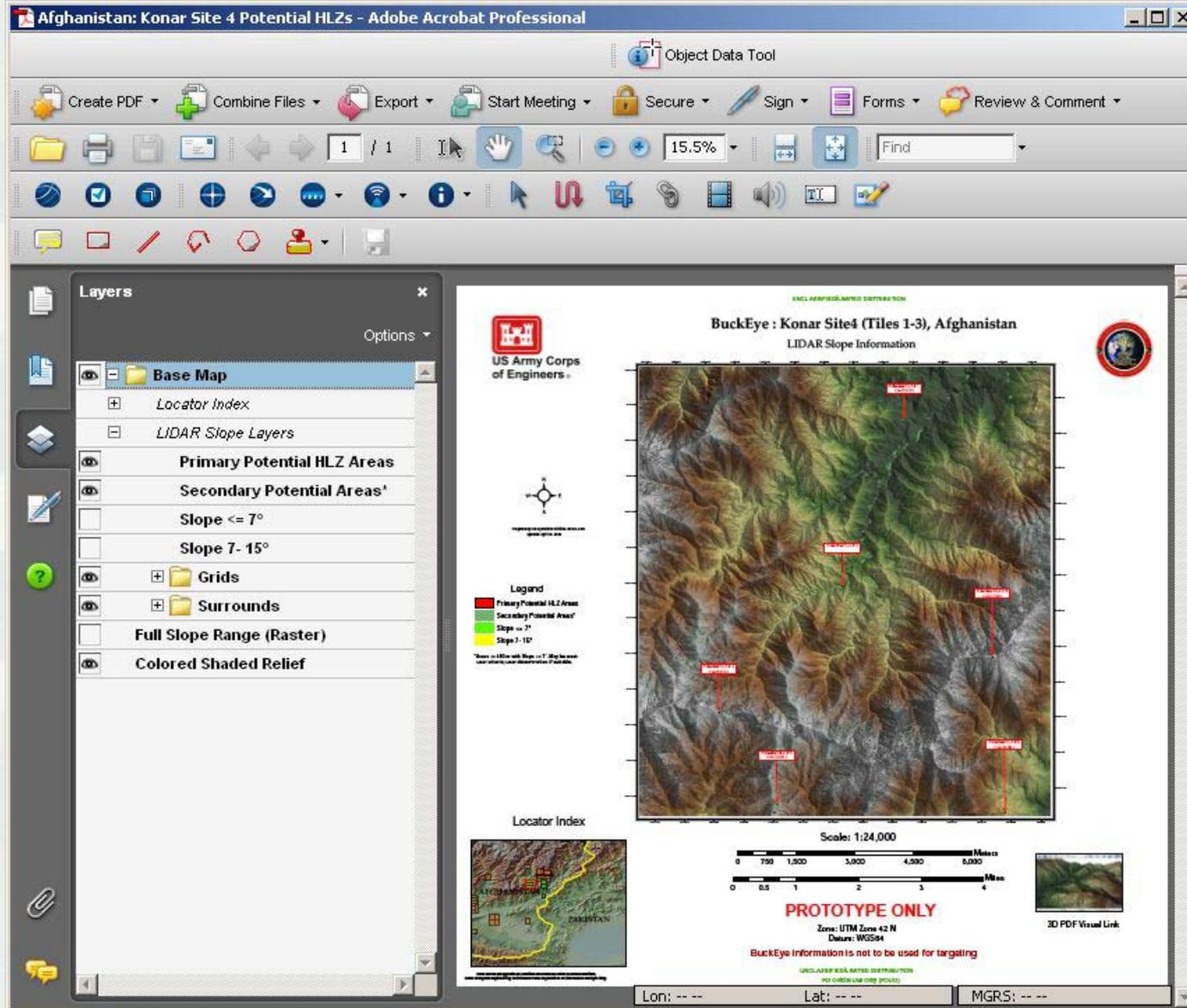


**Buckeye  
Imagery over  
LIDAR in  
QT Modeler  
Software**



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# Products from Buckeye Data

