

**Door County
Wisconsin
LIDAR**

AeroScan LIDAR Project Door County, Wisconsin

EarthData International of Maryland requested LIDAR mapping of approximately 490 square miles covering Door County, Wisconsin. In response, the acquisition was flown between April 17th and April 19th, 2002 using EarthData's King Air, tail number N7031L. LIDAR data was captured using the AeroScan LIDAR system, including an inertial measuring unit (IMU) and a dual frequency GPS receiver.

GPS Data Collection

An additional GPS receiver was in constant operation over a National Geodetic Survey (NGS) control point designated "Sturgeon Bay GPS" (PID PM0591). Control station "Sturgeon Bay GPS" is located at the Door County Cherryland Airport and is the primary airport control station. This control point is A order horizontal control with a third order class I ellipsoidal height. The NGS data sheet for point "Sturgeon Bay GPS" is attached. During the data acquisition, the receivers collected phase data at an epoch rate of 1 Hz.

Station	NAD 83 (1995) / WGS84		Ellipsoid Hgt.
Sturgeon Bay GPS	N 44° 50' 10.53283"	W 087° 25' 34.87193"	183.33 m

Coordinate position of the GPS base station

GPS Data Processing

All GPS phase data was post processed with continuous kinematic survey techniques using "On the Fly" (OTF) integer ambiguity resolution. The GPS data was processed with forward and reverse processing algorithms. The results from each process were combined to yield a single fixed integer phase differential solution of the aircraft trajectory. Plots of altitude and the forward and reverse GPS solution residuals for each lift are attached. For the April 17th flight, variance of the forward to reverse solution difference in the survey area was less than +/- 10 cm in the horizontal and less than +/- 25 cm in the vertical components. Over the majority of the lift, the vertical residual was less than 15 cm. For the first lift on April 19th, the variance of the forward to reverse solution was less than +/- 10 cm in the horizontal and less than +/- 15 cm in the vertical components. Finally, for the second lift on April 19th, the variance of the forward to reverse solution was less than +/- 8 cm in the horizontal and less than +/- 11 cm in the vertical components.

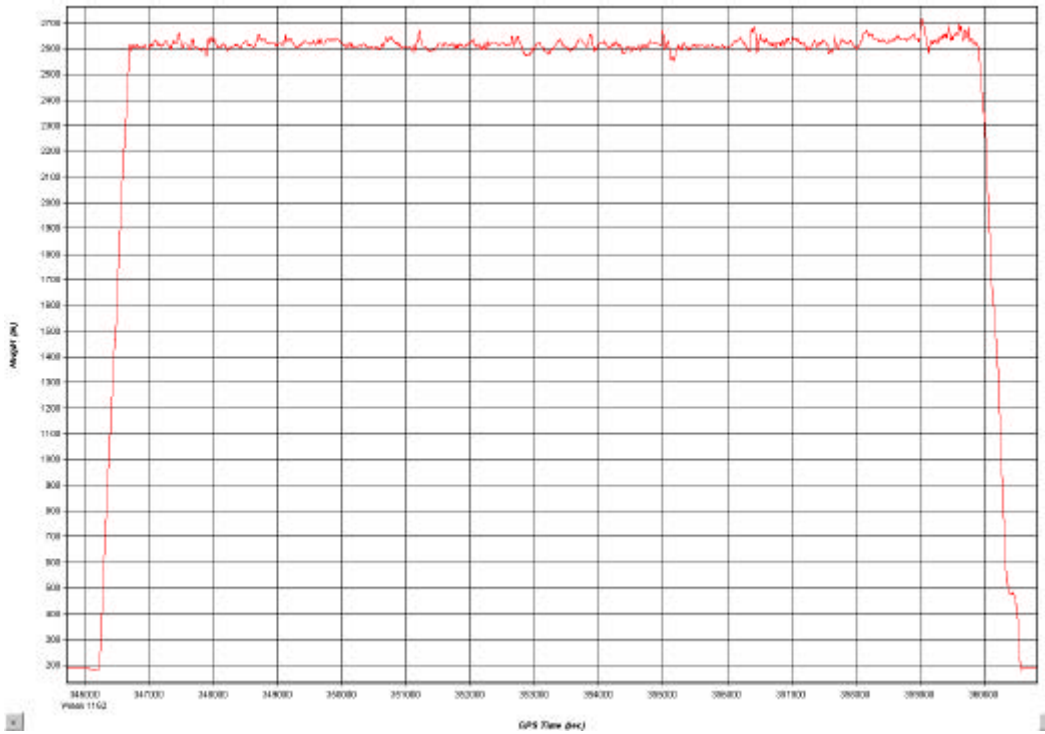
LIDAR Data Collection

The areas of interest were flown at one of two scenarios used during collection. The first scenario, which was used for the majority of the project, was flown at an altitude of 2438 meters (8000 feet) above mean terrain. The LIDAR specifications for this scenario follow:

