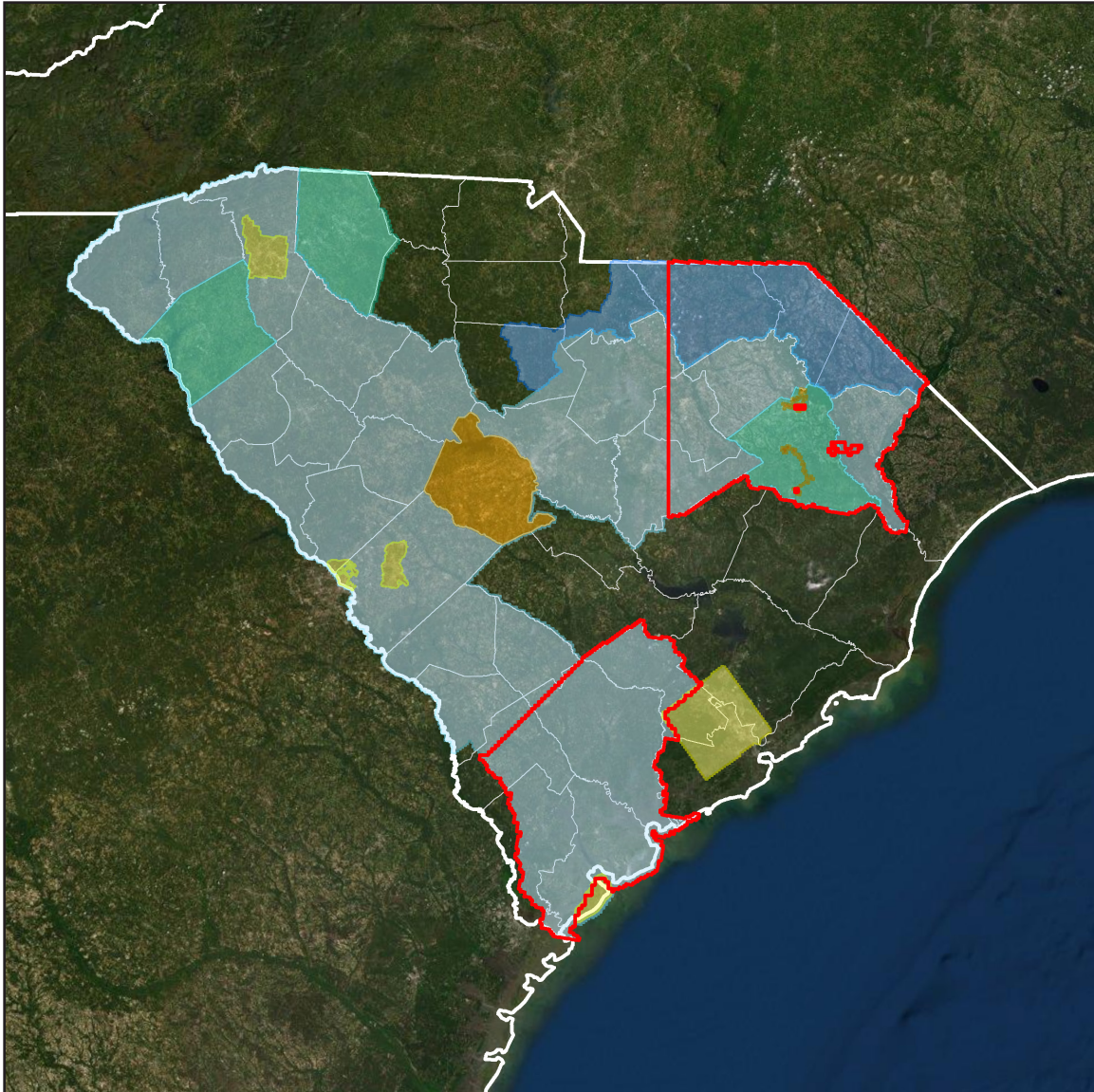


# SC Savannah Pee Dee 2019 B19

Lot 9 QL2

## Airborne Lidar Report

August 2021



Contract # G16PC00022  
Task Order # 140G0219F0339



Contractor Woolpert  
Project # 80495

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# 1. Overview

## About

This project contains a comprehensive outline of the 140G0219F0339 SC Savannah Pee Dee 2019 B19 task order issued by the United States Geological Survey's National Geospatial Technical Operations Center (USGS-NGTOC). This task order called for the acquisition and processing of QL1 and QL2 data over eight blocks covering approximately 21,453 square miles in across South Carolina.

This report encompasses the Lot 9 Blocks QL2 area of interest. This AOI totals approximately 7,255 square miles and includes the following counties:

Data includes the following counties:

- Bamberg
- Beaufort
- Berkeley
- Charleston
- Chesterfield
- Clarendon
- Colleton
- Darlington
- Dillon
- Dorchester
- Florence
- Georgetown
- Hampton
- Horry
- Jasper
- Kershaw
- Lee
- Marion
- Marlboro
- Orangeburg
- Sumter
- Williamsburg

## Purpose

This project will support the 3DEP mission, the Natural Resources Conservation Service (NRCS) high resolution elevation enterprise program, and the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment and Planning (MAP) program, as well as many South Carolina state and local agencies.

## Specifications

Data for this task order was acquired and produced to meet USGS Lidar Base Specification 1.3 standards and the American Society of Photogrammetry and Remote Sensing (ASPRS) Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0).

## Spatial Reference

Geospatial data products were produced using the following horizontal and vertical spatial data reference system.

Table 1-1. Spatial Reference System

<b>Horizontal</b>	<b>EPSG Code</b>	6570
	<b>Datum</b>	NAD83 (2011)
	<b>Projection</b>	State Plane South Carolina (FIPS 3900)
	<b>Units</b>	International Feet
<b>Vertical</b>	<b>Datum</b>	NAVD88
	<b>Geoid</b>	GEOID18
	<b>Units</b>	US Survey Feet
	<b>Height Type</b>	Orthometric

## Task Order Deliverables

All data products produced as part of this task order are listed below. All tiled deliverables had a tile size of 5,000-Int'l. feet x 5,000-Int'l. feet. Tile names are derived from the provided South Carolina tiling schema.

Table 1-2. Deliverables

<b>Lidar Data</b>	
Classified lidar point cloud data	Tiles in .las v1.4 format Classes <ul style="list-style-type: none"> <li>• 1 – Processed, not Classified</li> <li>• 2 – Ground</li> <li>• 7 – Noise</li> <li>• 9 – Water</li> <li>• 10 – Ignored Ground</li> <li>• 17 – Bridge Decks</li> <li>• 18 – High Noise</li> <li>• 20 – Ignored Ground</li> </ul>
Breaklines used for hydro-flattening	<ul style="list-style-type: none"> <li>• Lake and River features as feature classes in an Esri file geodatabase               <ul style="list-style-type: none"> <li>• Water bodies greater than 2 acres as polygon features</li> <li>• Rivers 30.5 meters / 100 feet and greater in width as polyline features</li> </ul> </li> <li>• Bridges used in DEM generation as point features in Esri shapefile format</li> </ul>
Hydro-flattened bare earth digital elevation model (DEM)	2-foot pixel size, 32-bit floating-point; no bridges or overpass structures GeoTIFF format
Intensity Imagery	2-foot pixel size, 8-bit gray-scale (linear rescaling from 16-bit intensity) GeoTIFF format
Flight Line Index	Polygon features in an Esri file geodatabase
<b>Control Data</b>	
Lidar calibration points	Esri shapefile format
Lidar NVA checkpoints	Esri shapefile format
Lidar VVA checkpoints	Esri shapefile format
<b>Other Data</b>	
Data extent	Esri shapefile format
Tile index	Esri shapefile format
Interswath and intraswath results	Esri shapefile format
Height separation rasters	GeoTIFF format

<b>Metadata and Reports</b>	
Metadata	Project-level FGDC CSDGM/USGS MetaParser Compliant metadata in .xml format
Lidar Project Report	Project report with flight logs in .pdf format
Survey Report	Survey report in .pdf format