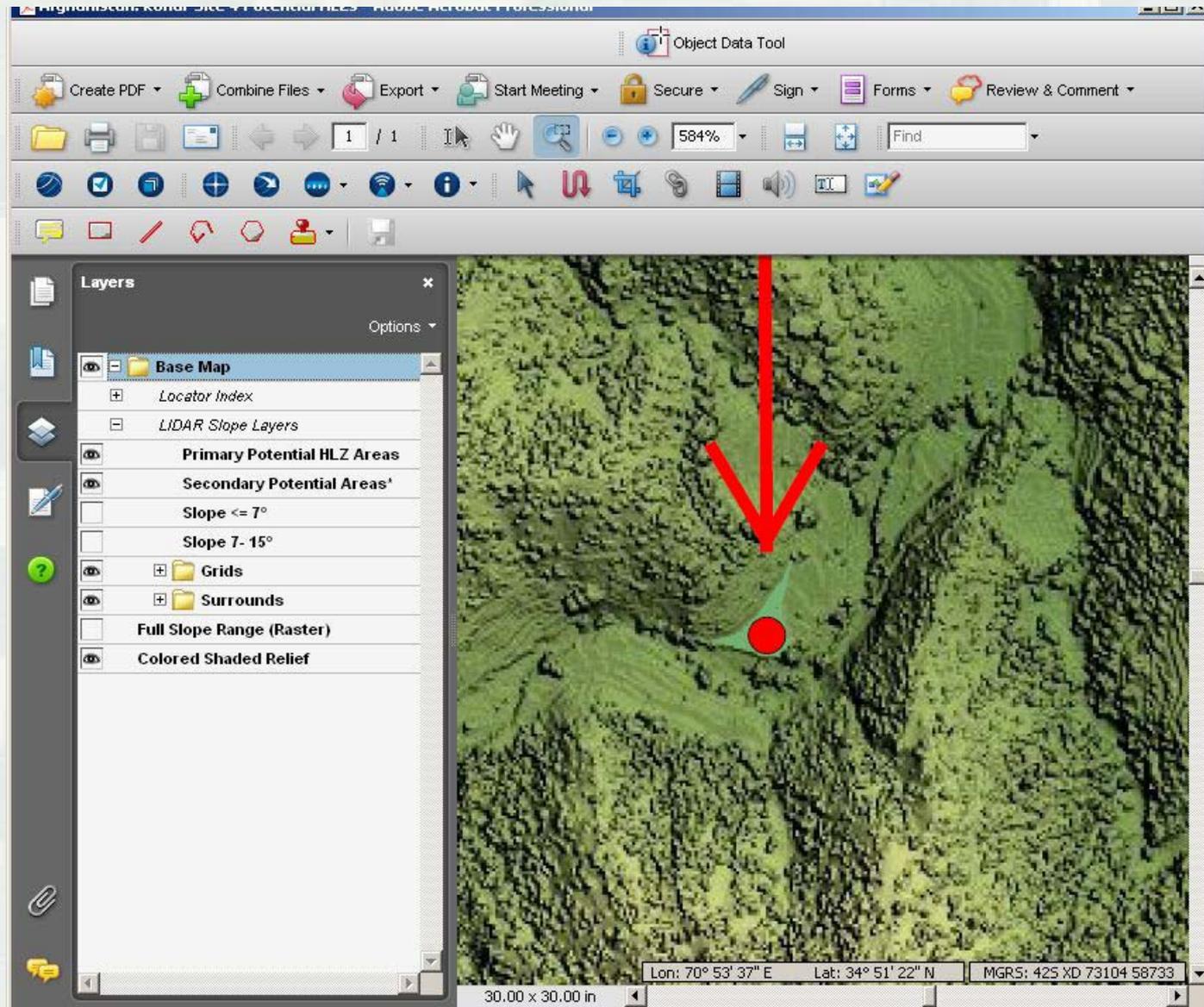


**Helicopter  
Landing Zone  
(HLZ)  
Prototype**



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# Products from Buckeye Data



