



**LANDPRO**

Make the most of your land

**2020/21 High Density LiDAR**

**Environment Canterbury**

**Metadata Report**

Prepared For:  
**Environment Canterbury**  
200 Tuam Street  
Christchurch  
8011



Prepared By:  
**Landpro Ltd**  
13 Pinot Noir Drive  
Cromwell  
Central Otago  
9310

Tel +64 3 445 9905

20 April 22

© Landpro Ltd 2022

The information contained in this document produced by Landpro Ltd is solely for the use of the Client identified on the cover sheet for the purpose for which it has been prepared and Landpro Ltd takes no duty to or accepts any responsibility to any third party who may rely upon this document. All rights reserved. No parts or sections of this document may be removed from this document, reproduced, electronically stored or transmitted in any form without the written permission of Landpro Ltd.

# **CONTENTS**

1.	Introduction .....	1
1.1	The Client .....	1
1.2	Purpose of Documentation.....	1
2.	Summary .....	2
2.1	Project.....	2
2.2	Data .....	2
3.	Project report .....	3
3.1	Safety .....	3
3.2	Acquisition .....	3
3.3	Ground Control .....	3
3.4	Data Processing .....	3
3.5	Data Presentation .....	3
3.6	Project Contacts.....	3
4.	Data Acquisition.....	4
4.1	Leica ALS60 Laser Scanner .....	5
4.2	Survey Specifications.....	5
4.3	Ground Control .....	6
5.	Data Processing.....	7
5.1	Map Projection and Datum .....	7
5.2	Classification .....	8
6.	Accuracy.....	9
6.1	Project Design.....	9
6.2	Validation .....	9
7.	Product deliverables.....	10
8.	File names .....	11
9.	License/Copyright.....	12

**TABLES**

*Table 1: Instrument specification*..... 5  
*Table 2: Survey specifications for Christchurch CBD*..... 5  
*Table 3: Survey specifications for the wider Christchurch area* ..... 5  
*Table 4: Survey specifications for Port Hills and Lyttleton Harbour*..... 6  
*Table 5: Map projection and datum* ..... 7  
*Table 6: LiDAR classification* ..... 8  
*Table 7: Accuracy specifications*..... 9  
*Table 8: Validation* ..... 9  
*Table 9: Product deliverables* ..... 10  
*Table 10: Data naming convention* ..... 11

**FIGURES**

*Figure 1: Map of Christchurch AOI and tile layout* ..... 4  
*Figure 2: Leica ALS60 Laser scanner* ..... 5

## **1. INTRODUCTION**

### **1.1 The Client**

Client Address: Environment Canterbury  
200 Tuam Street  
Christchurch  
8011

Address for Service: c/- Landpro Limited  
13 Pinot Noir Drive  
Cromwell  
Otago  
9310

### **1.2 Purpose of Documentation**

The purpose of this Metadata Report is to provide detailed information regarding the acquisition, processing, and delivery of high-density LiDAR data products collected, processed and delivered for the client during the 2020/21 capture season.

## **2. SUMMARY**

### **2.1 Project**

A high-density aerial survey was conducted over the greater Christchurch area, covering approximately 523 km<sup>2</sup>.

### **2.2 Data**

The data deliverables include the following:

- Classified point cloud
- 1m DEM
- 1m DSM
- Tile layout
- Breaklines
- Flightline Shapefiles
- QA Reports
- Metadata report

### **3. PROJECT REPORT**

#### **3.1 Safety**

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

#### **3.2 Acquisition**

Airborne Laser Scanner (ALS) data was acquired from a fixed wing aircraft on 18/19/28 December 2020, 13/22/23/24/25/26 January 2021 and 17 February 2021.

#### **3.3 Ground Control**

GPS base station data was provided by Global Survey's CORS operating in Christchurch. Ground check points were surveyed by Landpro Ltd for assessing the accuracy of the ALS data.

#### **3.4 Data Processing**

Reduction of the ALS data proceeded without any problems. Laser strikes were classified into ground and non-ground points using algorithms to ensure continuity.

#### **3.5 Data Presentation**

The data provided on this volume has been supplied in accordance with a specification agreed with by Environment Canterbury.

#### **3.6 Project Contacts**

ECAN Geospatial Team Lead: Iain Campion (Ph. (03) 367 7175)

Landpro Ltd Project Lead: Andy Burrell (Ph. (03) 445 9905)





#### 4.1 Leica ALS60 Laser Scanner

The high-density LiDAR was captured using the Leica ALS60 Laser scanner.



**Figure 2: Leica ALS60 Laser scanner.**

<b>Manufacturer</b>	Leica
<b>ALS60 Laser Scanner Serial No.</b>	6129

**Table 1: Instrument specification.**

#### 4.2 Survey Specifications

Christchurch CBD

<b>Flying Height</b>	785m
<b>Scan Angle</b>	13 degrees
<b>Pulse Rate</b>	118kHz
<b>Points Per m<sup>2</sup></b>	16 pts/m <sup>2</sup>
<b>Sidelap</b>	55%

**Table 2: Survey specifications for Christchurch CBD.**

Wider Christchurch

<b>Flying Height</b>	1400m
<b>Scan Angle</b>	16 degrees
<b>Pulse Rate</b>	158kHz
<b>Points Per m<sup>2</sup></b>	12pts/m <sup>2</sup>
<b>Sidelap</b>	55%

**Table 3: Survey specifications for the wider Christchurch area.**

## Port Hills and Lyttleton Harbour

<b>Flying Height</b>	1940m
<b>Scan Angle</b>	11 degrees
<b>Pulse Rate</b>	123kHz
<b>Points Per m<sup>2</sup></b>	8 pts/m <sup>2</sup>
<b>Sidelap</b>	55%

***Table 4: Survey specifications for Port Hills and Lyttleton Harbour.***

### **4.3 Ground Control**

Ground control was completed using existing benchmarks and survey data collected by Landpro Ltd, this was used in the vertical accuracy of the processed ground dataset.