Figure 1-1. Project Area

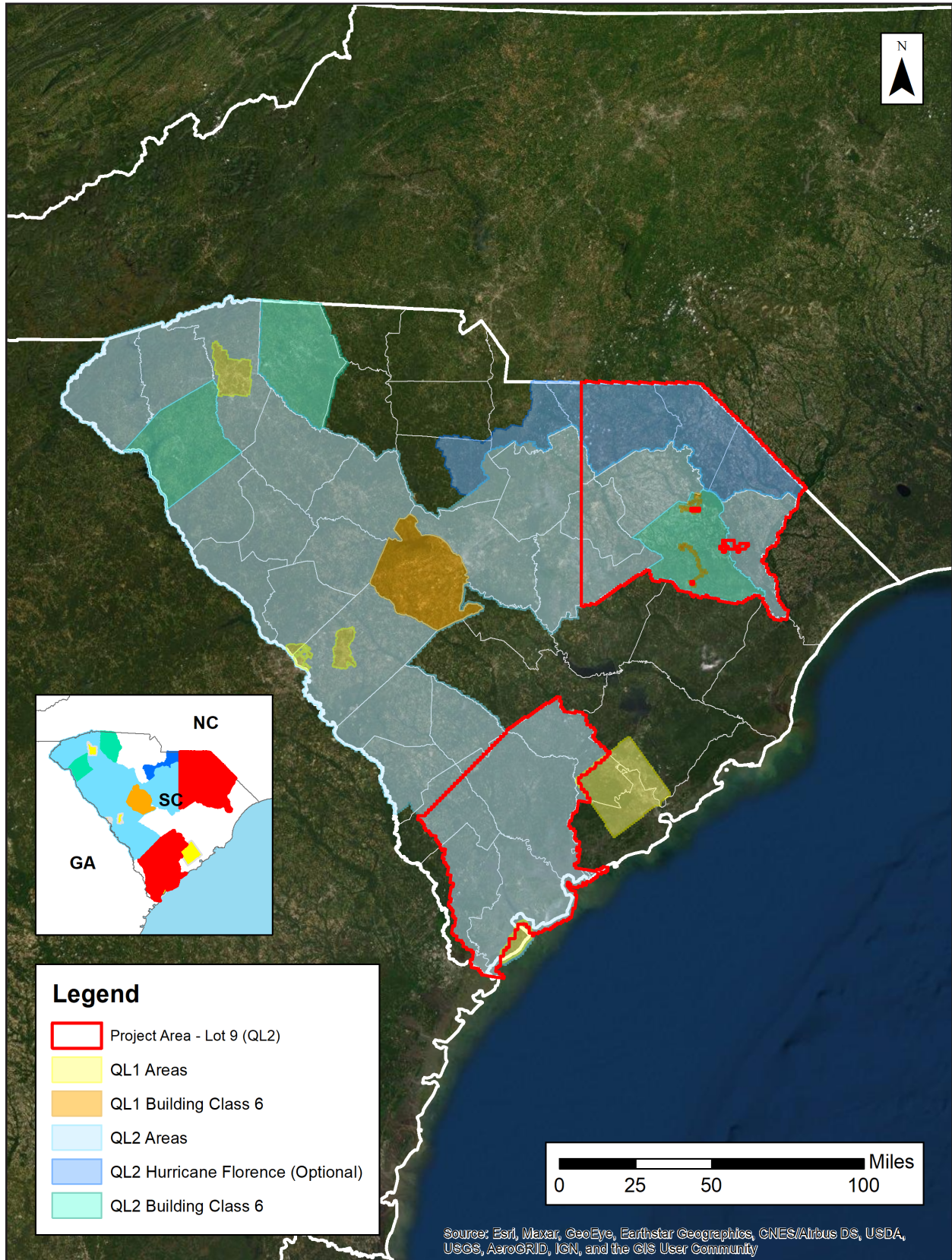
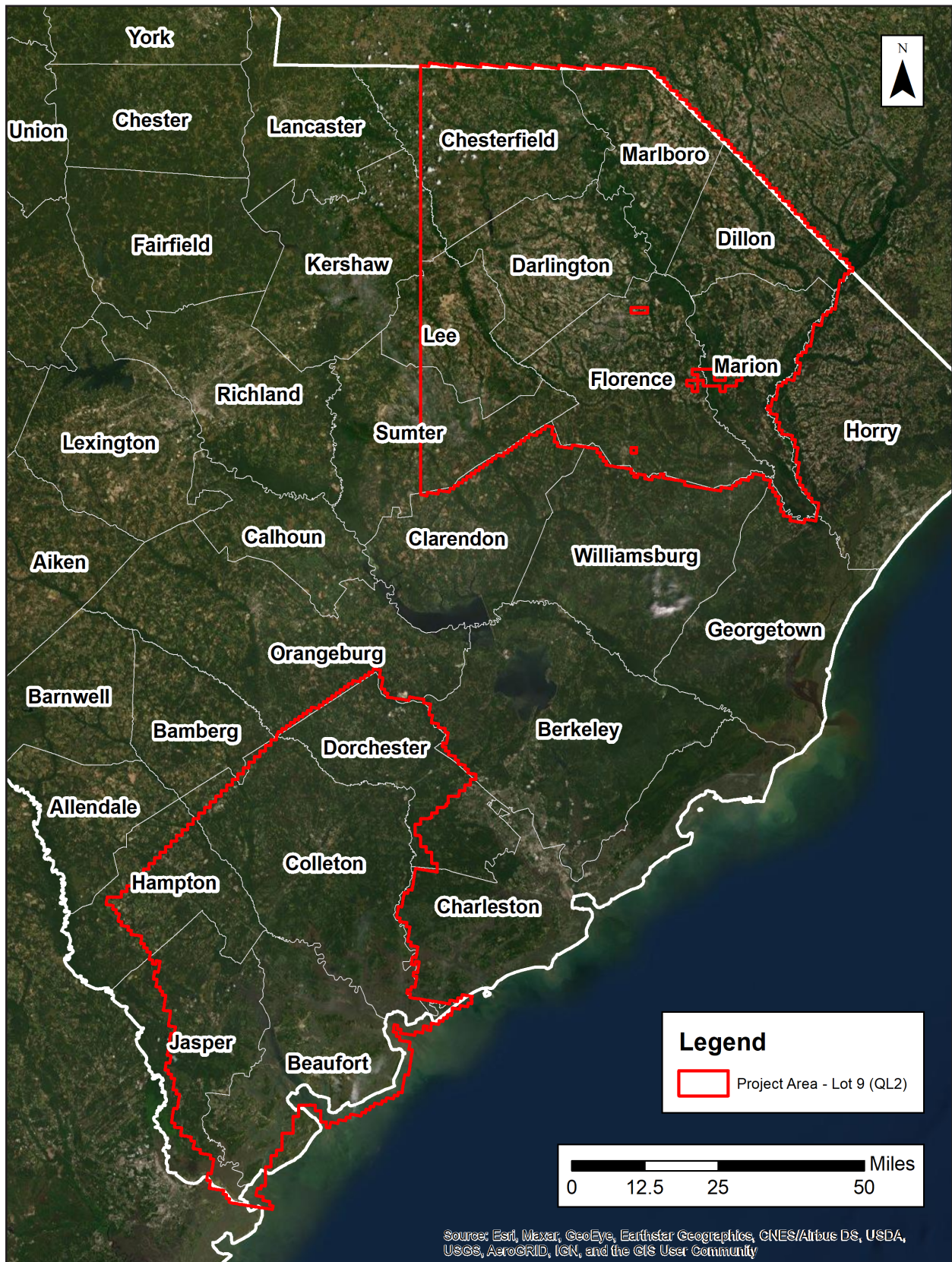


Figure 1-2. Project Area - Lot 9 QL2



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



## 2. Acquisition

### Flight Planning

Aerial lidar data for this project was collected using the specifications listed below.

Table 2-1. Acquisition Requirements

Specification	Target
Resolution	<ul style="list-style-type: none"> <li>• 2 points per square meter</li> <li>• 0.71-meter nominal point spacing</li> </ul>
Overlap	At contractor's discretion, but enough to ensure there are no data gaps between usable portions of the swath and nominal point density is achieved
Acquisition Window	Fall 2019 / Spring 2020 leaf-off window (through March 15, 2020)
Data Voids	Not allowed except <ul style="list-style-type: none"> <li>• Where caused by water bodies</li> <li>• Where caused by areas of low near infra-red (NIR) reflectivity (i.e. asphalt or composition roofing)</li> <li>• Where caused by lidar shadowing from buildings or other features</li> <li>• Where appropriately filled-in by another swath</li> </ul>
Acquisition Conditions	<ul style="list-style-type: none"> <li>• Cloud and fog-free between the aircraft and ground</li> <li>• Ground is snow free; very light undrafted snow may be acceptable in special cases, with prior approval</li> <li>• Ground has no unusual flooding or inundation, except in cases where the goal of the collection is to map the inundation</li> <li>• Preference of vegetation is leaf-off</li> <li>• Time of day is not of concern</li> </ul>
Control	Airborne Global Positioning System (ABGPS) and Inertial Measurement Unit (IMU) data to be used along with differentially-corrected GPS ground control points

In Woolpert's review of South Carolina Lot 9 QL2 WU 214102 some data gaps in the point cloud were identified which will require reflights. These data gaps are clustered in a single area and appear to be due to cloud shadows in adjacent flight lines and they range from 0.04 – 0.3 square miles impacting approximately 15 tiles.