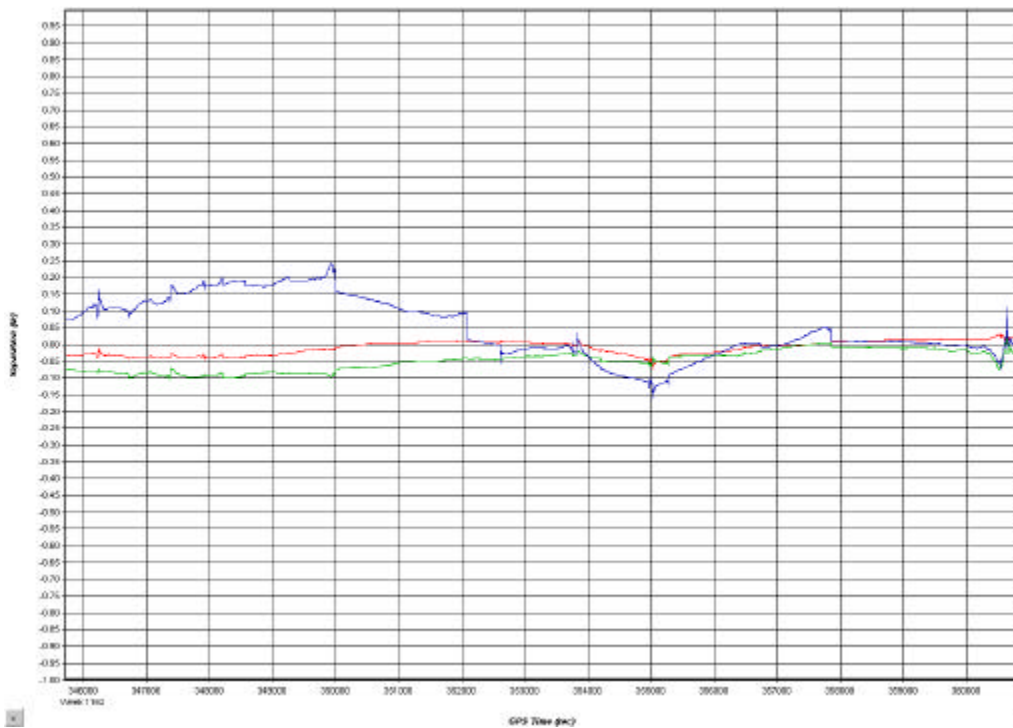
Flying Height	2438 m AMT
Airspeed	120 - 160 knots
Laser Pulse Rate	15 kHz
Field of View	50°
Scan Rate	11 Hz
Average Swath Width	2274 meters

The second scenario, which was used mainly for the small islands was flown at an altitude of 610 meters (2000 feet) above mean terrain. The LIDAR specifications for this scenario follow:

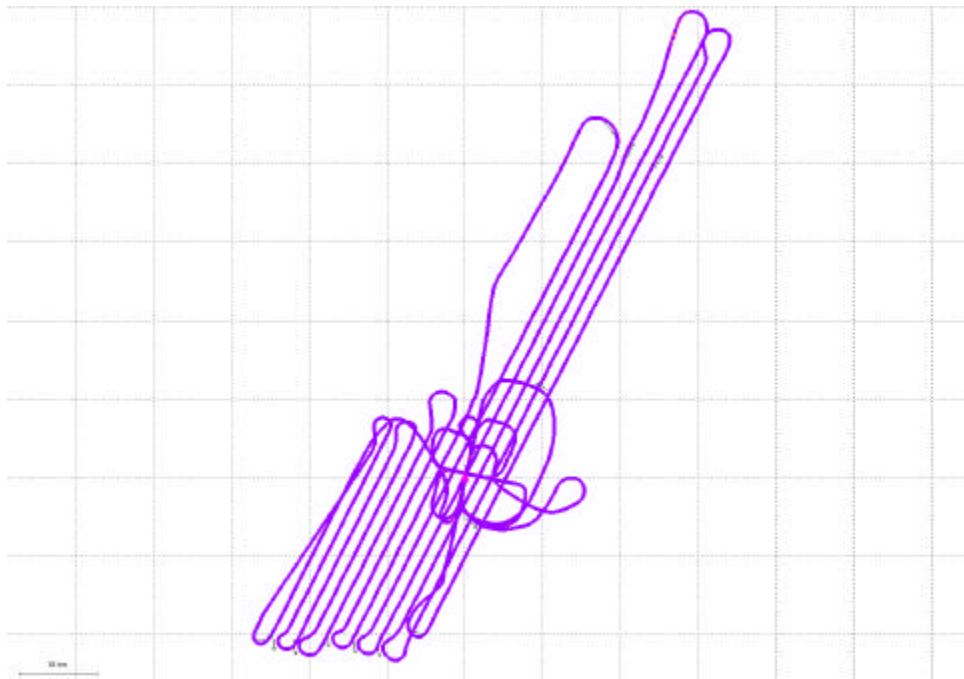
Flying Height	610 m AMT
Airspeed	115 – 145 knots
Laser Pulse Rate	15 kHz
Field of View	30°
Scan Rate	12 Hz
Average Swath Width	326 meters