## 5. DATA PROCESSING

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

GNSS/IMU data is processed utilising GSCC Base Station and precise ephemeris data. The GNSS and IMU are processed in Novatel Inertial Explorer to give an optimum trajectory.

This data is then applied to the LiDAR for LAS 1.4 creation in Leica Cloudpro. The geoidal adjustments are applied in Cloudpro, the data is now in NZTM with NZVD 2016 Heights.

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.

Height accuracy of the ground classified LiDAR points was checked using check site data (non-vegetated check sites) collected by Landpro Ltd. This was done by performing an Output Control Report (OCR) in TerraSolid's TerraScan, which calculates height differences statistics between a TIN of the LiDAR ground points and the check points. The standard deviation statistic is 0.03, RMS is 0.03, CI95 is 0.05m and the average difference is 0.000.

The positional accuracy of the LiDAR was checked by overlaying Landpro Ltd surveyed data over the LiDAR data displayed by intensity. The data fits into position.

The TerraSolid suite was used for the automated method of macro based bare-earth filtering. Multiple iterations of automated filtering were utilized to address the ever-changing terrain while retaining a homogenous surface. After automated filtering, manual editing was completed using TerraScan and TerraModeler in MicroStation. Editing was performed to ensure that 100% of the identified bare-earth surface was visually inspected for errors, completeness, and accuracy. Bridge decks were also classified. Points floating above or positioned below the bare earth surface were designated as low noise and high noise.

The Digital Elevation Model (DEM) was created using point to TIN and TIN to raster process, using Natural Neighbour interpolation. Hydro flattening was performed as stipulated in the LINZ Specification Version 1.1 – June 2018.

### 5.1 Map Projection and Datum

<b>Projection</b>	NZTM/NZGD2000
<b>Datum</b>	NZVD2016

**Table 5: Map projection and datum.**

## 5.2 Classification

Number	Point Class
Withheld 1	Unclassified
2	Ground
3	Low Vegetation
4	Med Vegetation
5	High Vegetation
6	Building
7	Low Noise
9	Water
17	Bridge
18	High noise

**Table 6: LiDAR classification.**

## 6. ACCURACY

### 6.1 Project Design

The project has been designed to achieve the respective accuracies in accordance with LINZ Specification Version 1.1 – June 2018.

<b>Vertical Accuracy (95%)</b>	≤20cm
<b>Horizontal Accuracy (95%)</b>	≤100cm
<b>Pulse Density</b>	≥8pts/m <sup>2</sup>

**Table 7: Accuracy specifications.**

### 6.2 Validation

Height accuracy of the classified LiDAR was checked using open land-cover survey check sites. This was done by comparing the test points against the elevations from the classified LiDAR dataset.

<b>Mean Difference (m)</b>	<b>Std Deviation (m)</b>	<b>RMS (m)</b>	<b>CI95</b>
<b>0.00</b>	0.03	0.03	0.058

**Table 8: Validation.**

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

Data classification has been manually checked and edited against any available imagery.

## 7. PRODUCT DELIVERABLES

The following data was delivered in NZTM/NZGD2000 projection and NZVD2016 vertical datum:

<b>AOI</b>	Extent of the project area in SHP format
<b>Classified Point Cloud</b>	Classified LiDAR point cloud in ASPRS LAS 1.4 format
<b>DEM</b>	1m Digital Elevation Model in TIF format
<b>DSM</b>	1m Digital Surface Model in TIF format
<b>Breaklines</b>	Breaklines for all hydro-flattened features in SHP format
<b>Flightline Shapefile</b>	Flightlines as ESRI polyline in SHP format
<b>Tile Layout</b>	Tiles for the project area in SHP format
<b>Metadata Report</b>	Report in PDF format

**Table 9: Product deliverables.**

All digital data has been uploaded onto Environment Canterbury's FTP on 20 April 2022.

## 8. FILE NAMES

Data has been provided in LINZTopo50 subtiles based on NZTM2000 coordinates. Tile size 1:1000 sheet layout (480 x 720m).

<b>Product</b>	<b>Identifier</b>	<b>Extension</b>
<b>Classified LiDAR Tiles</b>	CL2_	*.las
<b>DSM Tiles</b>	DSM_	*.tif
<b>DEM Tiles</b>	DEM_	*.tif

***Table 10: Data naming convention.***

## **9. LICENSE/COPYRIGHT**

The Council and its partners intent to release this imagery, LiDAR and all derived products under 'Creative Commons Attribution 4.0 International' as per the New Zealand Government Open Access and Licensing (NZGOAL) framework New Zealand, licensing must allow the Council and its partners the ability to do this.

<https://creativecommons.org/licenses/by/4.0/>