OTAGO REGIONAL COUNCIL

PGF-LIDAR OTAGO REGION SURVEY

VOLUME: PRJ38924_02

PROJECT SUMMARY

This project is for provision of Airborne LiDAR survey over 8,191 km^2 of the Otago Region.

This volume contains data over the Catlins area – 565 km^2. Captured between the 27th June – 23rd September 2021.

Specific estuary areas were flown within 1 hour of low tide: Catlins Estuary was flown on 27 June 2021, and Tautuku Estuary was flown on 12th August 2021. The remaining coastline was capture within 2 hours of low tide.

The survey was planned to achieve ≤ 20cm vertical accuracy (95% CI), ≤ 100cm horizontal accuracy (95% CI) with an emitted pulse density of 4ppsm, and ground classification to ICSM level 2.

Background image from Google Earth

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DATA SUMMARY

This volume includes the following data in NZTM2000 projection and NZVD2016 vertical datum:

- Classified Point Cloud data in LAS v1.4 and ASCII XYZi formats
- Ground Classified Point Cloud data in LAS v1.4 format
- DEM Grids, 1m cell size in GeoTIFF and ASCII XYZ formats
- DSM Grids, 1m cell size in GeoTIFF and ASCII XYZ formats
- Contours, 0.5m interval in ESRI Shapefile format
- Intensity images, 1m cell size in GeoTiff format
- Hydro-flattening Breaklines in ESRI Shapefile format
- Flight lines in ESRI Shapefile format
- Tile layout, 1:1000 NZTopo50 in Shapefile format
- Extent file, describing the delivered data in Shapefile format
- File listing in text file format
- Metadata file: This document in PDF format

This data has been supplied in accordance with the specifications agreed with Otago Regional Council and the *LINZ PGF Version: New Zealand National Aerial LiDAR Base Specification – January 2020*. Users requiring other formats and projections please contact AAM NZ Ltd.

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CONTENTS

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1. DATA INFORMATION

Data supply: AAM AWS S3 (Links via e-mail)
Number of files: 14 zip files, 1 file list, 1 metadata report
Data formatted on: 23.12.2021
README Document: This file

File Details of this Delivery	Contents
PRJ38924NOB02_1-1-1 to 1-1-6.zip	Classified Point Cloud in LAS format
PRJ38924NOB02_1-2-1 to 2-3.zip	Classified Point Cloud in ASCII_XYZi format
PRJ38924NOB02_1-3.zip	Ground Points in LAS format
PRJ38924NOB02_2.zip	DEM and DSM file in GeoTiff and ASCII_XYZ
PRJ38924NOB02_3.zip	Contours in ESRI Shapefile format
PRJ38924NOB02_4.zip	Intensity Images in GeoTiff format
PRJ38924NOB02_5.zip	Ancillary files in ESRI shapefile format – Tile Layout, Trajectories, Extent, etc
Readme_PRJ38924_02.pdf	Metadata Report
PRJ38924_02_File_List.txt	Listing of product files delivered in this volume

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2. METADATA

Source Data	Source	Description	Ref No	Date
LiDAR	AAM	Optech Galaxy+ 473	FL015383	27.06.21
		Optech Galaxy+ 473	FL015601	12.08.21
		Optech Galaxy+ 473	Fl015834	23.09.21
Trajectory	AAM	RTX	FL015383	27.06.21
		RTX	FL015601	12.08.21
		RTX	Fl015834	23.09.21
Field Survey	WSP NZ Ltd	RTK	6-XZ685	05.10.21

LiDAR Characteristics	Description
Format	LAS 1.4 & ASCII xyzi
Emitted Density	4 ppm2
Tile size	480m x 720m (NZTopo50 1:1000 tiles)
ICSM Classification	Level 2. Ground surface improvement

Number	Point Class	Description	ICSM	CI %
1	Default	Unclassified	1	95
2	Ground	Bare ground	2	98
3	Low vegetation	< 2 m	1	95
4	Medium vegetation	2-8 m	1	95
5	High vegetation	> 8 m	1	95
6	Buildings, structures	Buildings, houses, silos etc.	1	95
7	Low Noise	Spurious low point returns (unusable)	1	95
9	Water	Any point in water	2	98
17	Bridge	Any bridge or overpass	2	98
18	High Noise	Spurious high point returns (unusable)	1	95

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Reference Systems	Horizontal	Vertical
Datum	NZGD2000	NZVD2016
Projection	NZTM2000	N/A
Geoid Model	N/A	NZGeoid2016

Accuracy Specification	Measured Point	Derived Point	Basis of Estimation
Field Survey	5 cm		Survey methodology used
LiDAR (Horizontal)	< 100 cm		Project design
LiDAR (Vertical)	< 20 cm		Project design

Project specifications and technical processes were designed to achieve data accuracies as above.