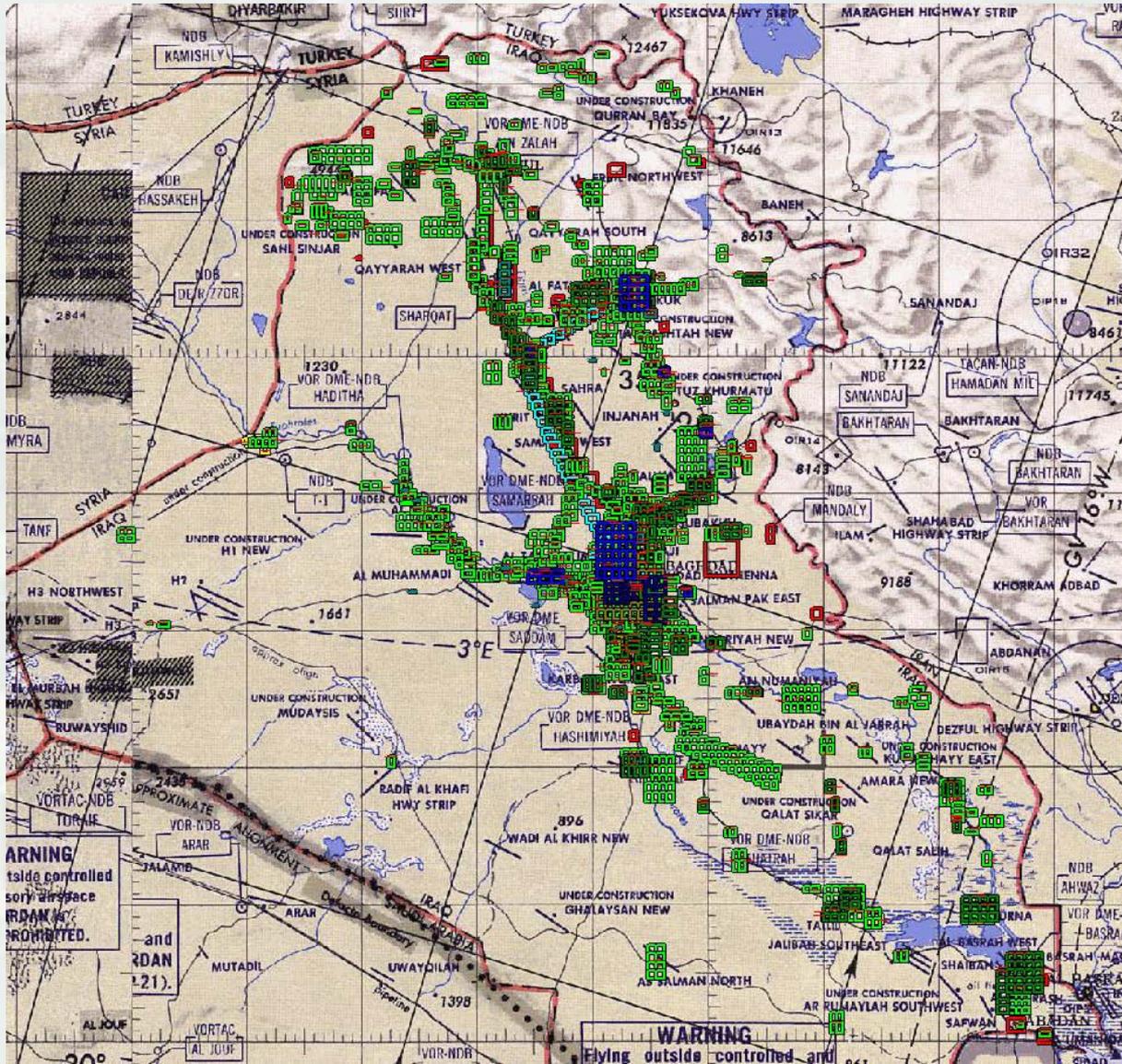
**HLZ  
Prototype in  
GeoPDF  
Format**

**<= 7° Slope  
> 25 m  
diameter**



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# Buckeye Theater Update - Iraq



