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CA Eastern San Diego Co LiDAR 2016 B16
Kick Off Meeting
Task Order# G16PD01219

USGS
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Agenda

- Introductions/Roles
- Scope of Work Review
- Deliverables Review
- Schedule Review
- Q&A
- Action Items

Roles/Contact Info

- USGS
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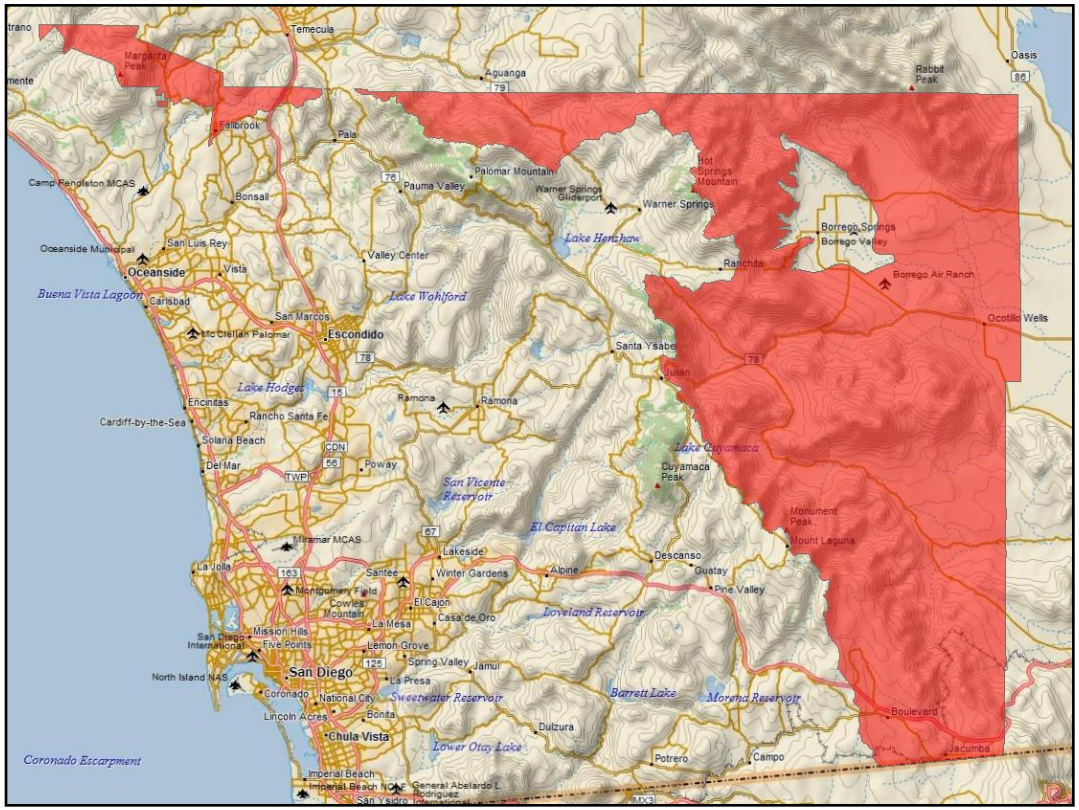
  - LiDAR Processing Lead: Ryan Griffin: rgriffin@quantumspatial.com (859) 277-8700

Scope of Work Overview

- USGS Task Order G16PD01219 issued on 9/16/2016
- Total Project Area: 1353 sq. miles
- Adherence to USGS NGP LiDAR Base Specifications Version 1.2
- Pilot Project
- California State Plane Coordinate System, Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet
- Data will be tied to existing and adjacent QL2 LiDAR projects
- Deliverables: raw & classified .las, hydro flattened DEM's, hydro break lines, intensity imagery, 2' contours, Automated building polygons, metadata & reports
- Schedule Range : Commence with this Kickoff Meeting to NLT November 30, 2017

Scope of Work: Project Area

- Total Project Area: 1353 Sq. Miles plus minimum 100 meter buffer
- Will utilize USGS supplied AOI shape file as final boundary limits (with 100m buffer) unless otherwise directed