Notes On Expected Accuracy

- Values shown represent 95% confidence level (2 sigma), in centimetres.
- "Derived points" are those interpolated from a terrain model.
- "Measured points" are those observed directly.
- Accuracy estimates for terrain modeling by LiDAR refer to the terrain definition on clear ground.
- Laser strikes have been classified into "ground" and "non-ground", based upon algorithms tailored for major terrain/vegetation combinations existing in the project area. The definition of the ground may be less accurate in isolated pockets of dissimilar terrain/vegetation combinations.

Limitations of Data

- The definition of the ground under trees may be less accurate.

Data Validation – LiDAR Data

- Vertical Accuracy Validation - Ground data in this volume has been compared to 190 test points obtained by field survey and assumed to be error-free. The test points were distributed in 6 sites across the mapping area and located on clear ground. Comparison of the test points with elevations interpolated from measured data resulted in:

  Mean difference: 0.005 m
  St. Deviation: 0.041 m
  Standard Error (RMS): 0.042 m or 0.081 m (95% CI)

  This mean elevation difference has been removed from the data supplied in this volume

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- Horizontal Accuracy – the LiDAR point cloud was compared to survey data and found to fit well in position. Expected accuracy is well within the specified range.
- Data classification has been manually checked and edited against available imagery.

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3. CONDITIONS OF SUPPLY

The data in this volume has been commissioned by **OTAGO REGIONAL COUNCIL**.

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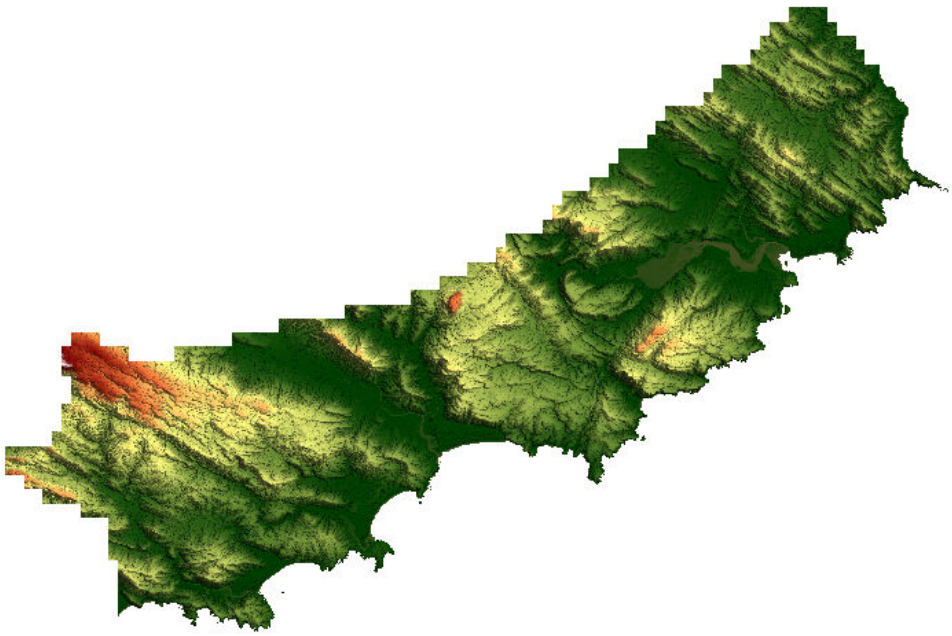
4. VALIDATION

Volume Extent

Colour Elevation Image



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OTAGO REGIONAL COUNCIL

PGF-LIDAR OTAGO REGION SURVEY

VOLUME: PRJ38924_03

PROJECT SUMMARY

This project is for provision of Airborne LiDAR survey over 8,191 km^2 of the Otago Region.