**Buckeye manned fixed-wing  
Color Imagery / LIDAR**

**Based at Kirkuk**

**Initial processing in country  
for rapid response**

**Processing in Iraq and  
CONUS and posted to AGC  
websites**

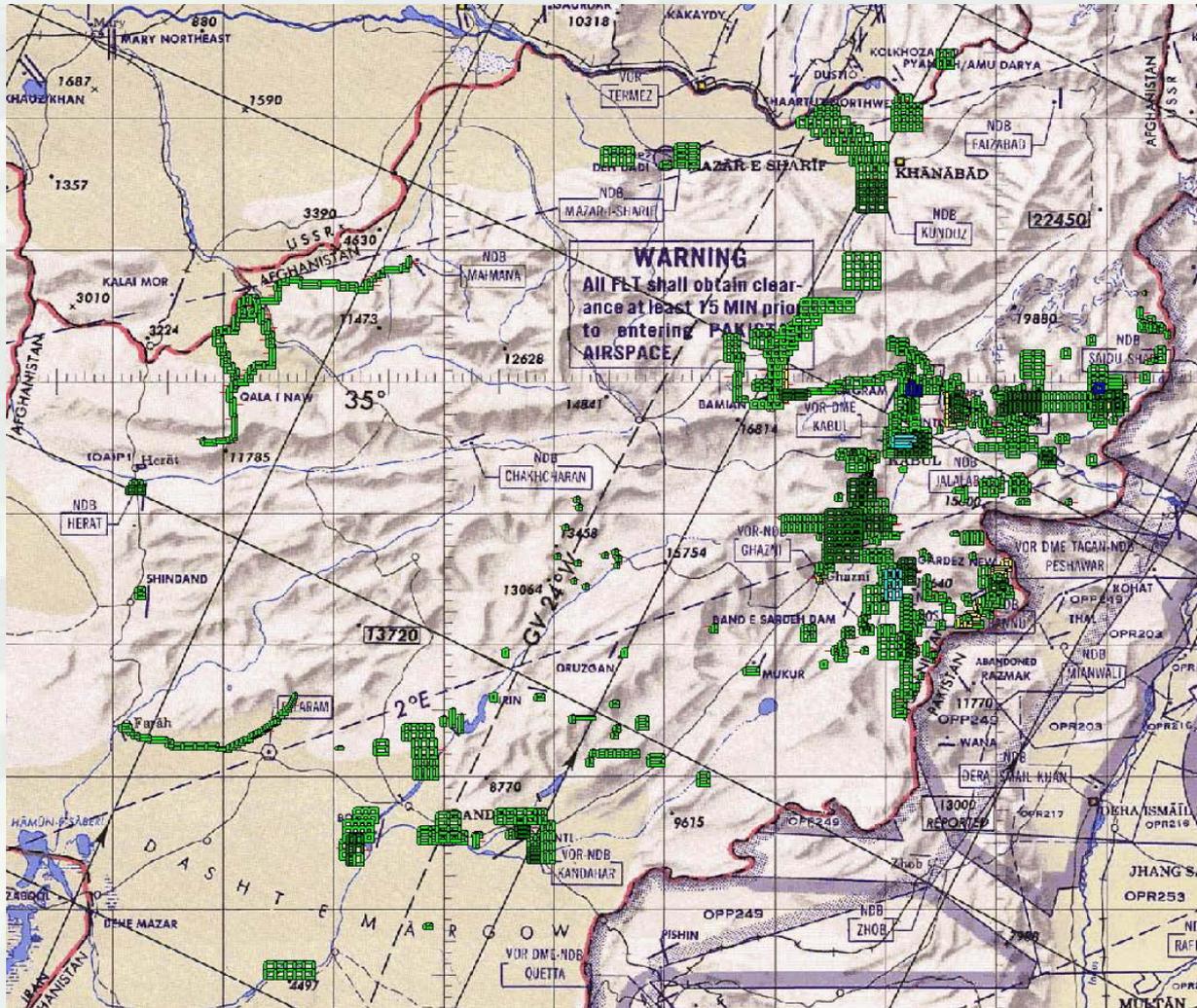
**Collection as of Aug 2010  
80,000 km<sup>2</sup>**

**- 11% of Iraq land area  
- Every major urban area**



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# Buckeye Theater Update - Afghanistan