Woolpert completed the review on the Work Unit with the gaps and will provide a low confidence polygon for the gap areas. Woolpert will re-fly the gap once leaf off conditions return, patch the impacted tiles, and redeliver the impacted products to the USGS and the end users.

## Lidar Sensor Information

Aerial lidar data was acquired for this project using the Leica ALS70 and Optech Galaxy PRIME lidar sensor systems. A total of 360 flight lines were collected for this project.

Table 2-2. Leica ALS70 Sensor Info

<b>System Performance</b>	
Maximum Flying Height (m AGL)	3,500
Maximum Measurement Rate (kHz)	500
Field of view (degrees)	0 - 75 (full angle, user adjustable)
Roll stabilization (automatic adaptive, degrees)	70 - active FOV
Scan patterns (user selectable)	sine, triangle raster
Maximum Scan Rate (Hz)	<ul style="list-style-type: none"> <li>• Scan</li> <li>• Triangle</li> <li>• Raster</li> </ul>
Number of Returns	unlimited
Number of intensity measurements	3 (first, second, third)
<b>Physical Specifications</b>	
Size (cm), Weight (kg)	<ul style="list-style-type: none"> <li>• Scanner</li> <li>• Control Electronics</li> </ul>
Operating Temperature	0 - 40°C
Scanner	
Control Electronics	
Flight Management	FCMS
Power Consumption	910 W @ 22.0 – 30.3 VDC

Source: Leica ALS70-HP Product Specifications

[https://w3.leica-geosystems.com/downloads123/zz/airborne/ALS70/brochures/Leica\\_ALS70\\_6P\\_BRO\\_en.pdf](https://w3.leica-geosystems.com/downloads123/zz/airborne/ALS70/brochures/Leica_ALS70_6P_BRO_en.pdf)

Table 2-3. Optech Galaxy PRIME Sensor Info

<b>Sensor Performance</b>	
Performance envelope <sup>1, 2, 3, 4</sup>	150-6000 m AGL, nominal
Absolute horizontal accuracy <sup>2, 3</sup>	1/10,000 × altitude; 1 $\sigma$
Absolute elevation accuracy <sup>2, 3</sup>	< 0.03-0.25 m RMSE from 150-6000 m AGL
<b>Laser Configuration</b>	
Topographic laser	1064-nm near-infrared
Laser classification	Class IV (US FDA 21 CFR 1040.10 and 1040.11; IEC/EN 60825-1)
Pulse repetition frequency (effective)	Programmable, 50-1000 kHz
Beam divergence	0.25 mrad (1/e)
Laser range precision <sup>5</sup>	< 0.008 m, 1 $\sigma$
Minimum target separation distance	< 0.7 m (discrete)
Range capture	Up to 8 range measurements, including last
Intensity capture	Up to 8 intensity measurements, including last (12-bit)
<b>Sensor Configuration</b>	
Position and orientation system	POS AV™ AP60 (OEM); 220-channel dual frequency GNSS receiver; GNSS airborne antenna with Iridium filters; high-accuracy AIMU (Type 57); non-ITAR
Scan angle (FOV)	10-60°
Swath width	10-115% of altitude AGL
Scan frequency	0-120 Hz advertised (0-240 scan lines/sec)
Scan product	2000 maximum
Flight management system	Optech FMS (Airborne Mission Manager and Nav) with operator console
SwathTRAK™	Dynamic FOV for fixed-width data swaths in variable terrain
PulseTRAK™	Multipulse tracking algorithm with no density loss across PIA transition zones
Roll compensation	±5° minimum
Data storage	Removable SSD (primary); internal SSD (spare)
Power requirements	28 V; 400 W
Dimensions and weight	Sensor: 0.34 × 0.34 × 0.25 m, 27 kg PDU: 0.42 × 0.33 × 0.10 m, 6.5 kg
Operating temperature	0 to +35°C

1. Target reflectivity  $\geq 20\%$ ; 99% detection probability
2. Dependent on selected operational parameters; assumes nominal FOV of up to 40° in standard atmospheric conditions (i.e. 23-km visibility) and use of Optech LMS Professional software suite
3. Angle of incidence  $\leq 20^\circ$
4. Target size  $\geq$  laser footprint
5. Under Teledyne Optech test conditions, 1 sigma

Source: Optech Galaxy PRIME Airborne Lidar Terrain Mapper Specification Sheet  
<http://info.teledyneoptech.com/acton/attachment/19958/f-0278/1/-/-/-/Galaxy%20PRIME%20Brochure.pdf>

## GNSS and IMU Equipment

Prior to mobilizing to the project site, flight crews coordinated with the necessary air traffic control personnel to ensure airspace access. Crews were on-site, operating a Global Navigation Satellite System (GNSS) Base Station for the airborne GPS support.

Flight navigation during acquisition was performed using IGI CCNS (Computer Controlled Navigation System). The pilots are skilled at maintaining their planned trajectory, while holding the aircraft steady and level. If atmospheric conditions are such that the trajectory, ground speed, roll, pitch and/or heading cannot be properly maintained, the mission is aborted until suitable conditions occur.

Base stations were set by acquisition staff and was used to support the aerial data acquisition. See the table below for stations operated during acquisition.

Table 2-4. GNSS Base Stations

Station Name	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height L1 Phase Center (Meters)
COLA_CORS	34° 04' 51.55792"	81° 07' 18.01522"	83.061
GAAE_CORS	33° 35' 38.05166"	82° 04' 04.04365"	125.833
GACC_CORS	33° 32' 44.70609"	81° 08' 01.70043"	99.946
NCLU_CORS	34° 37' 36.33614"	79° 04' 39.69488"	15.891
NCMR_CORS	34° 58' 54.77677"	80° 31' 25.79018"	144.41
NCPO_CORS	34° 59' 33.17291"	80° 10' 37.85773"	84.998
NCRO_CORS	34° 57' 51.98789"	79° 47' 47.74094"	91.939
NCSL_CORS	33° 58' 57.20137"	78° 23' 24.30672"	-9.935
NCWH_CORS	34° 16' 49.59009"	78° 42' 59.33174"	-2.274
P779_CORS	35° 12' 06.96421"	82° 52' 20.92282"	880.18
SCGP_CORS	34° 56' 15.68837"	82° 13' 57.26865"	279.47
SCHY_CORS	33° 56' 23.73657"	78° 44' 06.88299"	-15.97
SCSR_CORS	33° 55' 22.01095"	80° 20' 26.57980"	36.625
SCUN_CORS	34° 45' 58.60562"	81° 38' 55.69929"	169.798

## Timeline

Lidar data for Lot 9 QL2 was collected January 5, 2020 through March 20, 2020. Acquisition specifications are listed in the table below. An initial quality control process was immediately performed on to review the data coverage, airborne GPS data, and trajectory solution.

For more information, see the Flight Logs in Appendix 1.

Table 2-5. Project Acquisition Specifications

Settings	Leica ALS70	Optech Galaxy PRIME
Max. Number of Returns	4	8
Nominal Point Spacing	0.7 m	0.55 m
Nominal Point Density	2 ppsm	3.76 ppsm
Flying Height Above Ground Level	1,981 m	1,553 m
Flight Speed	130 knots	150 knots
Scan Angle	40°	40°
Scan Rate Used	49 Hz	70 Hz
Pulse Rate Used	277 kHz	450 kHz
Multi-Pulse in Air	Enabled	Enabled
Swath Width	1,450 m	1,109 m
Swath Overlap	25%	30%

## Acquisition Quality Assurance

Woolpert developed a quality assurance and validation plan to ensure the acquired lidar data meets the USGS Base Specification Version 1.3. For quality assurance purposes, the lidar data was processed immediately following acquisition to verify the coverage has appropriate density, distribution, and no unacceptable data voids. Accompanying GPS data was post processed using differential and Kalman filter algorithms to derive a best estimate of trajectory. The quality of the solution was verified to be consistent with the accuracy requirements of the task order. Any required re-flights were scheduled at the earliest opportunity.

The spatial distribution of the geometrically usable first return lidar points was reviewed for density requirements as well as regular and uniform point distribution - verifying the lidar data is spaced so that 90% of the cells in a 2\*NPS grid placed over the data contain at least one lidar point. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath. Additionally, the data was reviewed for unacceptable data voids – verifying no area greater than or equal to  $(4 \times \text{ANPS})^2$  exhibited data coverage gaps.