This volume contains data over the Milton area – 1,609 km^2. Captured between the 27th June – 23rd September 2021.

Specific estuary areas were flown within 1 hour of low tide: Clutha Mouth, Tokomairiro Estuary, Akatore Estuary and Taieri Mouth Road Coastline were flown on 27 June 2021. The remaining coastline was capture within 2 hours of low tide.

The survey was planned to achieve ≤ 20cm vertical accuracy (95% CI), ≤ 100cm horizontal accuracy (95% CI) with an emitted pulse density of 4ppsm, and ground classification to ICSM level 2.

Background image from Google Earth

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DATA SUMMARY

This volume includes the following data in NZTM2000 projection and NZVD2016 vertical datum:

- Classified Point Cloud data in LAS v1.4 and ASCII XYZi formats
- Ground Classified Point Cloud data in LAS v1.4 format
- DEM Grids, 1m cell size in GeoTIFF and ASCII XYZ formats
- DSM Grids, 1m cell size in GeoTIFF and ASCII XYZ formats
- Contours, 0.5m interval in ESRI Shapefile format
- Intensity images, 1m cell size in GeoTiff format
- Hydro-flattening features in ESRI Shapefile format
- Flight lines in ESRI Shapefile format
- Tile layout, 1:1000 NZTopo50 in Shapefile format
- Extent file, describing the delivered data in Shapefile format
- File listing in text file format
- Metadata file: This document in PDF format

This data has been supplied in accordance with the specifications agreed with Otago Regional Council and the *LINZ PGF Version: New Zealand National Aerial LiDAR Base Specification – January 2020*. Users requiring other formats and projections please contact AAM NZ Ltd.

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CONTENTS

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1. DATA INFORMATION

Data supply: Hard Drive
Number of files: 14 zip files, 1 file list, 1 metadata report
Data formatted on: 31.01.2022
README Document: This file

Previous Deliveries	Date	Title	Contents
PRJ38924_01	02.09.2021	PGF-LIDAR Otago Region	Dunedin and Mosgiel
PRJ38924_02	23.12.2021	PGF-LIDAR Otago Region	Catlins area

File Details of this Delivery	Contents
Folder: 01_Classified_Point_Cloud/1_LAS	Classified Point Cloud in LAS format
Folder: 01_Classified_Point_Cloud/2_ASCII_XYZ	Classified Point Cloud in ASCII XYZi format
Folder: 01_Classified_Point_Cloud/3_Ground_LAS	Ground Points in LAS format
Folder: 02_Grids/1_DEM	DEM tiles in GeoTiff and ASCII XYZ
Folder: 02_Grids/2_DSM	DSM tiles in GeoTiff and ASCII XYZ
Folder: 03_Contours	Contours in ESRI Shapefile format
Folder: 04_Intensity	Intensity Images in GeoTiff format
Folder: 05_Ancillary	Ancillary files in ESRI shapefile format – Tile Layout, Trajectories, Extent, Hydro-flattening features
Readme_PRJ38924_03.pdf	Metadata Report
PRJ38924_03_File_List.txt	Listing of product files delivered in this volume

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2. METADATA

Source Data	Source	Description	Ref No	Date
LiDAR	AAM	Optech Galaxy+ 473	FL015383	27.06.21
			FL015583	06.08.21
			FL015597	11.08.21
		Optech Galaxy+ 473	FL015601	12.08.21
			FL015613	15.08.21
			FL015804	19.09.21
			FL015808	20.09.21
			FL015815	20.09.21
		Optech Galaxy+ 473	FL015831	23.09.21
Trajectory	AAM	RTX™	As above	As above
Field Survey	WSP NZ Ltd	RTK / PPK	6-XZ685	22.07.21 – 06.10.21

LiDAR Characteristics	Description
Format	LAS 1.4 & ASCII xyzi
Emitted Density	4 ppm2
Tile size	480m x 720m (NZTopo50 1:1000 tiles)
ICSM Classification	Level 2. Ground surface improvement