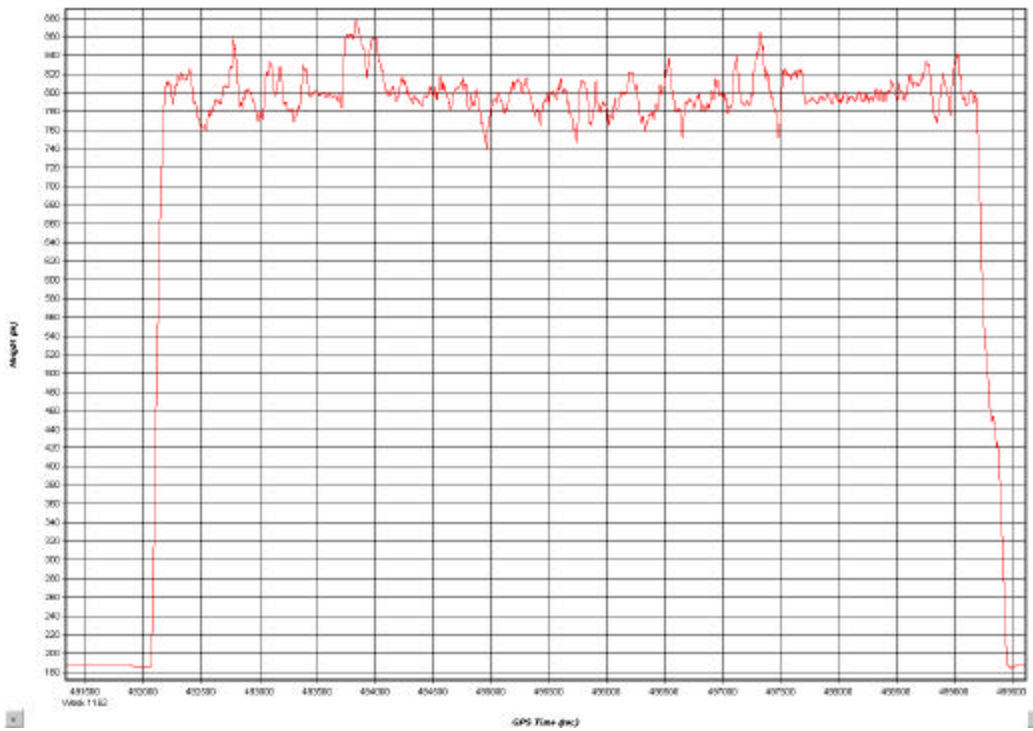
Altitude Plot - 17 April, 2002



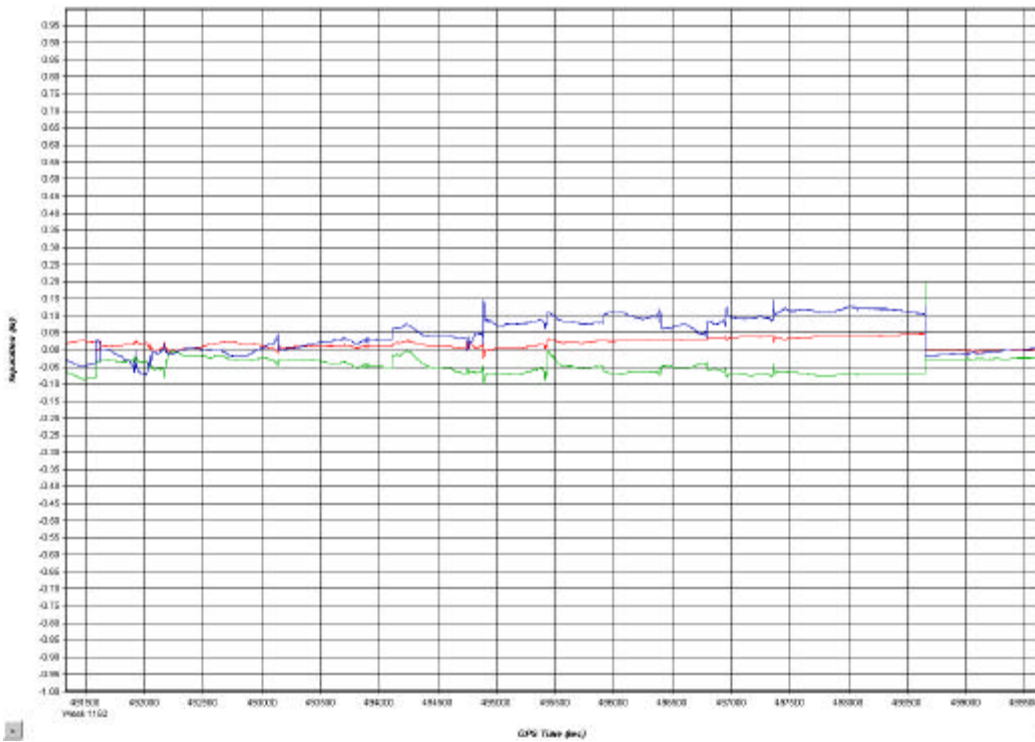
Forward-Reverse Solution Residuals- 17 April, 2002



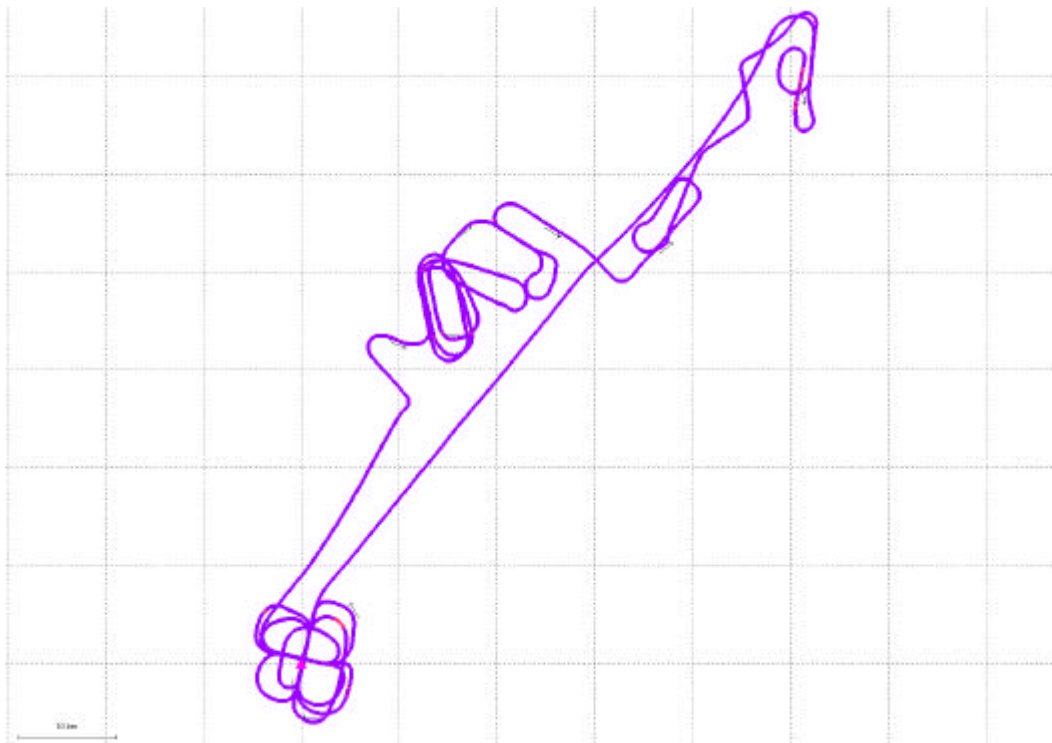
Aircraft Trajectory Plot – 17 April, 2002