# 3. Processing

## Processing Summary

Once the lidar data passed initial QC, the dataset was corrected for aircraft orientation and movement. This process used airborne inertial, orientation, and GPS data collected during acquisition along with ground-based GPS data. The data went through a geometric calibration that further corrected each laser point. This calibrated data set was used to create the LAS point cloud. The LAS point data was initially classified into “ground” and “non-ground”, then further refined using the classes specified in this task order. Breaklines were drawn to denote hydrological features. After the hydro-flattening process, the final deliverables products were created.

## GNSS-IMU Trajectory Processing

Kinematic corrections for the aircraft position were resolved using aircraft GPS and static ground GPS (1-Hz) for each geodetic control (base station) for three subsystems: inertial measurement unit (IMU), sensor orientation information, and airborne GPS data.

Post-processing of the IMU system data and aircraft position with attitude data was completed to compute an optimally accurate, blended navigation solution based on Kalman filtering technology, or the smoothed best estimate of trajectory (SBET).

**Software:** POSPac Software v. 5.3, IPAS Pro v.1.35., Novatel Inertial Explorer v8.60.6129

## Trajectory Quality

The GNSS trajectory and high-quality IMU data are key factors in determining the overall positional accuracy of the final sensor data. Within the trajectory processing, there are many factors that affect the overall quality, but the most indicative are the combined separation, the estimated positional accuracy, and the positional dilution of precision (PDOP).

## Combination Separation

Combined separation is a measure of the difference between the forward-run and the backward-run solution of the trajectory. The Kalman filter was processed in both directions to remove the combined directional anomalies. In general, when these two solutions match closely, an optimally accurate and reliable solution is achieved.

The data for this task order was processed with a goal to maintain a combined separation difference of less than ten (10) centimeters.

## Estimated Positional Accuracy

Estimated positional accuracy plots the standard deviations of the east, north, and vertical directions along a time scale of the trajectory. It illustrates loss of satellite lock issues, as well as issues arising from long baselines, noise, and/or other atmospheric interference.

## PDOP

The PDOP measures the precision of the GPS solution in regard to the geometry of the satellites acquired and used for the solution.

The data for this task order was processed with a goal to maintain an average PDOP value below 3.0. Brief periods of PDOP over 3.0 are acceptable due to the calibration and control process if other metrics are within specification.

## Geometric Calibration

After the initial phase was complete, a formal reduction process was performed on the data. Laser point position was calculated by associating the SBET position to each laser point return time, scan angle, intensity, etc. Raw laser point cloud data was created for the whole project area in LAS format. Automated line-to-line calibrations were then performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift. Statistical reports were generated for comparison and used to make the necessary adjustments to remove any residual systematic error.

**Software:** Proprietary Software, TerraMatch v20, Leica CloudPro 1.2.4

## Lidar Data Classification

LAS data was classified as ground and non-ground points with additional filters created to meet the task order classification specifications. Statistical absolute accuracy was assessed via direct comparisons of ground classified points to ground RTK survey data. Based on the statistical analysis, the lidar data was then adjusted to reduce the vertical bias when compared to the survey ground control of higher accuracy.

Calibrated LAS files were imported into the task order tiles and initially filtered to create a ground and non-ground class. Then additional classes were filtered as necessary to meet the following client-specified classes:

- Class 1 – Default / Processed, but not Classified
- Class 2 – Bare Earth Ground
- Class 7 – Low Noise
- Class 9 – Water
- Class 17 – Bridge Decks
- Class 18 – High Noise
- Class 20 – Ignored Ground

Classified LAS files were evaluated through a series of manual QA/QC steps as well as a peer-based review to eliminate remaining artifacts from the ground class. This included a review of the DEM surface to remove artifacts and ensure topographic quality.

**Software:** Proprietary Software, TerraScan v20

## Hydrologic Flattening

The lidar task order required compilation of breaklines defining the following types of water body features:

Lakes, reservoirs, ponds	Minimum of 2-acres or greater Compiled as closed polygons, collected at a constant elevation
Rivers, streams	Nominal width of 30.5 meters / 100 feet Compiled in direction of flow, with both sides maintaining an equal elevation gradient
Bridge breaklines	Breaklines used to enforce a logical terrain surface below a bridge

Woolpert utilized the following steps to hydrologically flatten the water bodies and for gradient hydrologic flattening of the double line streams within the existing lidar data:

1. The newly acquired lidar data was utilized to manually compile the hydrologic features in a 2D environment using the lidar intensity and bare earth surface. Open Source imagery was used as reference when necessary.
2. An integrated software approach was applied to combine the lidar data and 2D breaklines. This process “drapes” the 2D breaklines onto the 3D lidar surface model to assign an elevation. A monotonic process is performed to ensure the streams are consistently flowing in a gradient manner. A secondary step within the program verifies an equally matching elevation of both stream edges. The breaklines that characterize the closed water bodies are draped onto the 3D lidar surface and assigned a constant elevation at or just below ground elevation.
3. All classified ground points from inside the hydrologic feature polygons were reclassified to water, class nine (9).
4. All classified ground points were reclassified from within a buffer along the hydrologic feature breaklines to buffered ground, class twenty (20). The buffer distance was approximately the task order designed nominal pulse spacing distance.
5. Breaklines used for bridge removal during the hydrologic flattening were included with the hydrologic breakline geodatabase deliverable. The purpose of these breaklines is for a more aesthetically pleasing DEM appearance.
6. The lidar ground points and breaklines were used to generate a digital elevation model (DEM).
7. QA/QC for this task was performed by reviewing the hydrologically flattened DEM and hydrologic breakline features. Additionally, a combined approach utilizing commercial off the shelf software and proprietary methods were used to review the overall connectivity of the hydrologic breaklines.

TerraScan was used to add the hydrologic breakline vertices and export the lattice models.

Breaklines defining the water bodies greater than 2-acres were provided as polygon features. Rivers and streams with a nominal minimum width of 30.5 meters (100 feet) were provided as polyline features. All lake and river breaklines compiled as part of the flattening process were provided in an Esri file geodatabase.



Breaklines used for DEM generation were provided as point features in Esri shapefile format.

**Software:** TerraScan v20, TerraModeler v20, Esri ArcMap v10.7, LP360 v2019.1.30.4

## Digital Elevation Model

TerraScan was used to add the hydrologic breakline vertices and export the lattice models. Class 2 (ground) lidar points in conjunction with the hydro breaklines and bridge breaklines were used to create 2-foot hydro-flattened bare-earth raster DEM files. Using automated scripting routines within ArcMap, an 32-bit floating point raster GeoTIFF file was created for each tile. Files were clipped to the data extent. Each surface is reviewed using Global Mapper to check for any surface anomalies or incorrect elevations found within the surface.

**Software:** TerraScan v20, Esri ArcMap v10.7, Global Mapper v20.0

## Intensity Imagery

Lidar intensity data derived from the acquired lidar data was linearly rescaled from 16-bit intensity and provided as 2-foot pixel, 8-bit, 256 gray scale GeoTIFF format intensity imagery files. Files were clipped to the data extent.

**Software:** TerraScan v20, Esri ArcMap v10.7

## Metadata

FGDC CSDGM/USGS MetaParser-compliant metadata was produced in XML format. The metadata includes a complete description of the task order client information, contractor information, project purpose, lidar acquisition and ground survey collection parameters, lidar acquisition and ground survey collection dates, spatial reference system information, data processing including acquisition quality assurance procedures, GPS and base station processing, geometric calibration, lidar classification, hydrologic flattening, intensity imagery development, and final product development.

Other metadata deliverables included Esri shapefiles of the ground control and QA/QC points and delivery tile index. A georeferenced, polygonal representation of the detailed extents of each acquired lidar swath was produced as a polygon feature class in an Esri file geodatabase. A height separation raster was produced in GeoTIFF format. Inter-swath and intra-swath test results were provided in Esri shapefile format.

## 4. Accuracy Assessment

### Horizontal Accuracy

The data sets was produced to meet ASPRS “Positional Accuracy Standards for Digital Geospatial Data” (2014) for a 18.6 cm RMSE<sub>x</sub> / RMSE<sub>y</sub> Horizontal Accuracy Class which equates to Positional Horizontal Accuracy = +/- 45.5 cm at a 95% confidence level.

### Raw Lidar Swath Testing

This project required the lidar point cloud swath to be produced to meet a Non-Vegetated Vertical Accuracy (NVA) value of 19.6 cm at a 95% confidence level using an RMSE<sub>z</sub> target value of 10 cm x 1.9600.