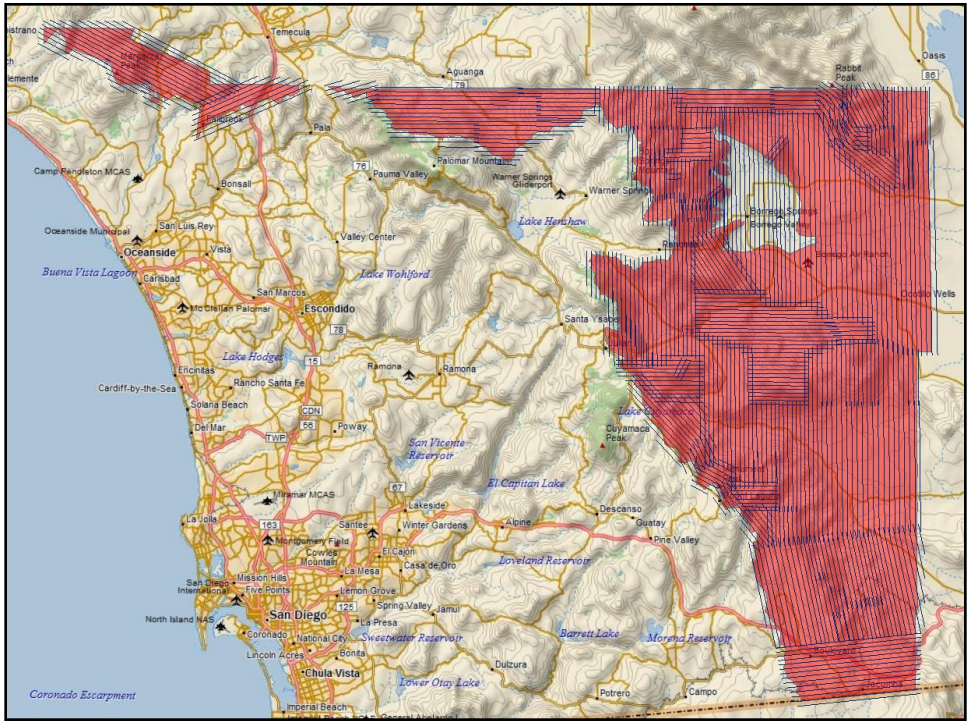
Scope of Work: Standards

- Adherence to USGS NGP LiDAR Base Specifications Version 1.2
- Hydro Flattening
- Accuracy Requirements:
  - RMSEZ ≤ 10 cm (non-vegetated, Swath, DEM))
  - NVA ≤ 19.6 cm 95% Confidence Level (Swath, DEM) as tested and reported using points established in bare earth/open terrain & urban land cover types
  - VVA ≤ 29.4 cm 95th Percentile (DEM) as tested and reported using points established predominant vegetated land cover types such as:
    - Tall Weeds/Crops,
    - Brush lands/swamp/marsh
    - Trees/Forested and Fully Grown

Scope of Work: Acquisition

Acquisition Window:

- Fall of 2016 during leaf off conditions and continuing, as needed, through the winter of 2017 until all acquisition is completed
- All flights will be conducted when there is no snow, high water, ground fog and/or clouds below the planned flight altitude, or within 72 hours of a rain event of 0.5 inches or greater



Collection Parameters:

- Collection will be performed by our partner Aerographics
- Laser Type: Optech Orion H
- Aircraft Type: Twin Piston Engine (or similar)
- Flight Altitude: 2,100m AGL
- Aircraft Speed: 150 knots
- Number of Flight Lines: 309
- Total Flight Line Nautical Miles:11371
- Planned Side Lap: 30%
- Full Field of View: 34 degrees
- Laser Scan Rate: 56 Hz
- Laser Pulse Rate: 265 Kz
- Average Point Spacing: 0.67 m
- Average Point Density: 2.26 ppsm
- Relative Accuracy (RMSED), within swaths: ≤ 6 cm, between adjacent swaths: ≤ 8cm with max diff of ±16cm