**Buckeye fixed-wing Color Imagery / LIDAR**

**Based at Bagram Airfield, Kandahar Airfield and Shindand Airfield (UAV)**

**Tasking based on IJC priorities**

**Initial processing in country for rapid response**

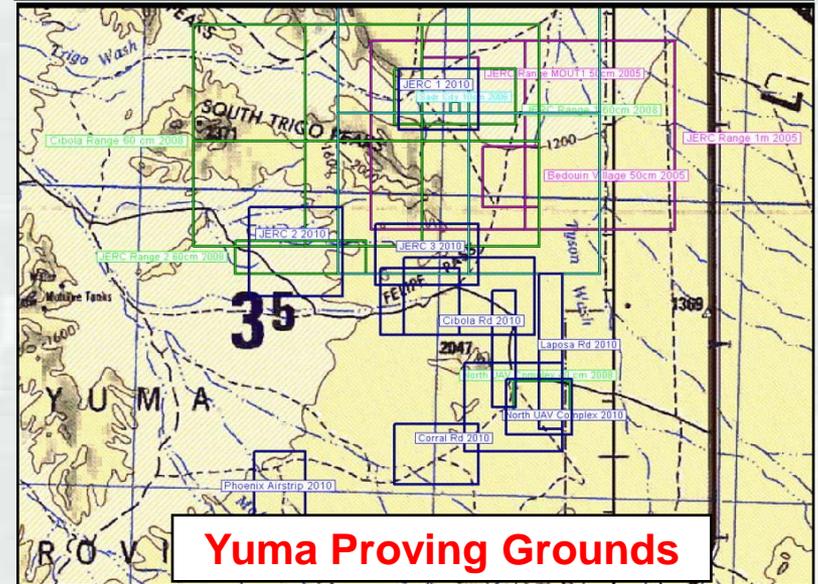
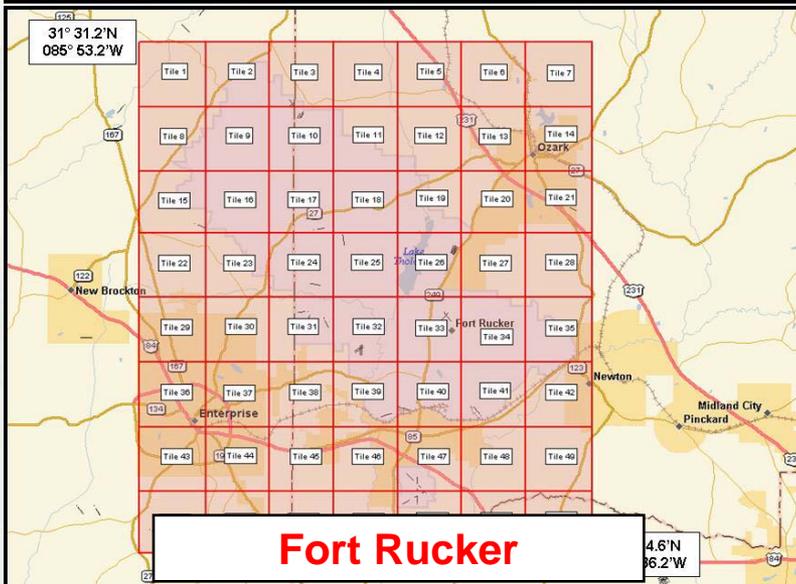
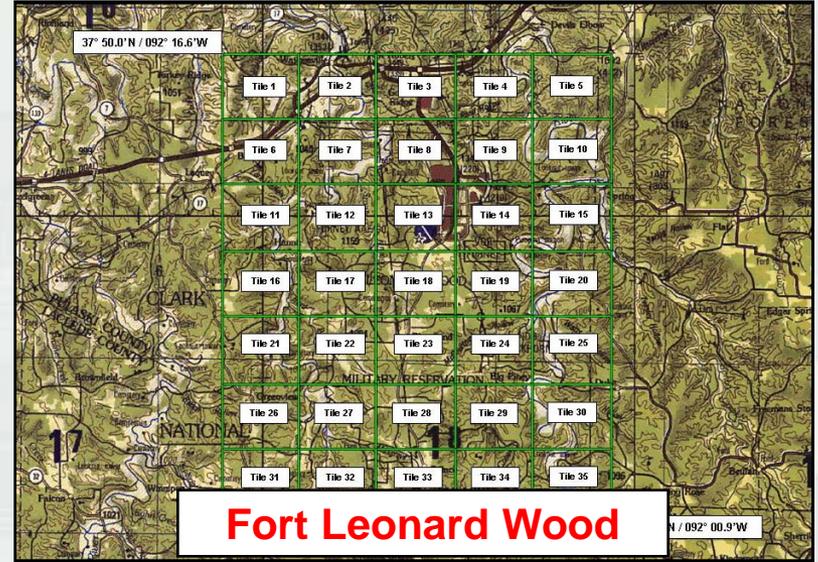
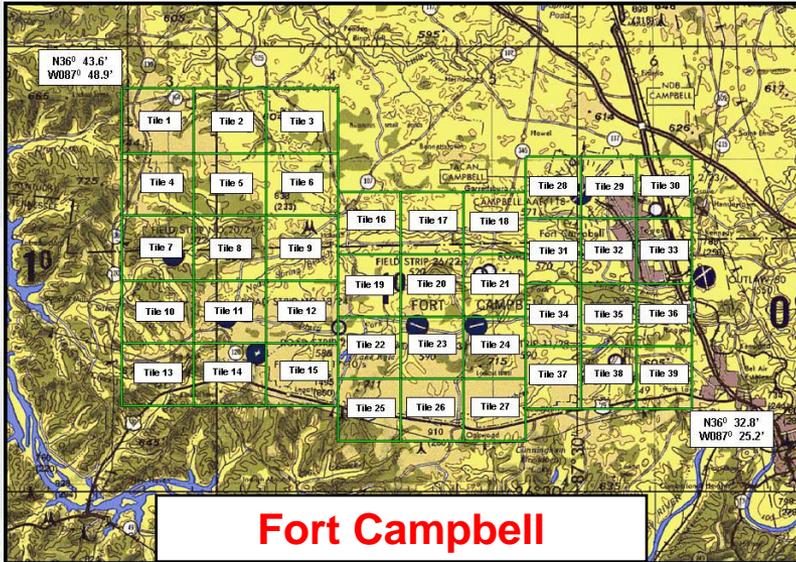
**Final processing in CONUS and posted to AGC websites**