### Digital Elevation Model Testing

This project required DEM data to be produced to meet a Non-Vegetated Vertical Accuracy (NVA) value of 19.6 cm at a 95% confidence level using an RMSE<sub>z</sub> target value of 10 cm x 1.9600 and a Vegetated Vertical Accuracy (VVA) value of 0.30 cm at the 95th percentile error.

# Appendix 1: Flight Logs



# Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19	Day005_7178_B	01/05/2020	005	B

Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Blake	Cessna 206	N85PE	6143.8	12:10:00	17:10:00	KFLO	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70	7178	6146.8	15:10:00	20:10:00	KFLO	

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
270	10	20	25,000	Clear	12	-2	3024
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

					Verify S-Turns Before Mission		Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
7	270	17:52:00	18:10:00	00:18:00	16	1.2	
8	90	18:13:00	18:27:00	00:14:00	17	1.4	
9	270	18:31:00	18:50:00	00:19:00	18	1.2	
10	90	18:52:00	19:08:00	00:16:00	18	1.1	
11	270	19:11:00	19:31:00	00:20:00	16	1.2	
12	90	19:33:00	19:49:00	00:16:00	15	1.4	

Page 1					Verify S-Turns After Mission		Yes
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**Additional Comments**  
 Project # 2551-017  
 QL2 NE  
 Leica Mission # 20200105-171123

# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19	Day006_7178_A		01/06/2020	006	A

Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Blake	Cessna 206	N85PE	6146.8	07:50:00	12:50:00	KFLO	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70	7178	6150.1	11:10:00	16:10:00	KFLO	

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
278	19	20	25,000	Clear	2	-1	3013
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				

Settings						
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)	
0.7	2	40	49	277	100	

					Verify S-Turns Before Mission	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
UL001	20	13:11:00	13:22:00	00:11:00	16	1.3	Cross Flight
13	270	13:24:00	13:43:00	00:19:00	16	1.2	
14	90	13:47:00	14:03:00	00:16:00	15	1.3	
15	270	14:07:00	14:27:00	00:20:00	17	1.1	
16	90	14:30:00	14:47:00	00:17:00	18	1.1	
17	270	14:51:00	15:11:00	00:20:00	18	1.2	
18	90	15:14:00	15:32:00	00:18:00	18	1.2	
UL002	180	15:44:00	15:51:00	00:07:00	16	1.4	Cross Flight
UL003	180	15:57:00	15:59:00	00:02:00	17	1.2	Cross Flight

					Page 1	Verify S-Turns After Mission	Yes
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**Additional Comments**  
Project # 2551-017  
QL2 NE  
Leica Mission # 20200106-125033

# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day006_7178_B	01/06/2020	006	B	

Crew	Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206	N85PE	6150.1	12:25:00	17:25:00	KFLO
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70	7178	6153.7	15:50:00	20:50:00	KFLO

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
340	6	20	25,000	Clear	15	1	3017
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)			
130		6,500	6,647	147			

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

	<b>Verify S-Turns Before Mission</b>	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
19	270	17:58:00					Aborted for closed shutter
19	270	18:11:00	18:33:00	00:22:00	17	1.2	Reflew entire line 19
20	90	18:35:00	18:55:00	00:20:00	17	1.2	
21	270	18:59:00	19:22:00	00:23:00	16	1.3	
22	90	19:25:00	19:45:00	00:20:00	16	1.4	
23	270	19:48:00	20:11:00	00:23:00	16	1.4	
24	90	20:17:00	20:38:00	00:21:00	19	1	

Page 1	<b>Verify S-Turns After Mission</b>	Yes
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**Additional Comments**  
 Project # 2551-017  
 QL2 NE  
 Leica Mission # 20200106-172613





# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day007_7178	01/07/2020	007		

Crew	Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206	N85PE	6157.1	08:31:00	13:31:00	KFLO
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Norvell	Leica ALS70	7178	6159.6	10:41:00	15:41:00	KFLO

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
300	10	20	7,000	Clear	6	3	3004
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

	<b>Verify S-Turns Before Mission</b>	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
31	270	13:59:00	14:30:00	00:31:00	17	1.1	
32	90	14:34:00	14:57:00	00:23:00	17	1.2	
33	270	15:03:00	15:27:00	00:24:00	17	1.4	Partial line, clouds on west end; entire line reflight on 1-8-20

Page 1	<b>Verify S-Turns After Mission</b>	Yes
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**Additional Comments**  
 Project # 2551-017  
 QL2 NE  
 Leica Mission # 20200107-131939

# Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19	Day008_7178_A	01/08/2020	008	A

Crew	Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Blake	Cessna 206	N85PE	6159.6	07:40:00	12:40:00	KFLO
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70	7178	6163.2	11:10:00	16:10:00	KFLO

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
306	25	20	25,000	Clear	1	-1	3029
Air Speed (kts)		Altitude AGL (ft)		Altitude MSL (ft)		Airfield Elevation (ft)	
130		6,500		6,647		147	

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

					Verify S-Turns Before Mission	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
33	270	13:11:00	13:41:00	00:30:00	17	1.2	
34	90	13:50:00	14:11:00	00:21:00	17	1.1	
35	270	14:15:00	14:46:00	00:31:00	16	1.3	
36	90	14:49:00	15:12:00	00:23:00	19	1.1	
37	270	15:14:00	15:47:00	00:33:00	17	1.4	

Page 1					Verify S-Turns After Mission	Yes
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<b>Additional Comments</b>					
Project # 2551-017 QL2 NE Leica Mission # 20200108-124013					

# Woolpert Lidar Acquisition Log

Project Info					Date		
Project #	Project Name		Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19		Day008_7178_B		01/08/2020	008	B
Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206		N85PE	6163.2	14:27:00	19:27:00	KFLO
Operator	Sensor Make/Model		Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Norvell	Leica ALS70		7178	6167	17:55:00	22:55:00	KFLO
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
270	10	20	25,000	Clear	17	-4	3031
Air Speed (kts)	Altitude AGL (ft)		Altitude MSL (ft)	Airfield Elevation (ft)			
130	6,500		6,647	147			
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.7	2	40	49	277	100		
						Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
38	270	19:52:00	20:23:00	00:31:00	18	1.3	
39	90	20:26:00	20:50:00	00:24:00	18	1.1	
40	270	20:53:00	21:25:00	00:32:00	18	1.4	
41	90	21:33:00	21:59:00	00:26:00	19	1.2	
42	270	22:03:00	22:35:00	00:32:00	17	1.3	
Page 1					Verify S-Turns After Mission		Yes
Additional Comments							
Project # 2551-017 QL2 NE Leica Mission # 20200108-191216							



# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day017_7178_A	01/17/2020	017	A	

Crew	Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206	N85PE	6173.7	08:18:00	13:18:00	KFLO
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70	7178	6177.3	11:40:00	16:40:00	KFLO

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
353	20	20	25,000	Clear	6	-9	3062
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

							Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
43	90	13:52:00	14:18:00	00:26:00	18	1.1	QL2-NE	
44	270	14:21:00	14:50:00	00:29:00	17	1.5	QL2-NE	
45	90	14:53:00	15:20:00	00:27:00	17	1.4	QL2-NE	
46	270	15:23:00	15:51:00	00:28:00	20	1.1	QL2-NE	
47	90	15:54:00	16:20:00	00:26:00	18	1	QL2-NE	

**Additional Comments**  
 Project # 2551-017  
 QL2 NE  
 Leica Mission # 20200117-131649

# Lidar Acquisition Log

Project Info					Date		
Project #	Project Name		Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19		Day017_5060413_1		01/17/2020	017	1
Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Ryan	Cessna 401		N41GD	718.5	09:00:00	14:00:00	RBW
Operator	Sensor Make/Model		Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Jonathan	Galaxy Prime		5060413	723.6	02:00:00	19:00:00	RBW
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
30	12	10	12,000	Clear	8	-7	30.6
Air Speed (kts)		Altitude AGL (ft)		Altitude MSL (ft)		Airfield Elevation (ft)	
140		7,000		7,000			
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)		Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)	
0.41	7	40		85	600	50	
						Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
1		14:31:36	14:37:39	00:06:03	30	1.01	good
2		14:40:35	14:52:41	00:12:06	31	0.94	good
3		14:55:47	15:08:31	00:12:44	27	1.01	good
4		15:11:43	15:25:08	00:13:25	27	0.98	good
5		15:28:24	15:41:15	00:12:51	28	0.9	good
6		15:44:51	15:58:25	00:13:34	27	0.95	good
7		16:01:41	16:14:35	00:12:54	27	0.94	good
8		16:17:59	16:31:45	00:13:46	25	1.02	good
9		16:35:10	16:49:19	00:14:09	27	0.94	good
10		16:52:35	17:07:11	00:14:36	27	0.9	good
11		17:10:41	17:24:55	00:14:14	24	0.98	good
12		17:28:39	17:43:22	00:14:43	25	0.93	good
13		17:47:44	18:02:06	00:14:22	25	0.96	good
14		18:05:10	18:19:57	00:14:47	26	0.87	good
15		18:23:25	18:37:54	00:14:29	27	0.93	good
Page 1						Verify S-Turns After Mission	Yes
Additional Comments							
QL2							