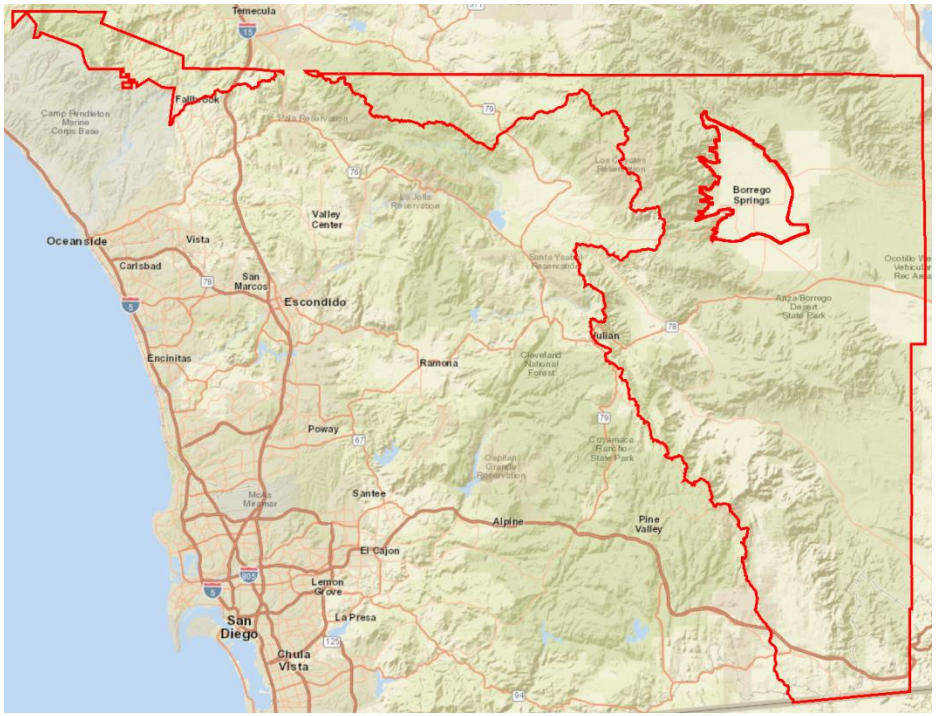
Scope of Work: Ground Control

Base Stationing:

- Combination of local CORS & established locations by QSI flight crew during acquisition
- Referenced to CA SPCS Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet

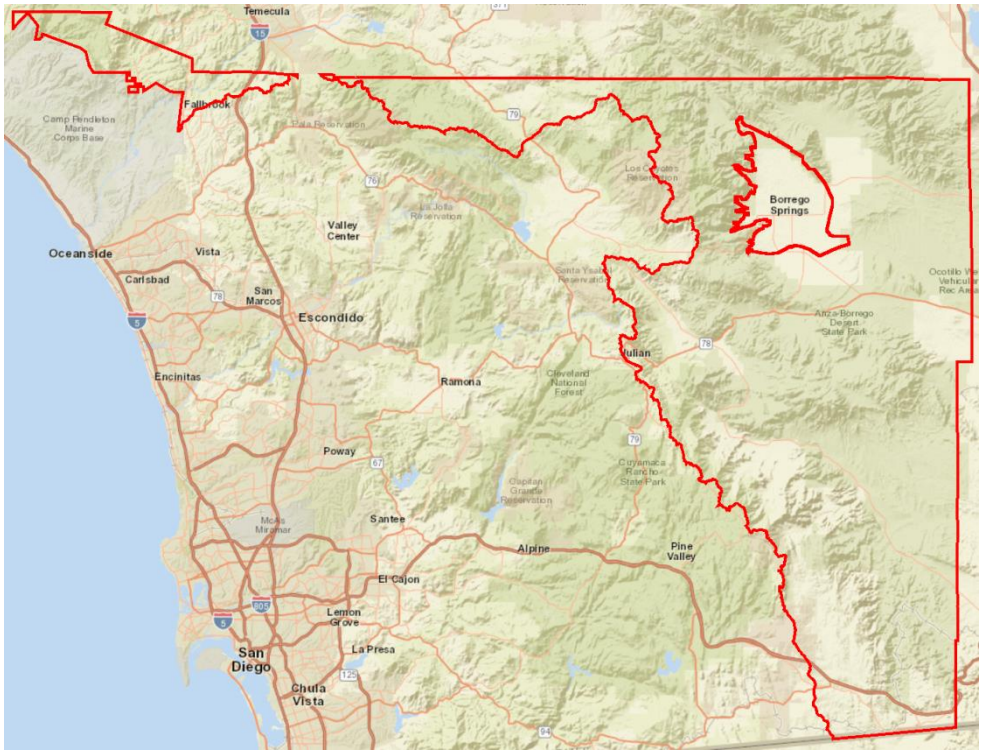
Supplemental (Calibration) Control Surveys:

- Approximately 28 points to be set
- Necessary to support post processing and bias adjustment of raw point cloud
- To be established independent of LiDAR acquisition
- GPS Survey Techniques
- Open, flat, bare earth locations accessible by vehicle only
- Referenced to CA SPCS Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet



Scope of Work: QA Ground Control

- Necessary to test and report NVA & VVA
- GPS & Conventional Survey Techniques
- A total of 112 points will be set
  - 62 points in open/clear land cover to check NVA (UA, BE)
  - 50 points in vegetated land cover types to check VVA (FO, TW, SW)
- Referenced to CA SPCS Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet
- Shape/kml of proposed point locations will be provided to USGS for review prior to survey efforts
- Surveys will be conducted at the same general time frame as supplemental control phase



Scope of Work: Post Processing

- Classification, matching, editing, break line collection, hydro flattening, building polygon generation, formatting & finishing
- Select Pilot Area(s): Location, size, & number of tiles
- Referenced to CA SPCS Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet
- Fully compliant LAS v1.4, Point Record Format 6
  - Proper use of the LAS withheld and overlap bits is required.
  - Georeference information included in LAS header (OGC WKT).
  - GPS times will be recorded as Adjusted GPS Time
  - Intensity values, 16 Bit, Linear Rescaling

Scope of Work: Post Processing

- Automated bare earth macros followed by manual editing
- Hydro break lines collection methodology used to support hydro flattening per V1.2 collection requirements for inland ponds/lakes, inland streams/rivers and non-tidal boundary waters.
- Bridge breaklines collected, as needed, to minimize DEM void saddles
- Break lines will be topologically correct, maintain monotonicity and used to classify point data

Scope of Work: Post Processing

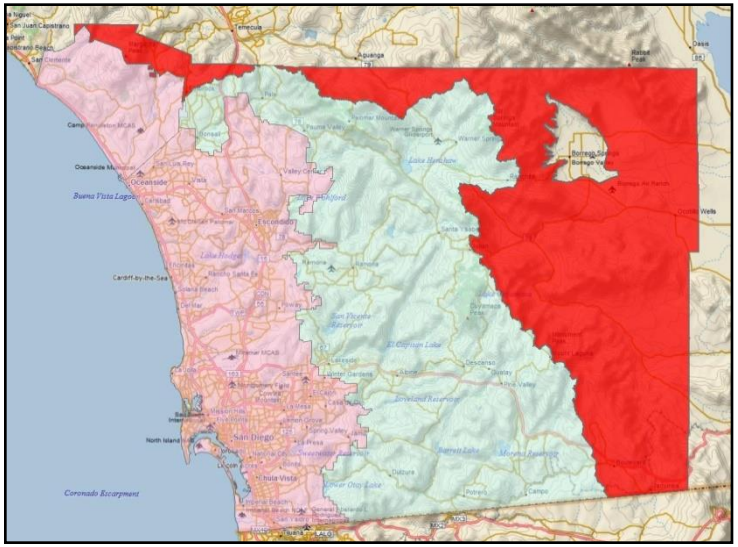
Classification Schema:

- Class 1 – Processed, but unclassified
- Class 2 – Bare-earth ground
- Class 6 – Buildings (automated classification only)
- Class 7 – Low Noise (low, manually identified, if necessary)
- Class 9 — Water
- Class 10 — Ignored Ground (Breakline Proximity)
- Class 17 — Bride Decks
- Class 18 – High Noise (high, manually identified, if necessary)

