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METADATA REPORT

Prepared for Regional Software Holdings Ltd

Northland LiDAR

Project	Northland LiDAR
Client	Regional Software Holdings Ltd
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Landpro Reference	23553
Date of metadata creation	5 September 2024

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1. Introduction

1.1 Background

Landpro Ltd was contracted by Regional Software Holdings Ltd to capture and supply LiDAR topographic data and co-captured, orthorectified imagery for the area of interest presented in Figure 1. The primary purpose for the contract was the topographic LiDAR survey to support resource quantification & recovery after extreme weather events (Cyclone Gabrielle).

The purpose of this report is to provide detailed information regarding the acquisition, processing, and delivery of the requested orthorectified imagery, LiDAR topographic survey and their associated deliverables as provided to Regional Software Holdings Ltd.

1.2 Survey Coverage

The Northland LiDAR project for Regional Software Holdings Ltd comprised of one area of interest, as shown in Figure 1 and covered a total area of 3476.4 km^2.

Figure 1. Area of interest surveyed as part of the Northland LiDAR project captured for Regional Software Holdings Ltd.

2. Data Acquisition

2.1 Data Capture

Imagery & LiDAR for this project was acquired on the following dates: 18/04/2024 – 28/06/2024 using the Leica Terrain Mapper system. The Leica Terrain Mapper includes the use of a 150 Hz LiDAR sensor, combined with a 80MP (RGBN) camera. The integrated system is fitted to a Leica PAV100 high performance, gyro-stabilised mount, for optimal capture.

A copy of the Leica Terrain Mapper calibration certificate can be made available upon request.

Figure 2: Leica Terrain Mapper showing the RCD30 camera head, and Terrain Mapper system respectively.

Sensor	Serial Number
Leica Terrain Mapper	6626
Leica PAV100 HP Mount	91014
Leica RCD30 80MP	82594

The supplied dataset includes the following items:

- LiDAR point cloud classified to ground, above ground, water vegetation, and building classes in LAZ format
- 1 m DEM in RASTER (GeoTiff) format
- 1 m DSM in RASTER (GeoTiff) format
- Canopy Height Model in RASTER (Geotiff) format
- All data has been supplied in NZTM NZGD2000 and NZVD16

2.2 Flight Planning

Careful consideration was given during flight planning to geographic location, terrain, topographical characteristics of the area, acquisition efficiency, final output resolution and meeting the requested orthophoto quality specifications. Table 1 provides a summary of the flight parameters during the capture of the Northland LiDAR project.

Table 1: Summary of the flight planning parameters for the Northland LiDAR project.

	Summary
No. of flight lines	117
Total length of flight lines (km)	4294.3
Sidelap (%)	35

2.3 Environmental capture requirements

All LiDAR was captured without the presence of cloud within the specified areas of interest.

2.4 Ground Control

Ground control was carried out by Landpro a month before the capture date..

2.5 Safety

No safety incidents were reported during the completion of this project.

3. Data Processing

3.1 GNSS Processing

Projection: NZTM NZGD2000

Vertical Datum: NZVD16

Reference Station: GSDR, GSMH & WHNG

GSDR: Mark details

MARK IDENTIFICATION

Code: **GSDR**
Name: **Dargaville Jervois**
Alternatives:

Country: **New Zealand**
Land District: **North Auckland**
Topo50 sheet: **AX28**
NZTM: **6022965.131 1679503.201**
Scale factor: **0.9996779**
Convergence: **+0° 31' 02"**

NZGD 2000 COORDINATES

Latitude: **35° 56' 03.95345" S**
Longitude: **173° 52' 52.96113" E**
Ellipsoidal height (m): **49.082**
Order: **3**
Authorised: **21-Dec-2018**
Reference: **CORS Update (Constrained to PositioNZ stations DefMod v20180701 ITRF2008@2018-01-01)**
Previous coordinates

Circuit	Northing (m)	Easting (m)	Scale Factor	Convergence	
Mount Eden Circuit 2000	**904525.043**	**320345.666**	**0.9999782**	**-0° 31' 05"**	Previous coordinates

ORTHOMETRIC HEIGHTS

Height datum	Height (m)	Order	Calculation Date	Reference
New Zealand Vertical Datum 2016	**12.884**	**2V**	**25-Feb-2020**	**2020CORS NZVD2016 Point Load**