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Number	Point Class	Description	ICSM	CI %
1	Default	Unclassified	1	95
2	Ground	Bare ground	2	98
3	Low vegetation	< 2 m	1	95
4	Medium vegetation	2-8 m	1	95
5	High vegetation	> 8 m	1	95
6	Buildings, structures	Buildings, houses, silos etc.	1	95
7	Low Noise	Spurious low point returns (unusable)	1	95
9	Water	Any point in water	2	98
17	Bridge	Any bridge or overpass	2	98
18	High Noise	Spurious high point returns (unusable)	1	95

Reference Systems	Horizontal	Vertical
Datum	NZGD2000	NZVD2016
Projection	NZTM2000	N/A
Geoid Model	N/A	NZGeoid2016

Accuracy Specification	Measured Point	Derived Point	Basis of Estimation
Field Survey	5 cm		Survey methodology used
LiDAR (Horizontal)	< 100 cm		Project design
LiDAR (Vertical)	< 20 cm		Project design

Project specifications and technical processes were designed to achieve data accuracies as above.

Notes On Expected Accuracy

- Values shown represent 95% confidence level (2 sigma), in centimetres.
- “Derived points” are those interpolated from a terrain model.
- “Measured points” are those observed directly.
- Accuracy estimates for terrain modeling by LiDAR refer to the terrain definition on clear ground.

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- Laser strikes have been classified into “ground” and “non-ground”, based upon algorithms tailored for major terrain/vegetation combinations existing in the project area. The definition of the ground may be less accurate in isolated pockets of dissimilar terrain/vegetation combinations.

Limitations of Data

- The definition of the ground under trees may be less accurate.

Data Validation – LiDAR Data

- Vertical Accuracy Validation - Ground data in this volume has been compared to 925 test points obtained by field survey and assumed to be error-free. The test points were distributed in 19 sites across the mapping area and located on clear ground. Comparison of the test points with elevations interpolated from measured data resulted in:

  Mean difference: 0.004 m
  St. Deviation: 0.029 m
  Standard Error (RMS): 0.029 m or 0.057 m (95% CI)

  This mean elevation difference has been removed from the data supplied in this volume

- Horizontal Accuracy – the LiDAR point cloud was compared to survey data and found to fit well in position. Expected accuracy is well within the specified range.
- Data classification has been manually checked and edited against available imagery.

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3. CONDITIONS OF SUPPLY

The data in this volume has been commissioned by **OTAGO REGIONAL COUNCIL**.