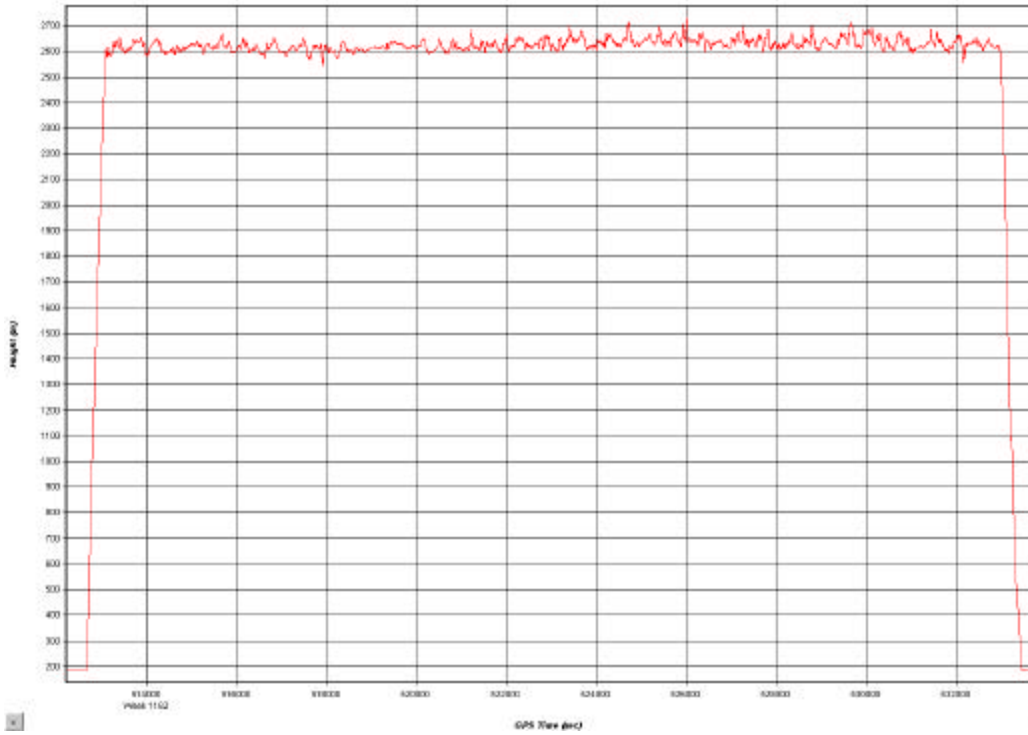
Altitude Plot – 19 April, 2002 Lift 1



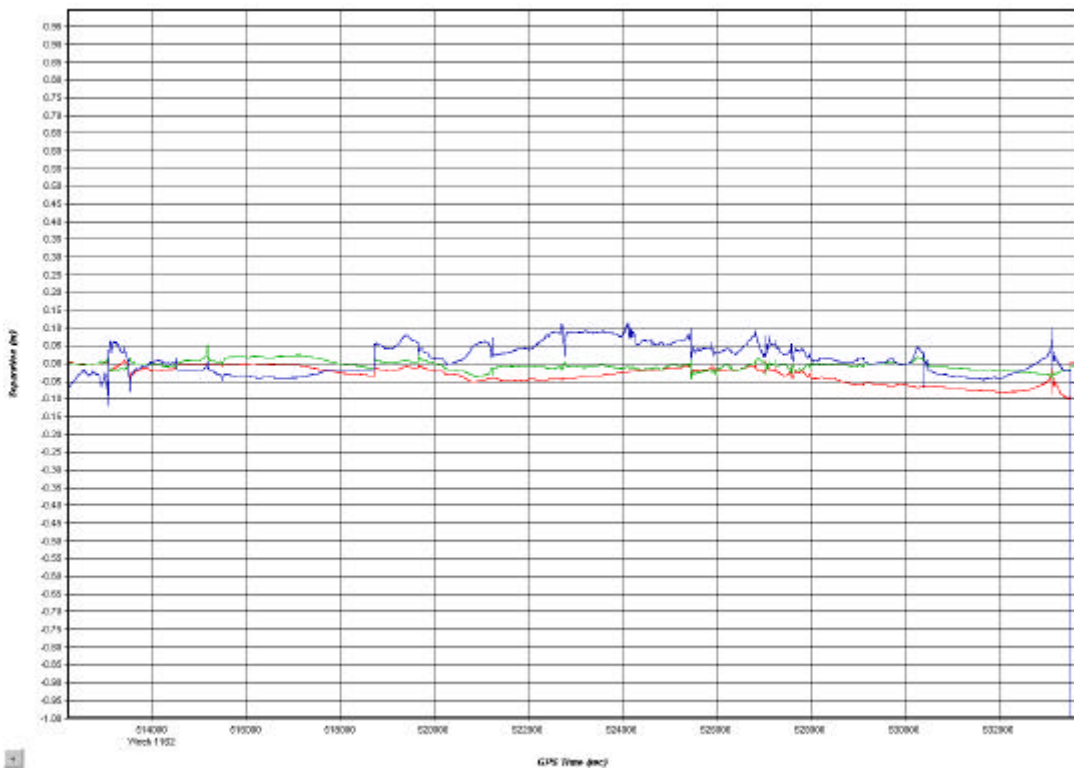