**Collection as of Nov 2010  
42,000 km<sup>2</sup>**



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# Buckeye – Other Recent Collections



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# Buckeye Dissemination

Web Sites

Hard Drives

DVD's

The screenshot shows a web browser window titled "LIDAR Product Library - Windows Internet Explorer". The address bar displays the URL: <https://tsunami.tec.army.mil/Products/LIDAR/index.cfm>. The page content includes a navigation menu with "Country & Region Search", "Products", "Software & Tools", and "About AGC & Our Work". A sidebar on the left lists categories: "Maps", "Imagery", "Planning & Analysis", "Data Models", "Water Resources", "Complete AGC Product List", and "Product Training Videos". The main content area is titled "AGC Home > Products & Services > LIDAR" and features a "Buckeye Graphical Reference Guides for:" section with links to "Afghanistan" and "Iraq". Below this is a "Buckeye Sample Data Sets - LIDAR and Imagery:" section with links to "NTC Tiefert City 2009" and "29 Palms MOUT 220 2009". A table lists various LIDAR products with columns for "Item", "Date", and "Format".

Home | DOD Warning | Crisis Support | Site Map | Contact Us | Site Help

AGC U.S. Army Geospatial Center products

Country & Region Search Products Software & Tools About AGC & Our Work

AGC Home > Products & Services > LIDAR

Buckeye Graphical Reference Guides for:

- [Afghanistan](#)
- [Iraq](#)

Click here to see the current version of the LIDAR / IFSAR Archive Spreadsheet.

- [Afghanistan LIDAR/IFSAR Shape File Download](#)
- [Iraq LIDAR Shape File Download](#)

Buckeye Sample Data Sets - LIDAR and Imagery:

- [NTC Tiefert City 2009](#)
- [29 Palms MOUT 220 2009](#)

Item	Date	Format
<a href="#">Afghanistan, Baghlan Road 1 - 1 Meter LIDAR (MSL) (FOUO/REL to USA, AUS CAN, GBR)</a>	01 Apr 2009	Directory
<a href="#">Afghanistan, Bagram - 1 Meter LIDAR (FOUO/REL to USA, AUS, CAN, GBR)</a>	15 Feb 2008	Directory
<a href="#">Afghanistan, Bamyan Site - 1 Meter LIDAR (MSL) (FOUO/REL to USA, AUS CAN, GBR)</a>	16 Jan 2009	Directory
<a href="#">Afghanistan, Daykundi Site - 1 Meter LIDAR (FOUO/REL to USA, AUS, CAN, GBR)</a>	16 Jul 2009	Directory
<a href="#">Afghanistan, Ghazni - 1 Meter LIDAR (MSL) (FOUO/REL to USA, AUS CAN, GBR)</a>	22 Sep 2008	Directory
<a href="#">Afghanistan, Helmand Point 1 - 1 Meter LIDAR (MSL) (FOUO/REL to USA, AUS CAN, GBR)</a>	21 Nov 2008	Directory

