



WAGGIS

2024/25 Greater Wellington Ortho-photography

0.20 m GSD Ortho Imagery

Metadata document detailing the acquisition, processing and deliverables for the above project undertaken for the client Greater Wellington Regional Council

Prepared by Aerial Surveys Ltd



www.aeralsurveys.co.nz

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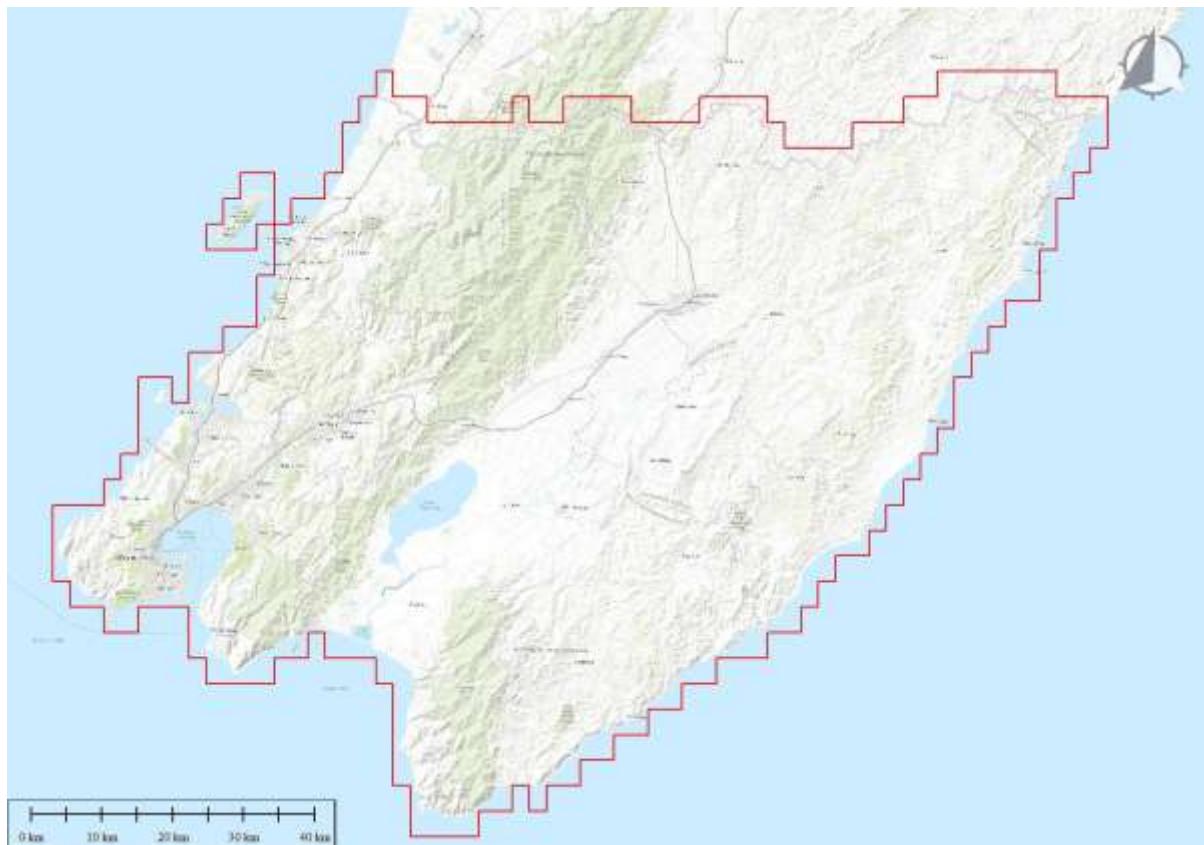
Summary

Project Contacts

Greater Wellington Principal GIS Analyst: Matt Velde (Ph. 022 315 2545)
Aerial Surveys National Account Manager: Jenny Bakker (Ph. (09) 415 3101)

Background

In December 2024 Greater Wellington Regional Council contracted Aerial Surveys Ltd to supply 0.20 m GSD digital ortho imagery covering the Wellington rural area as shown below.



A map showing the tiled ortho imagery is included in Appendix A.

Project

Aerial photography was captured over the rural areas of the Wellington Region, covering the Districts of Kāpiti Coast, Masterton, Upper Hutt City, Carterton, Porirua, Wellington City, Lower Hutt City, and South Wairarapa—totalling approximately 9,262 km². This area encompasses the full Wellington Region of the North Island.

This metadata relates to the portion of the Wellington Region captured during the 2024/2025 season. The orthophotos have been fully edited and colour-balanced.

As of the 2024/2025 season, 80.23% of the project area has been successfully captured. The remaining 19.77% is scheduled for capture when weather conditions are suitable and the sun angle exceeds +35 degrees during the 2025/2026 summer season.