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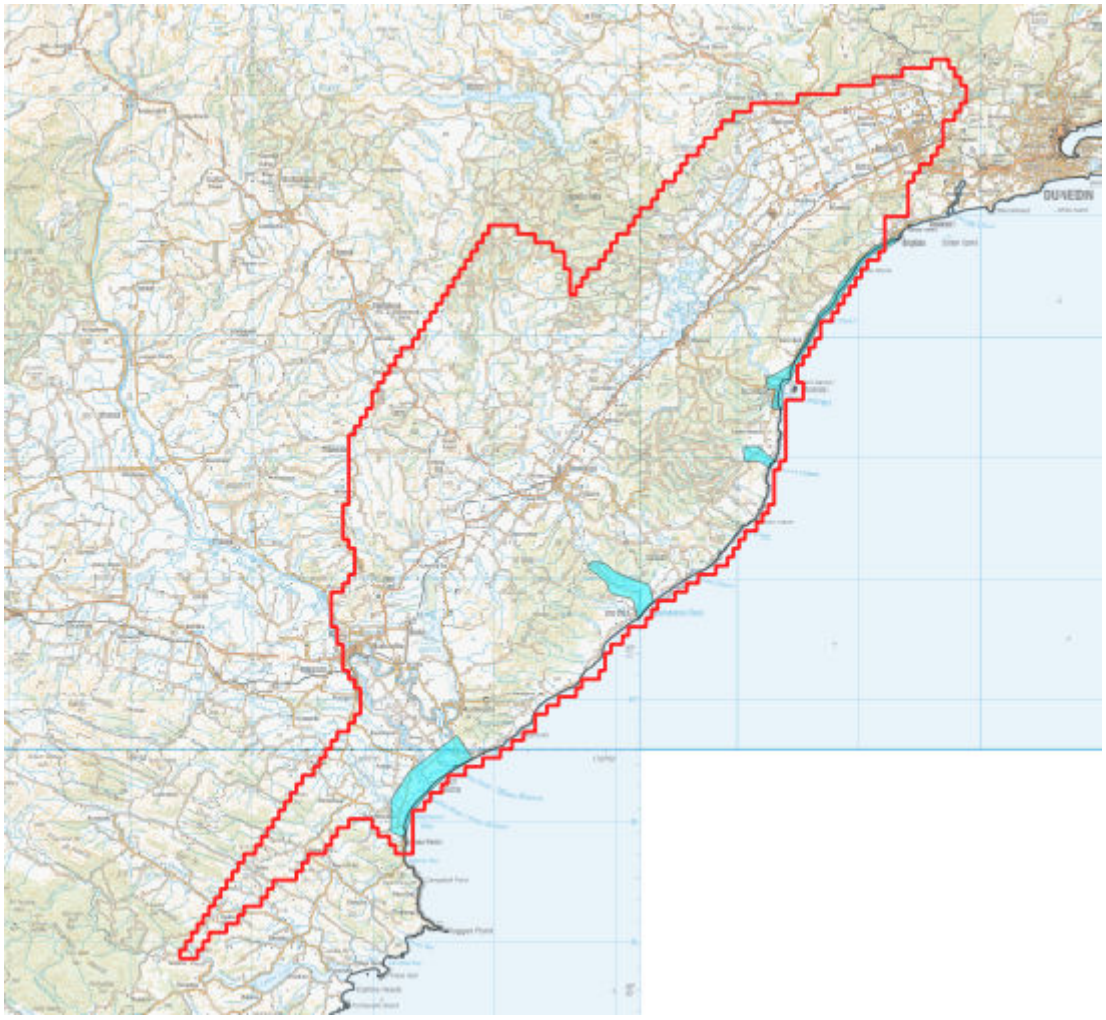
4. VALIDATION

Volume Extent



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Colour Elevation Image

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OTAGO REGIONAL COUNCIL

PGF-LIDAR OTAGO REGION SURVEY

VOLUME: PRJ38924_06

PROJECT SUMMARY

This project is for provision of Airborne LiDAR survey over 8,191 km^2 of the Otago Region.

This volume contains data over the Palmerston block – approximately 2,070 km^2. This area was captured between the 25th June – 1st October 2021.

Specific estuary areas were flown within 1 hour of low tide. The remaining coastline was capture within 2 hours of low tide.

The survey was planned to achieve ≤ 20cm vertical accuracy (95% CI), ≤ 100cm horizontal accuracy (95% CI) with an emitted pulse density of 4ppsm, and ground classification to ICSM level 2.

This volume replaces PRJ38924_04_rev2. It includes rework undertaken on this block following feedback from LINZ and Otago Regional Council.

Background image from Google Earth

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DATA SUMMARY

This volume includes the following data in NZTM2000 projection and NZVD2016 vertical datum:

- Classified Point Cloud data in LAS v1.4 and ASCII XYZi formats (classes 01, 02, 06, 09, 17)
- Ground Classified Point Cloud data in LAS v1.4 format
- DEM Grids, 1m cell size in GeoTIFF and ASCII XYZ formats
- DSM Grids, 1m cell size in GeoTIFF and ASCII XYZ formats
- Intensity images, 1m cell size in GeoTiff format
- Hydro-flattening features in ESRI Shapefile format
- Flight lines in ESRI Shapefile format
- Tile layout, 1:1000 NZTopo50 in Shapefile format
- Extent file, describing the delivered data in Shapefile format
- File list in text file format
- Metadata file: This document in PDF format
- Project Report – in PDF format

The Contours and remaining ASCII XYZi files will be supplied following acceptance of the above data.

This data has been supplied in accordance with the specifications agreed with Otago Regional Council and the *LINZ PGF Version: New Zealand National Aerial LiDAR Base Specification – January 2020*. Users requiring other formats and projections please contact AAM NZ Ltd.