Done Trusted sites 100%



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# Buckeye Shapefile Index

The screenshot shows the ArcMap interface with a map of a region in Iraq. The map is divided into several colored polygons representing different areas. The Identify window is open, showing the following data for the selected feature:

Identify from: <Top-most layer>

ALIDAR\_20091026\_Index

- Iraq - An Najaf - Tile 3
- Iraq - An Najaf 2 - Tile 4

Field	Value
FID	1741
Shape	Polygon
NAME	Iraq - An Najaf 2 - Tile 4
SENSOR	LIDAR 5
EXTENTKM	6.6 x 7.1
SIZE_SQKM	46.9
ULCOORDS	044d 15.7m E / 32d 03.8m N
LRCOORDS	044d 19.9m E / 32d 00.0m N
LLX	+0441542
LLY	+320000
URX	+0441954
URY	+320348
DATE	9/15/2007
HDATUM	WGS84
VDATUM	WGS84
EXTRACTEDF	
ORTHO	X
BARE_DEM	X
ASCIIPOINT	X
LAS_POINT	

Identified 2 features

The map shows several labeled areas: "Al Kufah", "An Najaf", "Al Gadirshah", "Abu Sukhayr", and "Esprayah". The map is overlaid with a grid and a yellow shaded area at the top. The status bar at the bottom shows the coordinates 44.311 32.138 Decimal Degrees.



# Buckeye Dissemination – CMB Online

AGC CMB Online - Windows Internet Explorer

https://agcwfs.agc.army.mil/CMB\_Online/default.aspx?resetSession=true

U.S. Army Geospatial Center - CMB Online

Hello, Guest

Base Map: World Imagery  
Scale: 11,076,123  
Map Input: Rectangle

Map Center: Iraq : Baghdad  
Mouse X,Y: 38.32974 , 33.97976  
Mouse MGRS: 37 S DT 38087 60113

Right Click a CMB Product to add it to the Cart.  
Products and AOIs that have Blue Text are in the Cart.

- CMB\_Products
  - BUCKEYE\_NITF
    - Buckeye\_Individual\_NITF
  - BUCKEYE\_Orthos
    - Buckeye\_Orthos\_GeoTif\_Tile\_8bit
    - Buckeye\_Orthos\_GeoTif\_Tile\_16bit
    - Buckeye\_Orthos\_MrSid\_Tile\_8bit
    - Buckeye\_Orthos\_MrSid\_Tile\_16bit
    - Buckeye\_Orthos\_MrSid\_CmpIt\_8bit
    - Buckeye\_Orthos\_MrSid\_CmpIt\_16bit
  - BUCKEYE\_Lidar
    - Buckeye\_Lidar\_Dem\_A1
    - Buckeye\_Lidar\_Dem\_A2
    - Buckeye\_Lidar\_Dem\_BareEarth
    - Buckeye\_Lidar\_Color\_A1
    - Buckeye\_Lidar\_Color\_A2
    - Buckeye\_Lidar\_Intensity\_A1
    - Buckeye\_Lidar\_Intensity\_A2
    - Buckeye\_Lidar\_Merged\_A1
    - Buckeye\_Lidar\_Merged\_A2
  - UTP
    - UTP\_MXD
    - UTP\_GeoPDF
    - UTP\_KML
    - UTP\_FLY
  - GeoPDF\_Maps
    - GeoPDF\_Maps\_Countdown

Map Request Complete, Elapsed Time 0.681 Ready.