Scope of Work: Post Processing

Data Matching

- Minimize amount of vertical offset present between new and existing QL2 LiDAR datasets
- 2014 Western/Coastal San Diego County QL2 LiDAR (purple), 2015 Central San Diego County QL2 Lidar (light blue)
- QSI will review the Borrego Springs LiDAR data (irregular void in the northeastern corner) once provided by USGS, if it is determined that the effort to match will not exceed the same type and level of effort to be expended on matching the areas listed above this data will be matched to the newly collected Eastern San Diego LiDAR
- Utilize editing tools to vertically feather (adjust) the new bare earth surface to adjoining existing surfaces
- Done to the extent practical, without compromising the overall required accuracies of the Task Order nor adjusting the existing data
- Likely that some vertical (and horizontal) offset will remain between the two datasets



Scope of Work: Tiling Schema

- 5000ft x 5000ft grid provided by San Diego County to be used
- Referenced to CA SPCS Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet
- Data sets delivered in this schema:
  - Classified bare earth .las files
  - Raster, gridded, hydro flattened DEM files
  - Intensity Imagery
  - 2ft Contours
- Hydro/bridge breaklines and building polygons will be continuous personal geodatabase and not tiled

Scope of Work: LAS Deliverables

- Raw Point Cloud
  - Format: .LAS v1.4, Point Record Format 6
  - Adjusted GPS time
  - Appropriate File Source ID #
  - Class 0
  - 16 bit intensity values
  - Full swath, 1 swath per file (>2gb now acceptable)
  - Assessed relative vertical accuracy report (smooth surface repeatability and overlap consistency)
  - Assessed absolute vertical accuracy (NVA only) report of unclassified LiDAR point data

- Classified Point Cloud
  - Format: .LAS v1.4, Point Record Format 6
  - Adjusted GPS time
  - Appropriate File Source ID “0”
  - Classified using previously indicated schema
  - 16 bit intensity values
  - Delivered in 5000ft x 5000ft tiling scheme

Scope of Work: Derived Deliverables

- Bare Earth DEM
  - One set of DEM tiles for hydro flattened surface in ERDAS .img format, 2.5ft grid cell
  - Bridges removed from the surface.
  - Road or other travel ways over culverts intact in the surface.
  - Tiled using same 5000ft x 5000ft schema as classified LAS
  - Georeference information will be included in raster files

Scope of Work: Derived Deliverables

- Hydro & Bridge Break Lines
  - Delivered in both Esri File Geodatabase with feature classes and shape file (if needed) formats
  - Continuous, no tiling
- Intensity Imagery
  - 2.5ft GSD Resolution
  - 16-bit, linear rescaled
  - 8-bit, 256 color gray scale
  - ERDAS .img Format
  - Tiled using same 5000ft x 5000ft schema as classified LAS and DEM

Scope of Work: Derived Deliverables

- Topographic Contours
  - Using hydro flattened surface, generate 2 foot topographic contours
  - Automated generation only, no manual editing will be performed
  - Intermediate and index contours only. No depression or hidden contours or spot elevations.
  - Index contours will be auto labeled
  - Referenced to CA SPCS Zone VI, NAD83(2011), US Feet; NAVD88(Geoid 12b), US Feet
  - Delivered in the same 5000ft x 5000ft schema as the other tiled products
  - Contours will be generated to cover the entire county (including Borrego Springs if practical)
  - Produced after USGS acceptance of classified las files and hydro flattened DEM

Scope of Work: Derived Deliverables

- Automated Building Polygons
  - Buildings will be identified by an automated filtering macro, with the resulting points being placed on Class 6 in the classified LAS files
  - No manual editing of the Class 6 data will be performed
  - It should be expected that Class 6 returns will also contain non-building returns such as vegetation (i.e. overhanging trees, trees/vegetation in proximity to buildings) and other manmade non-building structures/features the meet the filtering criteria during the classification process
  - Additionally, it should be expected that some building will not be classified (omitted) either in total or in part (i.e. corner of building).
  - The Class 6 points will be used to create polygons showing the buildings