# Woolpert Lidar Acquisition Log

Project Info						Date		
Project #	Project Name			Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19			Day020_7178_A		01/20/2020	020	A
Crew		Equipment			Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Vance	Cessna 206		N85PE	6180.7	08:05:00	13:05:00	KFLO	
Operator	Sensor Make/Model		Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70		7178	6184.1	11:30:00	16:30:00	KHVS	
Conditions								
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)	
9	6	20	25,000	Clear	-1	-8	3031	
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130		6,500	6,647	147				
Settings								
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)		Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.7	2	40		49	277	100		
							Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
53	90	13:41:00	14:09:00	00:28:00	18	1.1	QL2-NE	
54	270	14:12:00	14:45:00	00:33:00	19	1.1	QL2-NE	
55	270	14:49:00	15:10:00	00:21:00	18	1.2	QL2-NW	
54	90	15:13:00	15:32:00	00:19:00	19	1.1	QL2-NW	
53	270	15:35:00	15:56:00	00:21:00	18	1.2	QL2-NW	
52	90	16:00:00	16:18:00	00:18:00	19	1.2	QL2-NW	

**Additional Comments**

Project # 2551-017  
 QL2 NE, QL2 NW  
 Leica Mission # 20200120-130736



# Woolpert Lidar Acquisition Log

Project Info						Date		
Project #	Project Name		Unique ID			Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19		Day020_7178_B			01/20/2020	020	B
Crew		Equipment		Time			Airports	
<b>Pilot</b>		<b>Aircraft Make/Model</b>	<b>Aircraft Tail #</b>	<b>Hobbs Start</b>	<b>Local Start</b>	<b>UTC Start</b>	<b>Departing</b>	
Vance		Cessna 206	N85PE	6184.2	11:45:00	16:45:00	KHVS	
<b>Operator</b>		<b>Sensor Make/Model</b>	<b>Sensor Serial #</b>	<b>Hobbs End</b>	<b>Local End</b>	<b>UTC End</b>	<b>Arriving</b>	
Pautsch		Leica ALS70	7178	6187.3	15:00:00	20:00:00	KFLO	
Conditions								
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)	
0	5	20	25,000	Clear	3	-10	3035	
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)					
130	6,500	6,647	147					
Settings								
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)			
0.7	2	40	49	277	100			
						Verify S-Turns Before Mission	Yes	
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
51	270	17:18:00	17:41:00	00:23:00	17	1.2	QL2-NW	
50	90	17:43:00	18:02:00	00:19:00	17	1.1	QL2-NW	
49	270	18:06:00	18:28:00	00:22:00	17	1.2	QL2-NW	
48	90	18:30:00	18:49:00	00:19:00	16	1.5	QL2-NW	
47	270	18:52:00	19:14:00	00:22:00	17	1.2	QL2-NW	
46	90	19:17:00	19:36:00	00:19:00	19	1.1	QL2-NW	
<b>Page 1</b>						<b>Verify S-Turns After Mission</b>	Yes	
Additional Comments								
Project # 2551-017 QL2 NW Leica Mission # 20200120-164718								

# Lidar Acquisition Log

Project Info					Date		
Project #	Project Name		Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19		Day020_5060413_2		01/20/2020	020	2
Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Ryan	Cessna 401		N41GD	739.5	02:30:00	19:30:00	RBW
Operator	Sensor Make/Model		Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Jonathan	Galaxy Prime		5060413	745.1	08:00:00	01:00:00	RBW
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
350	7	10	12,000	Clear	7.2	-6.7	30.27
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)			
140		7,000	7,000				
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.56	3	40	70	450	100		
						Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
137		20:02:46	20:11:07	00:08:21	24	1.08	good
136		20:15:59	20:18:44	00:02:45	25	1.08	good
135		20:24:38	20:30:52	00:06:14	25	1.1	good
134		20:33:36	20:39:42	00:06:06	25	1.09	good
133		20:43:07	20:49:45	00:06:38	26	0.95	good
132		20:52:09	20:58:43	00:06:34	25	0.97	good
131		21:02:51	21:11:46	00:08:55	25	0.97	good
130		21:14:15	21:23:06	00:08:51	25	0.96	good
129		21:25:29	21:34:35	00:09:06	25	0.97	good
127		21:36:59	21:41:36	00:04:37	25	1.02	refly
128		21:51:21	22:00:09	00:08:48	26	1.09	good
127		22:05:11	22:14:18	00:09:07	26	1.11	good
126		22:17:06	22:25:49	00:08:43	26	1.11	good
125		22:36:42	22:45:32	00:08:50	25	1.16	good
124		22:47:54	22:57:17	00:09:23	27	1.01	good
123		23:01:04	23:10:15	00:09:11	27	1.04	good
122		23:12:49	23:21:56	00:09:07	26	0.99	good
121		23:24:55	23:34:15	00:09:20	25	0.99	good
120		23:36:50	23:46:08	00:09:18	25	0.97	good
119		23:50:58	00:00:32	00:09:34	23	1.06	good
118		00:03:08	00:12:22	00:09:14	22	1.07	good
117		00:16:20	00:25:40	00:09:20	22	1.1	good
116		00:28:42	00:37:51	00:09:09	22	1.06	good
115		00:41:36	00:46:44	00:05:08	20	1.37	refly
Page 1						Verify S-Turns After Mission	Yes
Additional Comments							
QL2							

# Woolpert Lidar Acquisition Log

Project Info					Date		
Project #	Project Name	Unique ID		Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day021_7178_A		01/21/2020	021	A	
Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Vance	Cessna 206	N85PE	6191	06:45:00	11:45:00	KFLO	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70	7178	6194.7	10:30:00	15:30:00	KHVS	

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
22	17	20	25,000	Clear	-2	-11	3040
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)			
130		6,500	6,647	147			

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

						<b>Verify S-Turns Before Mission</b>	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
45	270	12:22:00	12:42:00	00:20:00	17	1.2	QL2-NW
44	90	12:45:00	13:07:00	00:22:00	15	1.4	QL2-NW
43	270	13:10:00	13:30:00	00:20:00	17	1.4	QL2-NW
42	90	13:33:00	13:55:00	00:22:00	18	1.3	QL2-NW
41	270	13:58:00	14:17:00	00:19:00	18	1.2	QL2-NW
40	90	14:21:00	14:42:00	00:21:00	16	1.6	QL2-NW
UL001	350	14:52:00	15:11:00	00:19:00	18	1.3	cross flight

Page 1	<b>Verify S-Turns After Mission</b>	Yes
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**Additional Comments**  
 Project # 2551-017  
 QL2 NW  
 Leica Mission # 20200121-164718



# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day021_7178_B	01/21/2020	021	B	

Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Vance	Cessna 206	N85PE	6194.7	10:45:00	15:45:00	KHVS	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70	7178	6198.3	14:25:00	19:25:00	KFLO	

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
20	7	20	25,000	Clear	1	-12	3046
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

<b>Verify S-Turns Before Mission</b>	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
16	270	16:11:00	16:21:00	00:10:00	16	1.2	QL2-NW
17	90	16:25:00	16:36:00	00:11:00	16	1.2	QL2-NW
18	270	16:39:00	16:49:00	00:10:00	17	1.1	QL2-NW
19	90	16:54:00	17:05:00	00:11:00	16	1.2	QL2-NW
20	270	17:08:00	17:18:00	00:10:00	17	1.3	QL2-NW
21	90	17:22:00	17:35:00	00:13:00	18	1.2	QL2-NW
22	270	17:38:00	17:50:00	00:12:00	17	1.1	QL2-NW
23	90	17:55:00	18:11:00	00:16:00	18	1.1	QL2-NW
24	270	18:13:00	18:27:00	00:14:00	17	1.2	QL2-NW
25	90	18:36:00	18:58:00	00:22:00	16	1.4	QL2-NW

<b>Page 1</b>	<b>Verify S-Turns After Mission</b>	Yes
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**Additional Comments**  
 Project # 2551-017  
 QL2 NW  
 Leica Mission # 20200121-154709



# Lidar Acquisition Log

Project Info				Date			
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #		
80495	SC Savannah Pee Dee 2019 B19	Day021_5060413_2	1/21/2020	021	2		
Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Ryan	Cessna 401	N41GD	750	03:45:00	20:45:00	RBW	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Jonathan	Galaxy Prime	5060413	754.9	08:40:00	01:40:00	RBW	
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
350	17	10	12,000	Clear	6.1	-11.1	30.3
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
150	7,000	7,000					
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.41	7	40	85	600	50		