Data

The data was processed into various digital map data products. The products included for this dispatch contain:

- RGBI orthophotos
- Vector data:
 - Tile index
 - Accuracy polygon
 - Ortho seamlines
 - Ground control data
 - Cloud Issue polygon
 - Out of tide coastline for re-fly
- File listing
- Metadata report (this report)

Safety

No safety Incidents were reported during the project.

Data Acquisition

The aerial photography for this project was captured within the 2024/25 flying season (September 2024 – April 2025).

Camera and Flying Height

All photography was captured using Vexcel's digital UltraCam Eagle Prime (UCEP) camera and the UltraCam Eagle Mark3 (UCE3) camera, both fitted with the 100 mm lens and flown at an altitude of approximately 5,349 ft (1,630 m) with the lowest ground GSD set at 0.20 m. The camera was fitted to a GSM 3000 gyro-stabilised mount and IGI AEROcontrol GNSS/IMU positioning system.

Capture Dates

The aerial imagery was captured on the following dates:

23 January 2025, 9 February 2025, 22 February 2025, 25 February 2025, 1 March 2025, 3 March 2025, 7 March 2025, 29 March 2025, 25 April 2025.

Sun Angle

Imagery captured with a minimum sun angle of +35 degrees. The sun angle of the imagery used for the orthorectification ranged from 32 to 58 degrees.

Flight Planning

The flight survey number for this project is SN14400

The overall flight plan is named GWRC_Rural 20cm_UCEP_v2 and comprises 47 runs, 3,974 frames. All imagery captured in stereo: forward overlap 60%, min 54%; side overlap 35%, min 15%.

Environmental Specification

Imagery captured in clear weather conditions with minimal cloud or cloud shadow within the area of interest.

Tidal restriction for coastal and harbour areas captured within three hours either side of low tide.
Imagery covering harbour coastal areas extended from the tide line during low tide periods out to 100m.
Imagery of harbour areas to extend out to 100 m from the perimeter of the harbour.

Some areas of cloud are present in the ortho imagery. We have provided a cloud polygon file for review.
Subject to the final review these areas are scheduled for re-fly in the 2025/2026 season.

Three sorties were captured outside the low-tide window, and a file has been provided showing the extent of coastline. This is to be reviewed by Council to confirm the extent of re-fly.

Rural Building Displacement Specification

Rural 0.20 m GSD imagery – using the UCEp camera and by flying with 60% forward overlap and with 35% side lap (standard stereo coverage) will achieve ~1 m building lean per 3 m height in the corners of the imagery used. Tall structures inwards of the corner of the frame will have less lean the closer to the nadir they are.

Ground Control

A combination of existing control and LINZ benchmarks were observed for use with the aerial triangulation and bundle adjustment.

Data Processing

All aspects of the data processing from imagery processing, aerial triangulation, ortho production and product deliverables were reviewed and approved in-house by Aerial Surveys staff.

Map Projection

All spatial data for this project provided in terms of New Zealand Transverse Mercator 2000 map projection (NZTM2000). The ellipsoidal datum is New Zealand Geodetic Datum 2000 (NZGD2000). The airborne GPS and ground control GPS data was converted from ellipsoidal heights into orthometric heights using the LINZ NZGeoid16 separation model. For this project the orthometric vertical datum is New Zealand Vertical Datum 2016 (NZVD2016).

Image Processing

Level-0 to Level-3 image processing carried out using UltraMap software. All imagery has gone through QA checks ensuring there is no cloud cover and cloud shadow. During aerial acquisition the aircraft on-board GPS navigation data and ground base station data collected and post processed. Level-3 imagery process provides model-based colour correctness/radiometry and even tonal balance across each project area.

Vexcel's UltraMap image processing software includes advanced colour balancing algorithms designed to produce a visually seamless ortho mosaic across an entire project area. During processing, UltraMap analyses radiometric properties of overlapping imagery, including tone, brightness, and contrast, to ensure consistent visual appearance throughout the block. This is achieved through histogram matching, gradient blending, and tonal adjustments that minimise visible seams and variations caused by differences in lighting, atmospheric conditions, or sensor settings during flight.

Aerial Triangulation (AT)

During aerial acquisition the aircraft on-board GPS navigation data and ground base station data Aerial triangulation carried out using Hexagon ISAT software. The AT brings together the GPS data and imagery using a two-part process which stitches the imagery together using tie point matching for the relative orientation phase and observing ground control points for the absolute orientation phase. A final report is generated to check RMSE values are within specification. AT in the project has been performed to make the expected accuracy of ± 1 pixel in XY and ± 2 pixels in Z.