MARK DETAILS

Last maintained: **08-May-2023**
Maintenance level:
Mark condition: **Reliably Placed**
Description: **N/A**
Mark type: **Forced Centering**
Beacon type: **Unknown**
Protection type: **Not specified**

GSMH: Mark details

MARK IDENTIFICATION

Code: **GSMH**
Name: **Mangawhai Molesworth**
Alternatives:

Country: **New Zealand**
Land District: **North Auckland**
Topo50 sheet: **AY31**
NZTM: **6003920.939 1742748.013**
Scale factor: **0.9998511**
Convergence: **+0° 56' 04"**

NZGD 2000 COORDINATES

Latitude: **36° 05' 55.94327" S**
Longitude: **174° 35' 08.74510" E**
Ellipsoidal height (m): **81.846**
Order: **3**
Authorised: **21-Dec-2018**
Reference: **CORS Update (Constrained to PositioNZ stations DefMod v20180701 ITRF2008@2018-01-01)**
Previous coordinates

Circuit	Northing (m)	Easting (m)	Scale Factor	Convergence	
Mount Eden Circuit 2000	**886625.941**	**383936.126**	**0.9999032**	**-0° 06' 18"**	Previous coordinates

ORTHOMETRIC HEIGHTS

Height datum	Height (m)	Order	Calculation Date	Reference
New Zealand Vertical Datum 2016	**44.901**	**2V**	**25-Feb-2020**	**2020CORS NZVD2016 Point Load**

MARK DETAILS

Last maintained: **18-Mar-2021**
Maintenance level:
Mark condition: **Reliably Placed**
Description: **N/A**
Mark type: **Forced Centering**
Beacon type: **Unknown**
Protection type: **Not specified**

WHNG: Mark details

MARK IDENTIFICATION

Code: **WHNG**
Name: **Whangarei**
Alternatives: **50218M001**

Country: **New Zealand**
Land District: **North Auckland**
Topo50 sheet: **AX30**
NZTM: **6037018.591 1718774.884**
Scale factor: **0.9997738**
Convergence: **+0° 46' 09"**

NZGD 2000 COORDINATES

Latitude: **35° 48' 13.57790" S**
Longitude: **174° 18' 52.43924" E**
Ellipsoidal height (m): **172.781**
Order: **0**
Authorised: **20-May-2024**
Reference: **2024.05.16 LINZ PositioNZ Update (DefMod v20180701 ITRF2020@2023-07-01)**
Previous coordinates

Circuit	Northing (m)	Easting (m)	Scale Factor	Convergence	
Mount Eden Circuit 2000	**919288.035**	**359366.130**	**0.9999203**	**-0° 15' 47"**	Previous coordinates

ORTHOMETRIC HEIGHTS

Height datum	Height (m)	Order	Calculation Date	Reference	
New Zealand Vertical Datum 2016	**134.9554**	**1V**	**20-May-2024**	**2024.05.16 LINZ PositioNZ Update (DefMod v20180701 ITRF2020@2023-07-01)**	Previous heights

MARK DETAILS

Last maintained: **14-Sep-2023**
Maintenance level:
Mark condition: **Reliably Placed**
Description: **Continuously operating GNSS station or CORS site. Mark is unable to be physically occupied. Horizontal reference point is the centre of 5/8ö thread. The vertical reference is the plate at top of pillar. 0.055m spacer is between GNSS antenna reference point (ARP) and vertical reference plate (antenna height). For more information see http://www.linz.govt.nz/positionz**
Mark type: **Forced Centering**
Beacon type: **Pillar**
Protection type: **Post & rail enclosure**

3.2 LiDAR Point Processing

Data processing has been in accordance with our standard policies and procedures surrounding acceptable tolerances, therefore ensuring optimal accuracy of deliverables.

GNSS/IMU data was processed using the GSDR, GSMH & WHNG Base Stations and precise ephemeris data.

The GNSS and IMU were processed in a tightly coupled loop to give an optimum trajectory. This data was then applied to the LiDAR and image exterior orientations prior to LAS and ortho creation.

Image data was processed using Leica HxMap and any radiometric adjustment applied as required. LiDAR data was generated via Leica HxMap.

3.3 LiDAR Calibration

Overlapping LiDAR points from adjacent aircraft trajectories were used to check the LiDAR calibration for heading, roll, pitch and scale.

These values were then used to make small flight-specific adjustments to the LiDAR data.