Verify S-Turns Before Mission  Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)		Satellite	PDOP	Line Notes/Comments
115		21:15:24	21:24:59	00:09:35	27	0.93	good
114		21:28:08	21:40:26	00:12:18	26	0.98	good
113		21:44:06	21:56:29	00:12:23	25	0.98	good
112		21:59:14	22:11:27	00:12:13	28	0.97	good
111		22:15:12	22:27:34	00:12:22	28	0.97	good
110		22:30:30	22:42:16	00:11:46	27	1.13	good
109		22:46:24	22:58:11	00:11:47	29	0.98	good
108		23:01:13	23:12:55	00:11:42	29	0.94	good
107		23:16:19	23:28:39	00:12:20	29	0.89	good
106		23:31:21	23:43:45	00:12:24	27	0.93	good
105		23:47:43	00:00:13	00:12:30	25	0.93	good
104		00:03:12	00:15:23	00:12:11	24	1.02	good
103		00:19:22	00:32:05	00:12:43	23	1.08	good
45		00:44:20	00:59:50	00:15:30	24	0.95	good
46		01:02:48	01:18:52	00:16:04	24	1.03	good

Page 1 Verify S-Turns After Mission  Yes

Additional Comments  
QL2





# Woolpert Lidar Acquisition Log

Project Info					Date		
Project #	Project Name		Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19		Day022_7178_A		01/22/2020	022	A
Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206		N85PE	6205	06:50:00	11:50:00	KFLO
Operator	Sensor Make/Model		Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70		7178	6208.1	09:55:00	14:55:00	KFDW
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
48	6	20	25,000	Clear	-1	-9	3036
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)			
130		6,500	6,647	147			
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.7	2	40	49	277	100		
						Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
38	270	12:23:00	12:43:00	00:20:00	16	1.2	QL2-NW
39	90	12:46:00	13:11:00	00:25:00	15	1.3	QL2-NW
1	270	13:22:00	13:45:00	00:23:00	17	1.1	QL2-SW
2	90	13:48:00	14:18:00	00:30:00	19	1	QL2-SW
3	270	14:21:00	14:44:00	00:23:00	17	1.4	QL2-SW
Page 1					Verify S-Turns After Mission	Yes	
Additional Comments							
Project # 2551-017 QL2 NW, QL2 SW Leica Mission # 20200122-115238							

# Lidar Acquisition Log

Project Info					Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #		
80495	SC Savannah Pee Dee 2019 B19	Day022_5060413_1	01/22/2020	022	1		
Crew		Equipment		Time		Airports	
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Ryan	Cessna 401	N41GD	754.9	11:10:00	16:10:00	RBW	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Jonathan	Galaxy Prime	5060413	758.9	03:10:00	20:10:00	RBW	
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
50	12	10	12,000	Clear	5	-5	30.36
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
150	7,000	7,000					
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.41	7	40	85	600	50		
					Verify S-Turns Before Mission	Yes	
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
138		16:37:07	16:48:11	00:11:04	25	0.96	good
47		17:00:48	17:16:55	00:16:07	26	0.96	good
48		17:20:47	17:36:54	00:16:07	27	0.9	good
49		17:40:39	17:56:56	00:16:17	26	0.99	good
139		18:08:48	18:21:00	00:12:12	28	0.92	good
50		18:37:31	18:54:07	00:16:36	27	1.02	good
51		18:58:08	19:15:10	00:17:02	25	0.95	good
52		19:17:49	19:34:35	00:16:46	31	0.9	good
Page 1					Verify S-Turns After Mission	Yes	
Additional Comments							
QL2							





# Woolpert Lidar Acquisition Log

Project Info						Date			
Project #	Project Name		Unique ID			Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19		Day022_7178_D			01/22/2020	022	D	
Crew		Equipment			Time			Airports	
Pilot	Aircraft Make/Model		Aircraft Tail #		Hobbs Start	Local Start	UTC Start	Departing	
Brantley	Cessna 206		N85PE		6215.3	18:21:00	23:21:00	KFDW	
Operator	Sensor Make/Model		Sensor Serial #		Hobbs End	Local End	UTC End	Arriving	
Norvell	Leica ALS70		7178		6218.7	21:36:00	02:36:00	KFLO	
<b>23:46</b>									
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)		
20	3	20	25,000	Clear	5	-9	3032		
Air Speed (kts)	Altitude AGL (ft)		Altitude MSL (ft)	Airfield Elevation (ft)					
130	6,500		6,690	364					
Settings									
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)				
0.7	2	40	49	277	100				
								Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments		
14	90	23:37:00	00:11:00	00:34:00	19	1.2	QL2-SW		
15	270	00:14:00	00:44:00	00:30:00	15	1.3	QL2-SW		
16	90	00:47:00	01:20:00	00:33:00	17	1.1	QL2-SW		
17	270	01:22:00	01:53:00	00:31:00	17	1.1	QL2-SW		
18	90	01:56:00	02:28:00	00:32:00	17	1.3	QL2-SW		
Page 1						Verify S-Turns After Mission		Yes	

**Additional Comments**  
 Project # 2551-017  
 QL2 SW  
 Leica Mission # 20200122-231306



# Woolpert Lidar Acquisition Log

Project Info						Date		
Project #	Project Name			Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19			Day023_7178_A		01/23/2020	023	A
Crew		Equipment			Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #		Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206		N85PE		6218.8	06:50:00	11:50:00	KFLO
Operator	Sensor Make/Model		Sensor Serial #		Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70		7178		6222.2	10:15:00	15:15:00	KFDW
Conditions								
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)	
150	8	20	10,000	Overcast	1	-4	3032	
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130		6,500	6,647	147				
Settings								
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)		Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.7	2	40		49	277	100		
							Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
19	270	12:22:00	12:52:00	00:30:00	16	1.2	QL2-SW	
20	90	12:55:00	13:26:00	00:31:00	17	1.1	QL2-SW	
21	270	13:29:00	13:59:00	00:30:00	17	1.2	QL2-SW	
22	90	14:02:00	14:32:00	00:30:00	17	1.3	QL2-SW	
23	270	14:35:00	15:02:00	00:27:00	19	1.1	QL2-SW	
							Verify S-Turns After Mission	Yes
Additional Comments								
Project # 2551-017 QL2 SW Leica Mission # 20200123-115344								

# Woolpert Lidar Acquisition Log

Project Info						Date		
Project #	Project Name			Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19			Day023_7178_B		01/23/2020	023	B
Crew		Equipment			Time			Airports
Pilot	Aircraft Make/Model			Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing
Vance	Cessna 206			N85PE	6222.2	10:30:00	15:30:00	KFDW
Operator	Sensor Make/Model			Sensor Serial #	Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70			7178	6225.2	13:30:00	18:30:00	KFLO
Conditions								
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)	
51	5	20	10,000	Overcast	3	-4	3035	
Air Speed (kts)		Altitude AGL (ft)		Altitude MSL (ft)	Airfield Elevation (ft)			
130		6,500		6,700	200			
Settings								
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)			
0.7	2	40	49	277	100			
Verify S-Turns Before Mission								Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
24	90	15:55:00	16:22:00	00:27:00	18	1.1	QL2-SW	
25	270	16:24:00	16:52:00	00:28:00	16	1.2	QL2-SW	
26	90	16:55:00	17:21:00	00:26:00	17	1.2	QL2-SW	
27	270	17:24:00	17:51:00	00:27:00	17	1.2	QL2-SW	
28	90	17:54:00	18:05:00	00:11:00	17	1.3	Line 28 broken due to hot restricted area; will refly entire line later date	

### Additional Comments

Project # 2551-017  
 QL2 SW  
 Leica Mission # 20200123-153203



# Woolpert Lidar Acquisition Log

Project Info				Date			
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #		
80495	SC Savannah Pee Dee 2019 B19	Day026_7178_A	01/26/2020	026	A		
Crew	Equipment		Time			Airports	
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Blake	Cessna 206	N85PE	6228.1	06:35:00	11:35:00	KFLO	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70	7178	6231.2	09:50:00	14:50:00	KCUB	
Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
300	15	20	25,000	Clear	5	2	3001
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				
Settings							
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)		
0.7	2	40	49	277	100		
					Verify S-Turns Before Mission	Yes	

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
40	270	12:02:00	12:32:00	00:30:00	17	1.2	QL2-SW
41	90	12:35:00	12:58:00	00:23:00	17	1.2	QL2-SW
42	270	13:02:00	13:32:00	00:30:00	17	1.2	QL2-SW
43	90	13:34:00	13:56:00	00:22:00	19	1.1	QL2-SW
44	270	13:59:00	14:28:00	00:29:00	17	1.4	QL2-SW