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CONTENTS

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1. DATA INFORMATION

Data supply: Hard Drive
Number of files: 75,283 data files, 1 file list
Data formatted on: 21.11.2022
README Document: This file

Previous Deliveries	Date	Title	Contents
PRJ38924_01	02.09.2021	PGF-LIDAR Otago Region	Dunedin and Mosgiel
PRJ38924_02	23.12.2021	PGF-LIDAR Otago Region	Catlins area
PRJ38924_03	04.02.2022	PGF-LIDAR Otago Region	Milton area
PRJ38924_04	05.04.2022	PGF-LIDAR Otago Region	Palmerston area
PRJ38924_04_rev2	02.08.2022	PGF-LIDAR Otago Region	Palmerston area resupply
PRJ38924_05	21.11.2022	PGF-LIDAR Otago Region	Central Otago 1

File Details of this Delivery	Contents
Folder: 01_Classified_Point_Cloud/1_LAS	Classified Point Cloud in LAS format
Folder: 01_Classified_Point_Cloud/2_ASCII_XYZ	Classified Point Cloud in ASCII XYZi format
Folder: 01_Classified_Point_Cloud/3_Ground_LAS	Ground Points in LAS format
Folder: 02_Grids/1_DEM	DEM tiles in GeoTiff and ASCII XYZ
Folder: 02_Grids/2_DSM	DSM tiles in GeoTiff and ASCII XYZ
Folder: 04_Intensity	Intensity Images in GeoTiff format
Folder: 05_Ancillary	Ancillary files in ESRI shapefile format
Readme_PRJ38924_06.pdf	Metadata Report
PRJ38924_06_File_List01.txt	Listing of product files delivered in this volume

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2. METADATA

Source Data	Source	Description	Ref No	Date
LiDAR	AAM	Optech Galaxy+ 473	FL015375	25.06.21
		Optech Galaxy+ 473	FL015383	27.06.21
		Optech Galaxy+ 473	FL015583	06.08.21
		Optech Galaxy+ 473	FL015597	11.08.21
		Optech Galaxy+ 473	FL015826	22.09.21
		Optech Galaxy+ 473	FL015834	23.09.21
		Optech Galaxy+ 473	FL015850	28.09.21
		Optech Galaxy+ 473	FL015853	28.09.21
		Optech Galaxy+ 473	FL015854	29.09.21
		Optech Galaxy+ 473	FL015871	01.10.21
Trajectory	AAM	RTX™	As above	As above
Field Survey	WSP NZ Ltd	RTK / PPK	6-XZ685	22.07.21 – 06.10.21

LiDAR Characteristics	Description
Format	LAS 1.4 & ASCII xyzi
Emitted Density	4 ppm2
Tile size	480m x 720m (NZTopo50 1:1000 tiles)
ICSM Classification	Level 2. Ground surface improvement

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Number	Point Class	Description	ICSM	CI %
1	Default	Unclassified	1	95
2	Ground	Bare ground	2	98
3	Low vegetation	< 2 m	1	95
4	Medium vegetation	2-8 m	1	95
5	High vegetation	> 8 m	1	95
6	Buildings, structures	Buildings, houses, silos etc.	1	95
7	Low Noise	Spurious low point returns (unusable)	1	95
9	Water	Any point in water	2	98
17	Bridge	Any bridge or overpass	2	98
18	High Noise	Spurious high point returns (unusable)	1	95

Reference Systems	Horizontal	Vertical
Datum	NZGD2000	NZVD2016
Projection	NZTM2000	N/A
Geoid Model	N/A	NZGeoid2016

Accuracy Specification	Measured Point	Derived Point	Basis of Estimation
Field Survey	5 cm		Survey methodology used
LiDAR (Horizontal)	< 100 cm		Project design
LiDAR (Vertical)	< 20 cm		Project design

Project specifications and technical processes were designed to achieve data accuracies as above.

Notes On Expected Accuracy

- Values shown represent 95% confidence level (2 sigma), in centimetres.
- “Derived points” are those interpolated from a terrain model.
- “Measured points” are those observed directly.
- Accuracy estimates for terrain modeling by LiDAR refer to the terrain definition on clear ground.

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- Laser strikes have been classified into “ground” and “non-ground”, based upon algorithms tailored for major terrain/vegetation combinations existing in the project area. The definition of the ground may be less accurate in isolated pockets of dissimilar terrain/vegetation combinations.