Western Block UCEP

Parameters

Parameter	X/Omega	Y/Phi	Z/Kappa	XY
RMS Control	0.054	0.049	0.048	0.051
RMS Check				
RMS Limits	0.100	0.100	0.200	
Max Ground Residual	0.125	0.190	0.259	
Residual Limits	0.500	0.500	1.000	
Mean Std Dev Object	0.047	0.042	0.144	
RMS Photo Position	0.000	0.000	0.007	
RMS Photo Attitude	0.003	0.002	0.010	
Mean Std Dev Photo Position	0.007	0.007	0.018	
Mean Std Dev Photo Attitude	0.000	0.000	0.001	

Eastern Block UCEP

Parameters

Parameter	X/Omega	Y/Phi	Z/Kappa	XY
RMS Control	0.063	0.078	0.044	0.071
RMS Check				
RMS Limits	0.100	0.100	0.200	
Max Ground Residual	0.199	0.196	0.121	
Residual Limits	0.500	0.500	1.000	
Mean Std Dev Object	0.048	0.044	0.146	
RMS Photo Position	0.281	1.125	0.737	
RMS Photo Attitude	0.007	0.005	0.011	
Mean Std Dev Photo Position	0.051	0.054	0.038	
Mean Std Dev Photo Attitude	0.001	0.001	0.001	

North-eastern Block UCE3

Parameters

Parameter	X/Omega	Y/Phi	Z/Kappa	XY
RMS Control	0.045	0.030	0.036	0.038
RMS Check				
RMS Limits	0.100	0.100	0.200	
Max Ground Residual	0.114	0.061	0.140	
Residual Limits	0.500	0.500	1.000	
Mean Std Dev Object	0.050	0.045	0.160	
RMS Photo Position	0.000	0.001	0.002	
RMS Photo Attitude	0.001	0.001	0.010	
Mean Std Dev Photo Position	0.011	0.011	0.027	
Mean Std Dev Photo Attitude	0.000	0.000	0.000	

DTM for Ortho Production

The digital terrain model used for this project was derived from existing LiDAR DTM data flown in 2013-2025. In areas of change a new DTM was collected from the 0.20 m GSD stereo imagery using photogrammetric techniques, largely automated pixel matching and autocorrelation process. The DTM

data was merged together seamlessly, and accuracy checked to meet the ortho imagery specification. The DTM was further processed and edited suitable for the ortho production.

RGBI Ortho Rectification Process

Ortho imagery created using Hexagon OrthoPro software. The imagery was orthorectified using the stereo-edited digital terrain model (DTM) to provide a geometric accurate seamless ortho mosaic dataset. The ortho imagery was extracted aligned to the LINZ 1:5,000 map sheet tile layout.

The ortho imagery was processed in all four bands (RGBI) to ensure a consistent dataset is maintained across all four bands.

Ortho accuracy was checked by observing a selection of geodetic marks around the project area. The ortho accuracy met the expected of $\pm 0.$ m @ 95% confidence level in clear flat open areas. The points that were in flat open areas were well within accuracy.

NAME	LENGTH	BEARING	DX	DY
A0HL	0.2202	49 33' 4.5"	-0.171	-0.138
A1Y9	0.1987	128 45' 11"	-0.151	0.129
A1YJ	0.1519	286 49' 36"	0.144	-0.049
A20G	0.2805	237 39' 10"	0.241	0.144
A20M	0.1538	268 25' 27"	0.154	0
A21N	0.3169	203 46' 7.9	0.135	0.287
A27D	0.259	127 15' 1.9	-0.203	0.161
A2GG	0.1521	36 20' 34.0	-0.093	-0.121
A2IF	0.3423	257 19' 35"	0.336	0.066
A2OH	0.1059	285 58' 10"	0.101	-0.032
A2R6	0.3689	331 17' 10"	0.166	-0.329
A3MP	0.2082	55 05' 12.0	-0.175	-0.113
A3MV	0.3019	322 47' 26"	0.174	-0.247
A3N0	0.1613	65 09' 1.2"	-0.149	-0.062
A3N6	0.1528	201 46' 36"	0.062	0.14
A400	0.270	319 16' 21"	0.169	-0.211
A400	0.303	33 28' 35.0	-0.176	-0.247
A409	0.207	281 17' 22"	0.201	-0.047
A40C	0.252	18 05' 23.0	-0.087	-0.236
A40F	0.335	64 35' 30.0	-0.308	-0.133
A40G	0.152	301 58' 16"	0.126	-0.085
ACWX	0.2828	281 13' 31"	0.276	-0.063
AP19	0.1386	13 50' 52.0	-0.038	-0.133
AP1A	0.2306	8 19' 57.8"	-0.042	-0.227
B0VN	0.3259	237 53' 50"	0.281	0.165
B4YU	0.2616	307 59' 7.0	0.201	-0.168
B8NN	0.3253	350 52' 42"	0.041	-0.323
EVA7	0.197	112 24' 7.0	-0.179	0.082
PALI	0.3396	227 14' 20"	0.255	0.224
Average	0.241		0.045	-0.054
Std Dev	0.075		0.181	0.168
RMSE	0.252		0.183	0.173
90% CI	0.415			
95% CI	0.494			

Peripheral Imagery

Because the flight planning incorporates capture of an area larger than the target this creates additional imagery that can be orthorectified. The peripheral image tiles contain pixels with null value (the area where there is no imagery). The null value pixels have been clipped and assigned an extra band. No editing is undertaken, and image distortion may be noticeable.