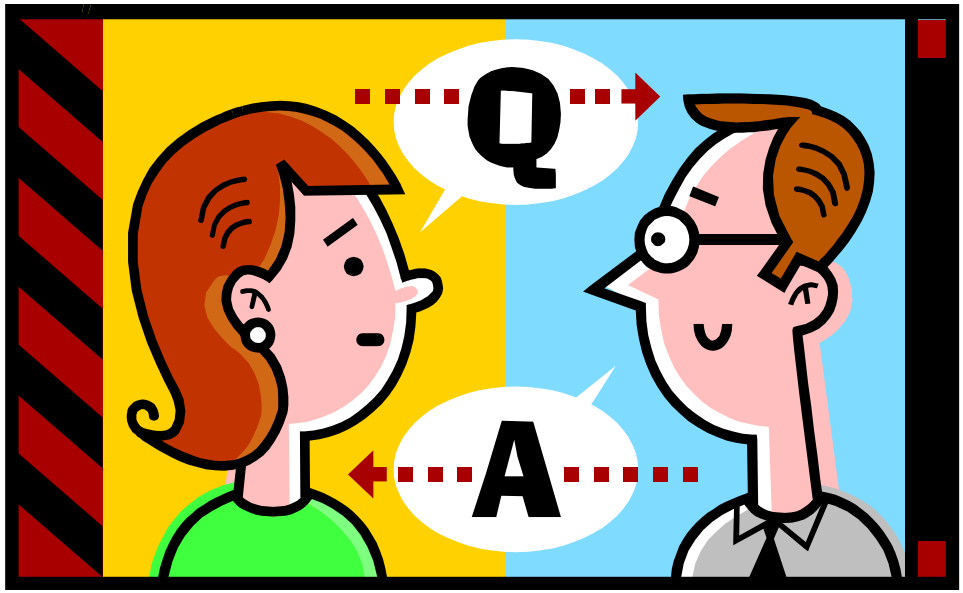
Scope of Work: Supporting Deliverables

- Supplemental & QC Ground Control
  - Control Data files: Excel & shapefiles of point locations
  - Control Report per Task Order Requirements
- Metadata
  - Three types: Project, Lift (one per lift) & deliverable type
  - FGDC compliant in .xml format
- Reports
  - Project Report: field procedures, data adjustments, QC procedures and results, any problems and solutions
  - Acquisition Reports: weekly progress reports including shapefiles representing the geographic extent of the acquired data.

Scope of Work: Schedule

Task Order Name	CA_Eastern San Diego Co Lidar_2016_B16- T.O# G16PD01219		
Deliverable Description	**% of task order**	**Due Date**	**Comments**
Lot 1 - Kick Off Meeting	4	11/1/2016	2 weeks after task order award and before acquisition
Lot 2 - Acquisition Updates	2	3/31/2017	Minimum weekly reports during acquisition
Lot 3- LiDAR Acquisition	40	3/31/2017	Weather, ground and air space access dependent
Lot 4- Ground Control Surveys	8	3/31/2017	Weather and ground condition dependent
Lot 5- Pilot Project	8	5/31/2017	NVA reporting & Pilot deliverables
Lot 6- Lidar data and all derived products	25	9/30/2017	
Lot 7- Three (3) sets of final accpeted LiDAR deliverables	3	11/30/2017	
USGS Final Acceptance	10	12/31/2017	

Questions & Answers



Action Items

- Pilot area(s) to be determined by SANDAG/San Diego County and provided to USGS/QSI for review
- USGS to provide the existing Borrego Springs LiDAR data source for QSI evaluation and use. Drew to coordinate shipping to Joel at QSI office in Lexington, KY
- Drew will coordinate with SANDAG and County stakeholders to compile an acquisition status update distribution list
- QSI will be using our trusted acquisition partner Aero-Graphics for the LiDAR collection
  - Aero-Graphics teamed with QSI for the 2015 Western and Coastal San Diego County task order to support both LiDAR and imagery collection