Limitations of Data

- The definition of the ground under trees may be less accurate.

Data Validation – LiDAR Data

- Vertical Accuracy Validation - Ground data in this volume has been compared to 2609 test points obtained by field survey and assumed to be error-free. The test points were distributed in 42 sites across the mapping area and located on clear ground. Comparison of the test points with elevations interpolated from measured data resulted in:

  Mean difference: 0.000 m
  St. Deviation: 0.033 m
  Standard Error (RMS): 0.033 m or 0.065 m (95% CI)

  This mean elevation difference has been removed from the data supplied in this volume

- Horizontal Accuracy – the LiDAR point cloud was compared to survey data and found to fit well in position. Expected accuracy is well within the specified range.
- Data classification has been manually checked and edited against available imagery.

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3. CONDITIONS OF SUPPLY

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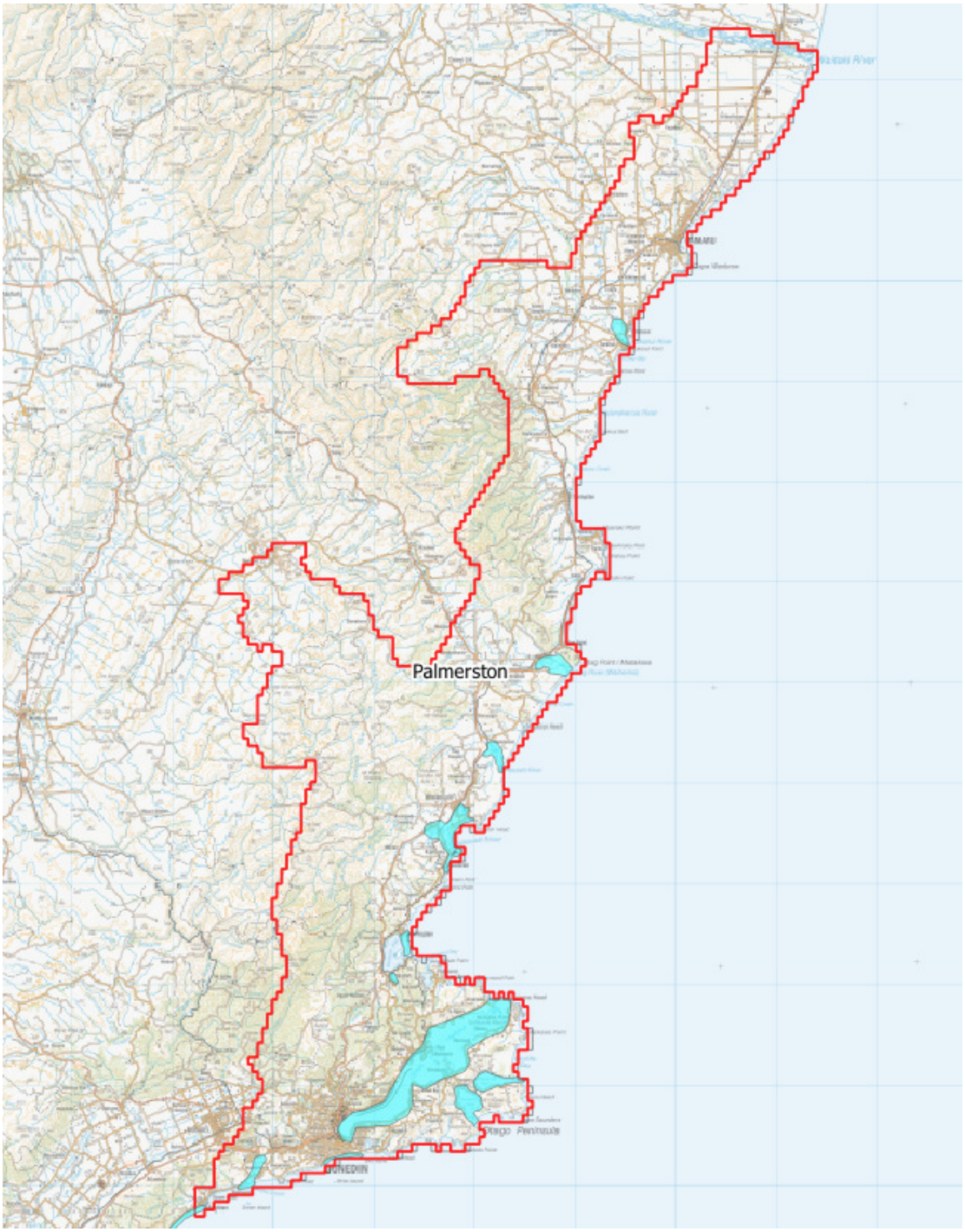
4. VALIDATION