Forward-Reverse Solution Residuals- 19 April, 2002 Lift 1



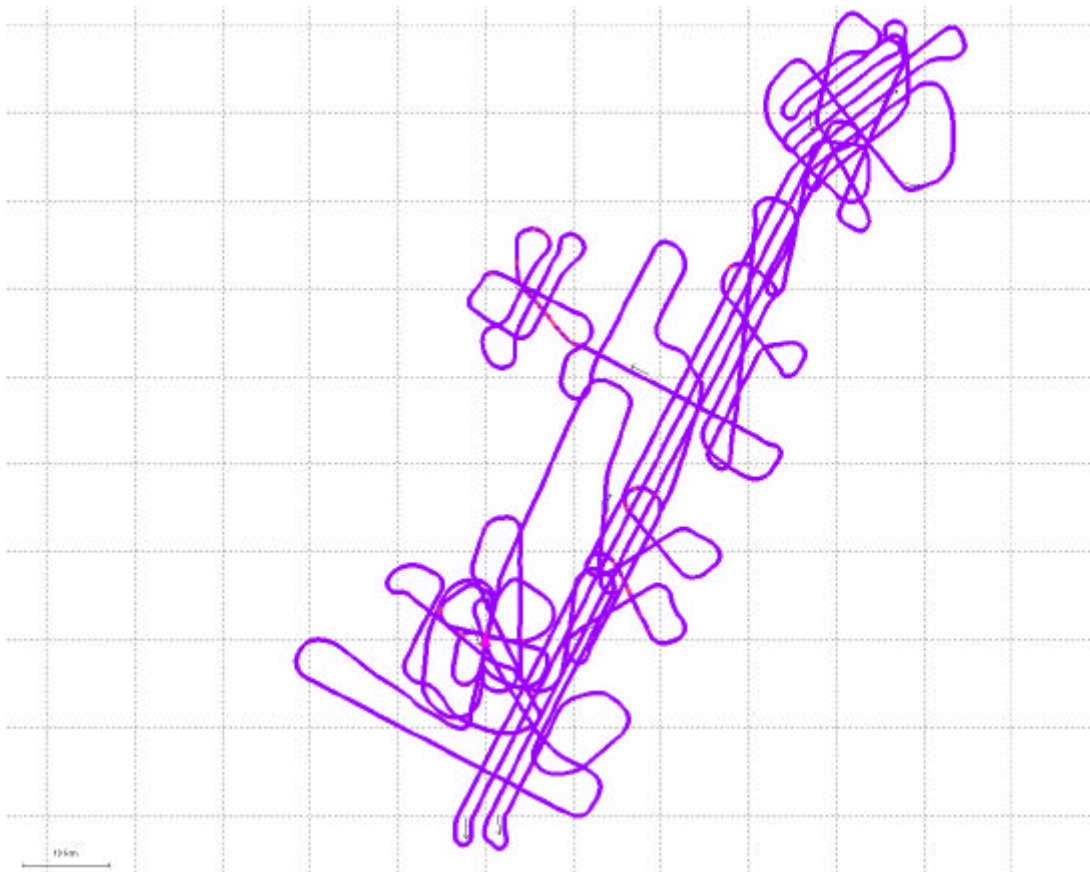
Aircraft Trajectory Plot – 19 April, 2002 Lift 1