Ortho Specification

Ortho imagery:	Four band RGBI
Radiometric resolution:	32-bit colour (4 x 8 bits per band)
Spectral resolution:	Red, green, blue, near infrared
Pixel resolution:	0.20 m GSD (20 cm)
Spatial accuracy:	±0.40 m @ 95% confidence level in clear flat open spaces (2 sigma) over client area of interest
Tile index:	Tile index for the project area (includes peripheral tiles) Aligned to LINZ 1:5000 map sheet layout (2400 m x 3600 m) Each tile contains attributed metadata information
Total number of tiles supplied:	1,247 1:5,000 map sheet tiles
Tile size:	1.054 Gb each tile
Accuracy polygon:	Shows the extent of the ortho imagery and the extents of the DTMs used. Achieved ortho accuracies are shown in the attribution.
Ortho mosaic seamlines:	Shows ortho mosaic polygon used from each frame. Polygons are attributed with image information.
Image format:	All ortho tiles supplied in uncompressed GeoTIFF format with associated TFW world file
Image compression format:	All ortho tiles supplied in ECW format with associated ERS world file compressed with a maximum compression of 10x
Ground control data:	Point file showing location of ground control points used for ortho production

The ortho tile layout containing attribute information as shown below:

Feature Information	
Name:	2025_BP36_5000_0603
Feature Type:	Unknown Area Type
Geometry:	5 vertices, Perimeter: 11.995 km, Area: 8.64 sq km, Bounds: (1856800.000, 5456400.000, 1859200.000, 5460000.000)
Map Name:	OrthosPGRM3235\WellingtonRural2025.shp [Index in Layer: 810]
Right click on an entry for more options (i.e. open URL, etc.)	
Attribute	Value
NAME	2025_BP36_5000_0603
index_tile	BP36_5000_0603
sheet_code	BP36
scale	5000
tile	0603
Year	2025
PROJECT	WAGGIS - 2024/25 Greater Wellington Ortho Photography
LOCATION	Wellington Rural
FLOWN	10325, 250225
HCOORDSYS	NZTM GD2000
V_DATUM	NZVD 2016
GSD	0.2m
IMAGE_DIM	2400m x 3600m
PIXEL_DIM	12000x18000
IMAGE_TYP	Uncompressed 32 Bit RGBI
BANDS_PP	4
BITS_SAMPL	8
GEO_REF	Geo tif & TFW
SPATIAL_AC	+/-0.4m at 95% confidence level in clear flat areas
DTM_SOURCE	Lidar DEM 2013-2025
ORTHO_TYPE	Client Area
FRAME	6230, 5631, 6228, 5629, 6229, 5630, 5632, 5633, 5644
CAMERA	UCEP-f100
SUPPLIER	Aerial Surveys Limited
SURVEY	SN14400
NOTE	Because no field verification has been undertaken we would always recommend the user to field verify any data to be used for design purposes.
Job_No	PGRM3235
ALTITUDE_F	14311.02408, 14314.30492, 14304.4624, 14317.58576, 14307.74324, 14288.0582
Edit... Delete Vertices... Fly-Through... Graphs... Notation... Copy to Clipboard	

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Product Deliverables

The following details the folder contents:

Tile index: Supplied in shapefile format

RGBI orthophotos:	All tiles supplied in uncompressed GeoTIFF format with TFW world file
	All tiles supplied in compressed ECW format with ERS world file
Ground control data:	Supplied in shapefile format
Accuracy polygon:	Supplied in shapefile format
Ortho mosaic seamlines:	Supplied in shapefile format
Cloud Issue polygon:	Supplied in shapefile format
Out of tide coastline for re-fly:	Supplied in shapefile format
File listing:	Supplied in TXT format
Metadata report:	Supplied in PDF format

All digital data supplied via digital upload and on e-HDD. Data was supplied to Matt Velde, Greater Wellington Regional Council on 31 July 2025.

If you have requirements for the data in other file formats, map projections please contact Aerial Surveys.

Appendix A: Project Area

The tile layout is shown in red.

The project extent area is shown in blue.