Page 1	Verify S-Turns After Mission	Yes
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**Additional Comments**  
Project # 2551-017  
Leica Mission # 20200126-113605  
QL2 SW



# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day026_7178_B	01/26/2020	026	B	

Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Blake	Cessna 206	N85PE	6231.2	10:15:00	15:15:00	KCUB	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Pautsch	Leica ALS70	7178	6234.5	13:35:00	18:35:00	KFLO	

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
314	20	20	25,000	Clear	7	1	3009
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130	6,500	6,647	147				

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

	<b>Verify S-Turns Before Mission</b>	<input checked="" type="checkbox"/> Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
45	90	15:41:00	16:03:00	00:22:00	18	1.1	QL2-SW
46	270	16:06:00	16:33:00	00:27:00	16	1.2	QL2-SW
47	90	16:35:00	16:55:00	00:20:00	16	1.2	QL2-SW
48	270	16:58:00	17:24:00	00:26:00	17	1.3	QL2-SW
49	90	17:27:00	17:46:00	00:19:00	16	1.3	QL2-SW
UL001	30	18:00:00	18:24:00	00:24:00	16	1.5	Cross-Flight

Page 1	<b>Verify S-Turns After Mission</b>	<input checked="" type="checkbox"/> Yes
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**Additional Comments**  
 Project # 2551-017  
 QL2 SW  
 Leica Mission # 20200126-151644

# Woolpert Lidar Acquisition Log

Project Info				Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #	
80495	SC Savannah Pee Dee 2019 B19	Day026_7178_C	01/26/2020	026	C	

Crew		Equipment		Time			Airports
Pilot	Aircraft Make/Model	Aircraft Tail #	Hobbs Start	Local Start	UTC Start	Departing	
Brantley	Cessna 206	N85PE	6234.5	14:15:00	19:15:00	KFLO	
Operator	Sensor Make/Model	Sensor Serial #	Hobbs End	Local End	UTC End	Arriving	
Norvell	Leica ALS70	7178	6238.4	17:53:00	22:53:00	KHVS	

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
290	6	20	25,000	Clear	13	-1	2999
Air Speed (kts)		Altitude AGL (ft)		Altitude MSL (ft)		Airfield Elevation (ft)	
130		6,500		6,647		147	

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	49	277	100

<b>Verify S-Turns Before Mission</b>	Yes
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Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
1	270	19:48:00	20:00:00	00:12:00	18	1.4	QL2-NW
2	90	20:08:00	20:17:00	00:09:00	19	1.2	QL2-NW
3	270	20:21:00	20:33:00	00:12:00	19	1.1	QL2-NW
4	90	20:36:00	20:45:00	00:09:00	19	1.1	QL2-NW
5	270	20:49:00	21:02:00	00:13:00	19	1	QL2-NW
6	90	21:08:00	21:15:00	00:07:00	17	1.2	QL2-NW
7	270	21:18:00	21:31:00	00:13:00	17	1.2	QL2-NW
8	90	21:34:00	21:44:00	00:10:00	17	1.2	QL2-NW
9	270	21:47:00	22:00:00	00:13:00	18	1.2	QL2-NW
10	90	22:03:00	22:13:00	00:10:00	17	1.4	QL2-NW
11	270	22:16:00	22:30:00	00:14:00	18	1.2	QL2-NW
12	90	22:32:00	22:42:00	00:10:00	19	1.2	QL2-NW

<b>Page 1</b>	<b>Verify S-Turns After Mission</b>	Yes
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**Additional Comments**

Project # 2551-017  
 QL2 NW  
 Leica Mission # 20200126-190503

# Woolpert Lidar Acquisition Log

Project Info						Date		
Project #	Project Name			Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19			Day026_7178_D		01/26/2020	026	D
Crew		Equipment			Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #		Hobbs Start	Local Start	UTC Start	Departing
Brantley	Cessna 206		N85PE		6238.4	18:21:00	23:21:00	KHVS
Operator	Sensor Make/Model		Sensor Serial #		Hobbs End	Local End	UTC End	Arriving
Norvell	Leica ALS70		7178		6242.2	21:51:00	02:51:00	KFLO
Conditions								
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)	
0	0	10	11,000	Broken	7	2	2998	
Air Speed (kts)		Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
130		6,500	6,860	360				
Settings								
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)			
0.7	2	40	49	277	100			
								Verify S-Turns Before Mission
								Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
13	270	23:38:00	23:52:00	00:14:00	18	1.4	QL2-NW	
14	90	23:55:00	00:04:00	00:09:00	19	1.2	QL2-NW	
15	270	00:08:00	00:21:00	00:13:00	19	1.1	QL2-NW	
50	90	00:50:00	01:07:00	00:17:00	19	1	QL2-SW	
51	270	01:11:00	01:34:00	00:23:00	17	1.2	QL2-SW	
52	90	01:37:00	01:53:00	00:16:00	17	1.2	QL2-SW	
53	270	01:57:00	02:17:00	00:20:00	17	1.2	QL2-SW	
54	90	02:19:00	02:33:00	00:14:00	18	1.2	QL2-SW	
								Verify S-Turns After Mission
								Yes
Additional Comments								
Project # 2551-017 QL2 NW, SW Leica Mission # 20200126-231254								



























# Woolpert Lidar Acquisition Log

Project Info						Date		
Project #	Project Name			Unique ID		Flight Date (UTC)	Day of Year	Flight #
80495	SC Savannah Pee Dee 2019 B19			Day072_7178_A		03/12/2020	072	A
Crew		Equipment			Time			Airports
Pilot	Aircraft Make/Model		Aircraft Tail #		Hobbs Start	Local Start	UTC Start	Departing
Blake	Cessna 206		N85PE		6359.9	08:10:00	12:10:00	KFLO
Operator	Sensor Make/Model		Sensor Serial #		Hobbs End	Local End	UTC End	Arriving
Pautsch	Leica ALS70		7178		6363	11:15:00	15:15:00	KFLO
Conditions								
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)	
300	15	20	25,000	Clear	11	9	3001	
Air Speed (kts)		Altitude AGL (ft)		Altitude MSL (ft)		Airfield Elevation (ft)		
130		5,300		5,447		147		
Settings								
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)		Scan Frequency (Hz)		Pulse Rate (kHz)	Laser Power (%)	
0.35	8	40		49		277	100	
							Verify S-Turns Before Mission	Yes
Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments	
43	100	12:40:00	12:41:00	00:01:00	17	1.2	QL1-South	
42	280	12:44:00	12:45:00	00:01:00	17	1.2	QL1-South	
41	100	12:48:00	12:49:00	00:01:00	16	1.3	QL1-South	
40	280	12:52:00	12:54:00	00:02:00	16	1.3	QL1-South	
39	100	12:56:00	12:57:00	00:01:00	16	1.3	QL1-South	
38	280	13:01:00	13:03:00	00:02:00	16	1.3	QL1-South	
37	100	13:05:00	13:06:00	00:01:00	17	1.2	QL1-South	
36	280	13:10:00	13:12:00	00:02:00	16	1.1	QL1-South	
35	100	13:14:00	13:16:00	00:02:00	16	1.3	QL1-South	
34	280	13:19:00	13:20:00	00:01:00	16	1.4	QL1-South	
33	100	13:23:00	13:24:00	00:01:00	16	1.4	QL1-South	
32	280	13:27:00	13:30:00	00:03:00	16	1.2	QL1-South	
31	100	13:32:00	13:33:00	00:01:00	17	1.2	QL1-South	
30	280	13:36:00	13:38:00	00:02:00	17	1.3	QL1-South	
25	10	13:43:00	13:46:00	00:03:00	17	1.3	QL1-North	
24	190	13:49:00	13:52:00	00:03:00	17	1.1	QL1-North	
17	10	13:54:00	13:56:00	00:02:00	17	1.2	QL1-North	
6	190	13:58:00	13:59:00	00:01:00	17	1.2	QL1-North	
3	10	14:02:00	14:03:00	00:01:00	17	1.3	QL1-North	
2	190	14:05:00	14:06:00	00:01:00	17	1.1	QL1-North	
1	10	14:09:00	14:10:00	00:01:00	17	1.1	QL1-North	
12	90	14:18:00	14:38:00	00:20:00	18	1	QL2-SE	
13	270	14:41:00	15:03:00	00:22:00	18	1	QL2-SE	
Page 1						Verify S-Turns After Mission		Yes
Additional Comments								
Project # 2551-017 QL1 S, QL1 N, QL2 SE Leica Mission #: 20200312_121003								