3.4 LiDAR Point Editing

A "1st run" automatic classification was carried out on the raw LiDAR points using *TerraSolid's TerraScan* software to separate the LiDAR points into ground hits and non-ground hits. This results in a greater than 90% correct classification. A manual classification was then used to edit points where gross classification errors occurred in the automatic classification process.

The DEM for the area of interest is presented in Figure 3.

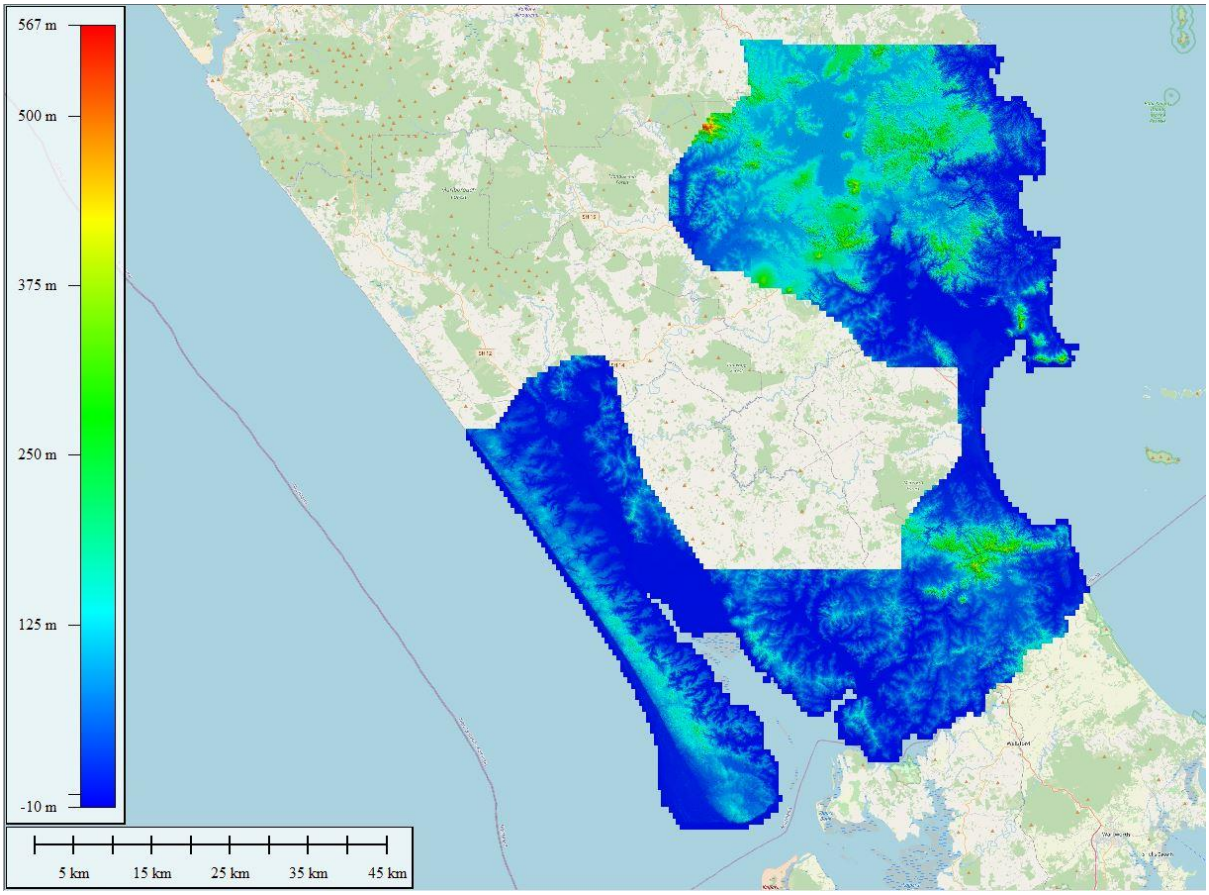

Figure 3: DEM for the Northland LiDAR area of interest.

3.5 Vertical LiDAR Accuracy

Average dz	-0.005
Minimum dz	-0.197
Maximum dz	0.133
Average magnitude	0.034
Root mean square	0.044
Std deviation	0.043

3.6 Horizontal Accuracy

The positional accuracy of the LiDAR data was checked by plotting Landpro Ltd. check points and displaying the LiDAR by intensity. The LiDAR was found to be in position.