Volume Extent



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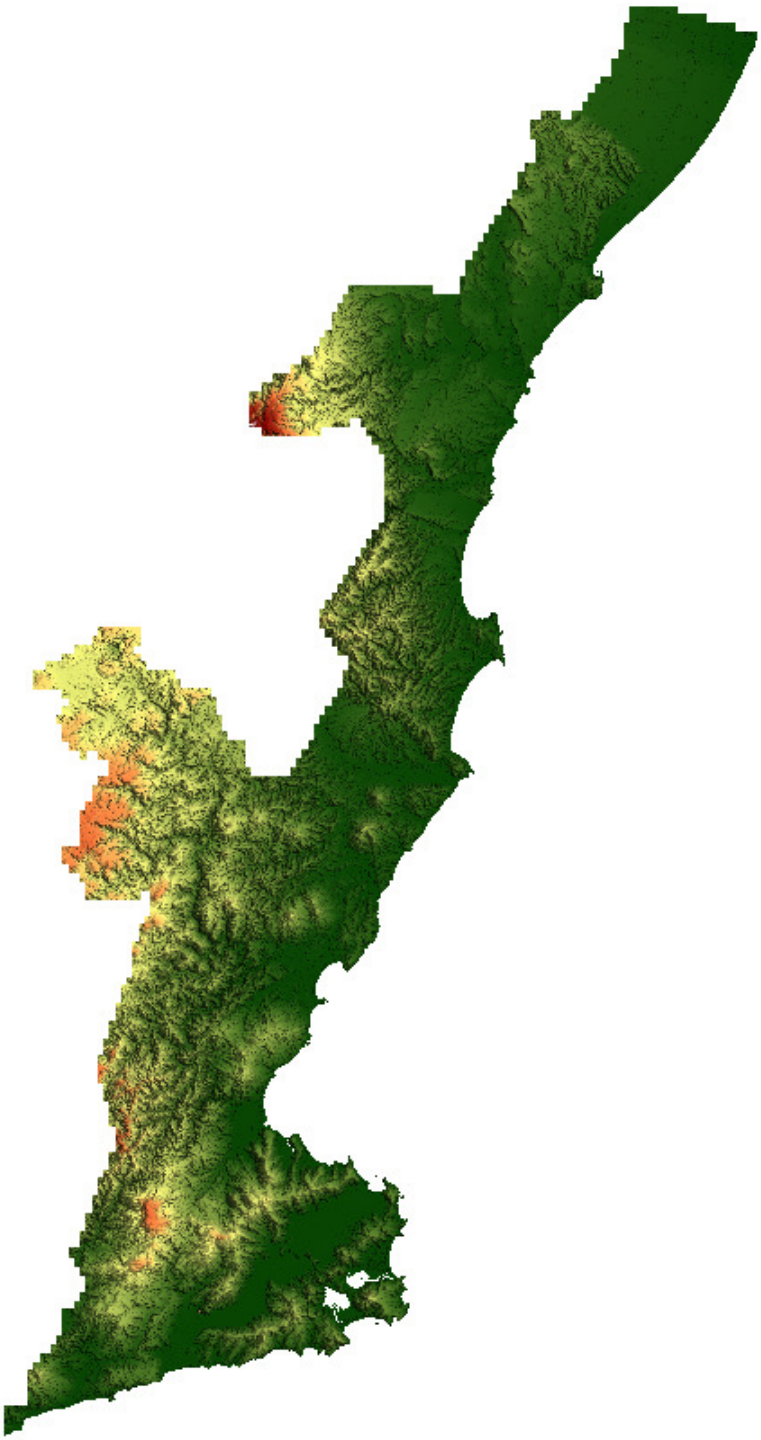
Colour Elevation Image



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