Trusted sites 100%



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# HALOE High Altitude LIDAR Collector

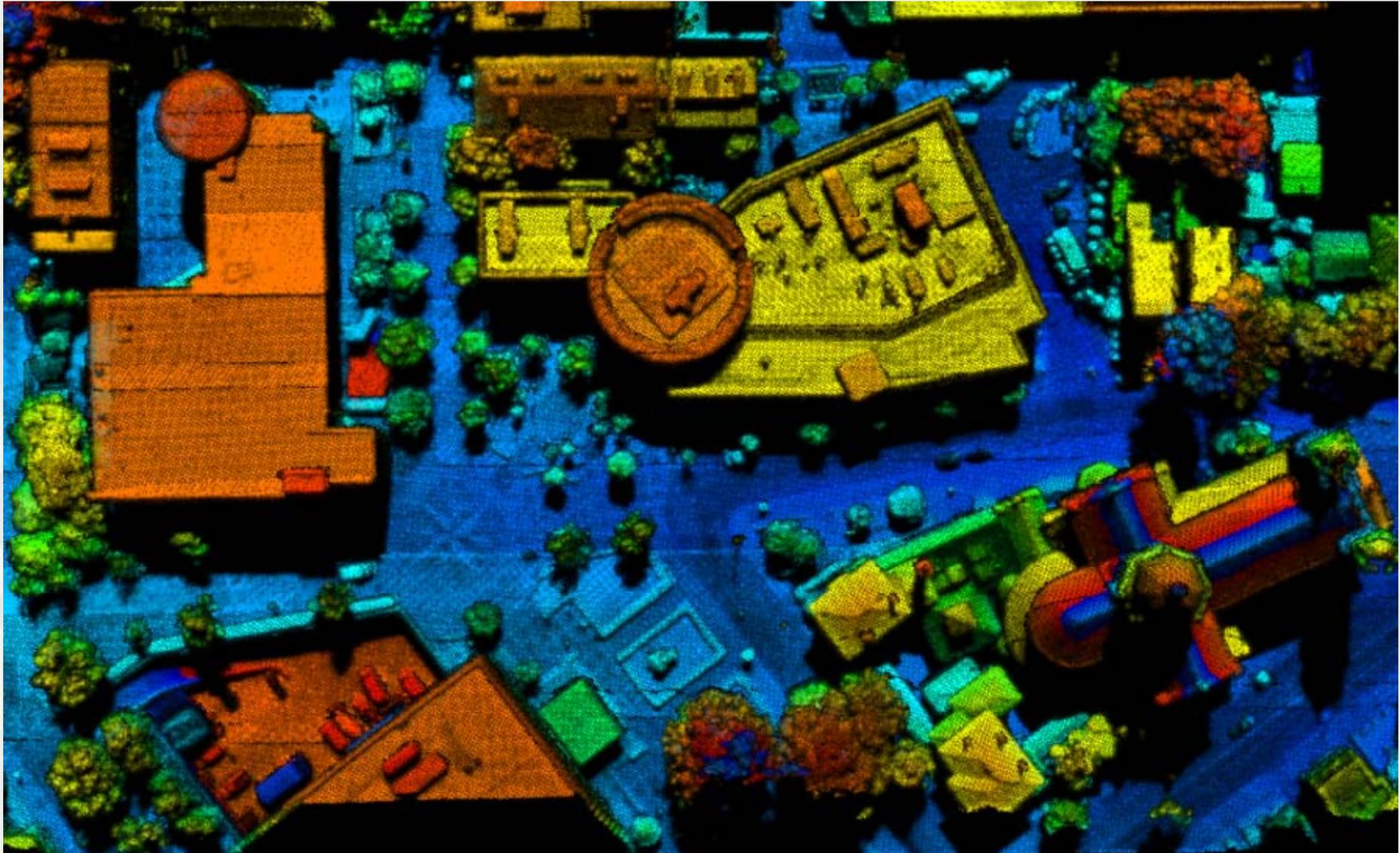
Capable of collecting LIDAR at 300 sq km / hour



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# HALOE High Altitude LIDAR (49,000 ft)

Richmond (20 cm)



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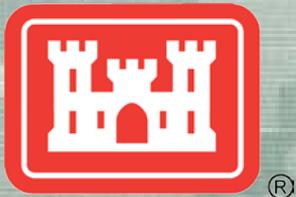
# The AGC: How to reach us -

Web Site: <http://www.agc.army.mil>

PKI: <https://cac.agc.army.mil>

SIPR: <http://www.agc.army.smil.mil>

JWICS: <http://www.agc.ic.gov>



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