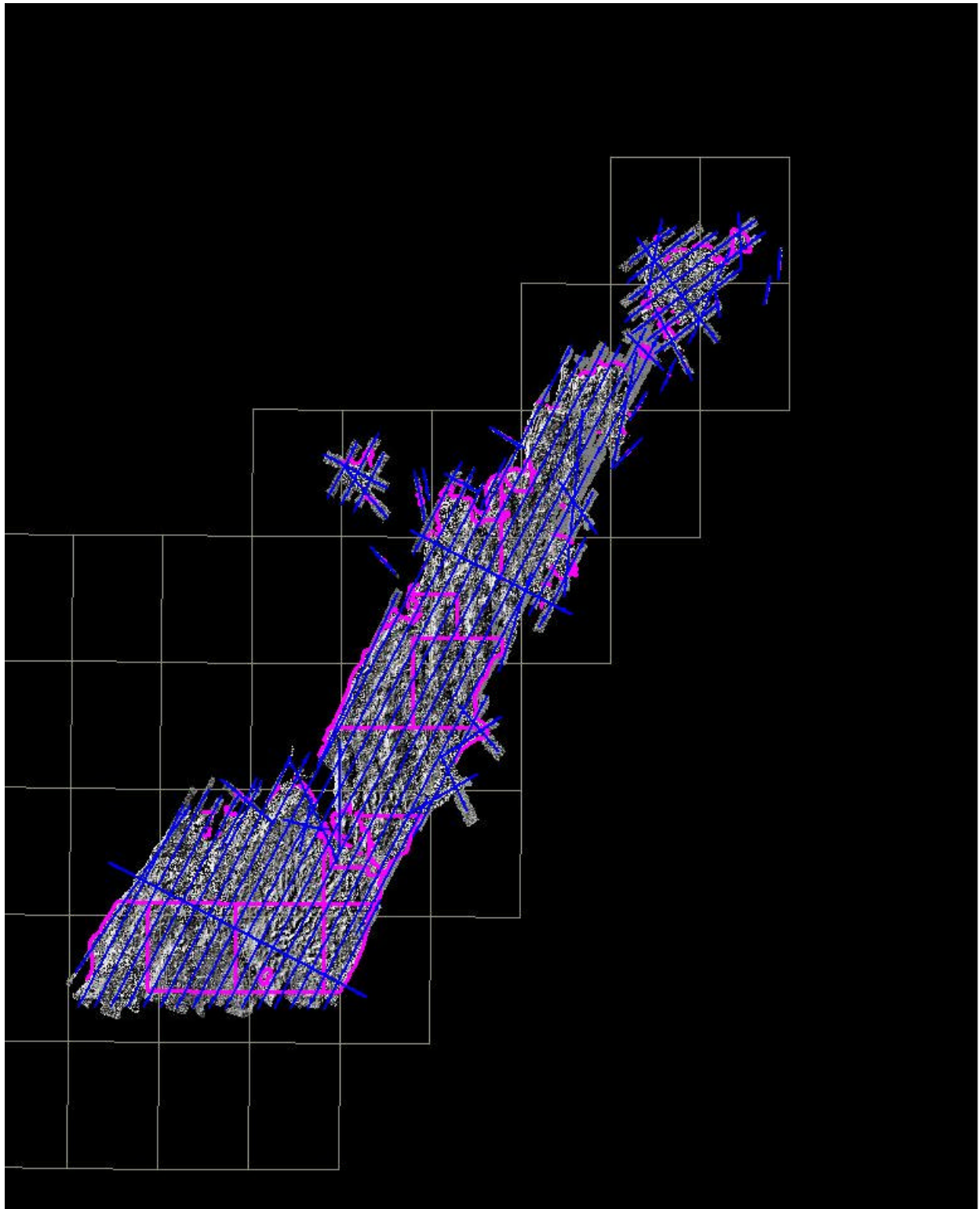
Altitude Plot – 19 April, 2002 Lift 2



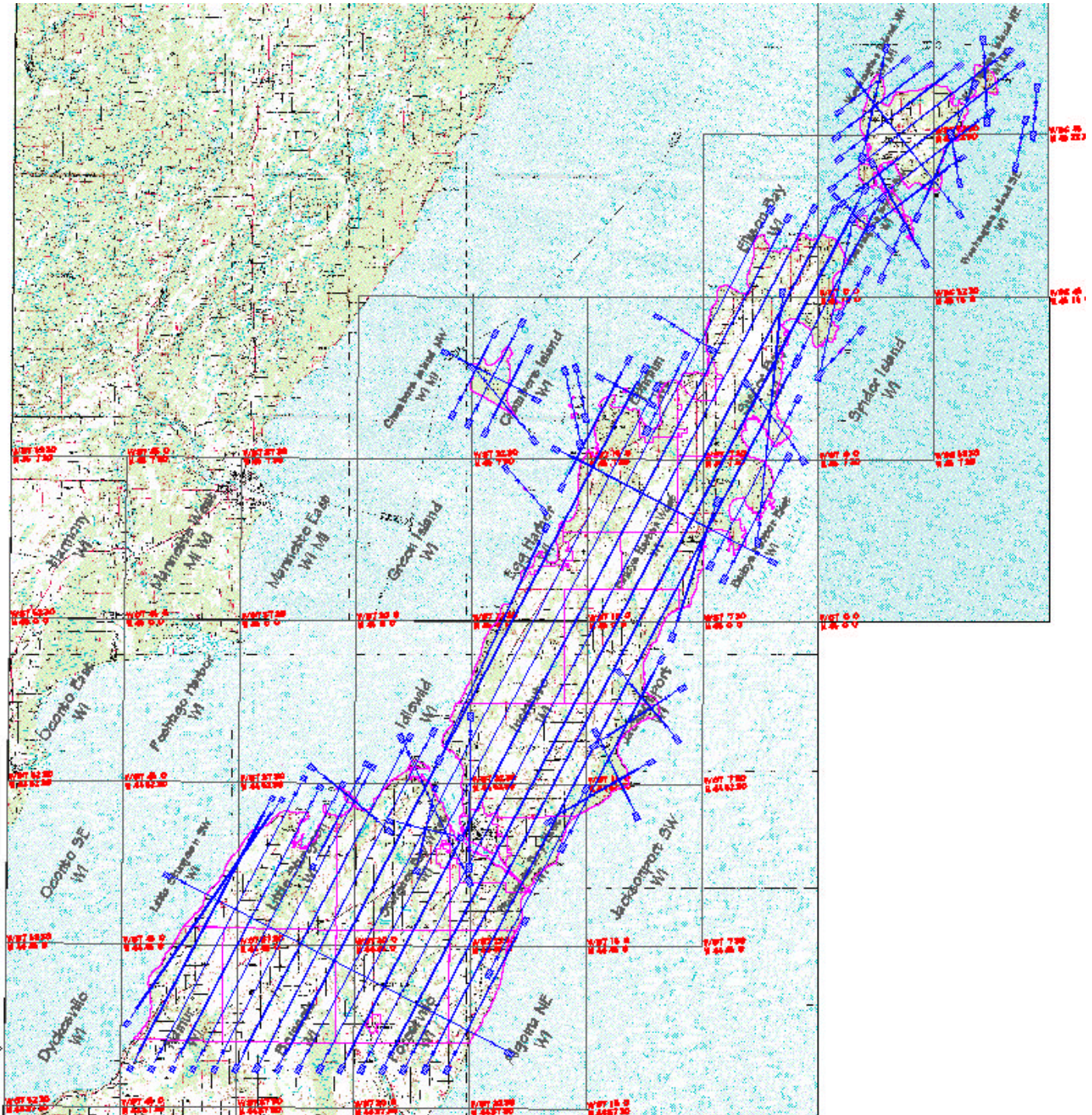
Forward-Reverse Solution Residuals- 19 April, 2002 Lift 2



Aircraft Trajectory Plot – 19 April, 2002 Lift 2



LIDAR Scan Coverage



LIDAR Flight Plan