

Croskell PSP Proposed Drainage Strategy

Feature Survey Report

Prepared for Melbourne Water

Prepared by Water4Good

24 May 2022



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Revision History

Revision N°	Prepared By	Description	Date
Rev 0	Michael Fazackerley	Issued for use	24/05/2022

Document Acceptance

Action	Name	Signed	Date
Prepared by	Michael Fazackerley		24/05/2022
Reviewed by	Nick Herath		24/05/2022
Approved by	Zaki Matar	 	24/05/2022
on behalf of	Water4Good		

1 Introduction

Melbourne Water commissioned Water4Good to complete a Feature survey for the Croskell Precinct Structure Plan (PSP) Proposed Drainage Strategy Project (hereafter 'the project'). The wider project involves completing a drainage concept options assessment and functional design of major drainage assets (retarding basin, wetland and new waterway alignment) for the Croskell PSP. The functional design of the major assets will provide greater certainty to the land required for the assets, which will inform the PSP and schemes, and confirm the quantities and cost estimation for the scheme contribution rate.

To inform functional design requirements a feature and level survey was completed of areas within the white polygon shown in figure 1. The survey was performed via ground-based GPS observations and supported by the deployment of an Unmanned Aerial Vehicle (UAV) fitted with a Riegl MiniVUX 2 LiDAR sensor in order to capture site topography which was of particular benefit through vegetated areas where pedestrian access was heavily restricted.



Figure 1: Extents of survey shown in White Polygon

2 Survey Details

The following works were conducted throughout the duration of this project.

- Initial site visit with Melbourne Water and W4G team
- OH&S review with development of project specific SWMS
- Verification that site does not lie within CASA restricted airspace.
- Obtain publicly available survey information for MGA94 & AHD connections
- Placing Survey control around the site via GNSS techniques
- Flying Aerial LiDAR of the site and collection of GNSS ground truthing data
- Processing Photogrammetry & LiDAR data
- Extracting Feature & Level information from 3D data
- Creating 3D DTM of site (TIN model)
- Drafting to Melbourne Water Drafting Standards
- Supply of survey datasets as set out in Appendix A of this document

2.1 Survey Datum

All deliverables for this project have been supplied to Map Grid Australia Zone 55 on Geocentric Datum Australia 1994 (MGA94 Zone 55) and scaled to Ground.

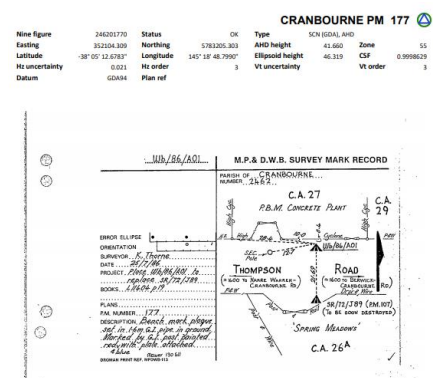
Levels are to Australian Height Datum (AHD) Cranbourne PM 177 (third order) with a stated value of RL41.660. Checks were then taken on Cranbourne PM745 & PM121 with good agreement.

Site survey control which includes temporary benchmarks and ground control points were established, co-ordinated, and referenced to the above noted SMES permanent survey marks and observed for a minimum of 2 minutes (120 Epochs) at the start of each workday and again at the end of the work day. This was performed via Trimble R10 GNSS Receivers for establishment of local survey control to MGA94 Zone 55 datum, using Trimble VRSnow CORS (Continuously Operating Reference Station) Network.

Ground Control Points were placed using white paint in checkerboard pattern. Temporary Benchmarks (T.B.M.) placed were a mixture of 450mm Start Pickets or Rivets placed in concrete.

Data has been scaled to Ground using the below CSF:

Datum Point	SCALE_POINT	
Easting	352119.439	
Northing	5782551.73	
Height	35.363	
Point Scale Factor	0.99986898	
Height Factor	0.99999444	
Combined Scale Factor	0.99986343	Ground to Grid
Inverse	1.000136589	Grid to Ground



2.2 Aerial Survey

All aerial survey operations were performed by CASA accredited Veris Surveyors operating under Veris Australia ReOC.

Ground Control Points (GCP's) were placed at strategic locations throughout the survey area. These points are used to tie the UAV data into existing Survey Datums (MGA94 and AHD).

These points were placed using white paint and coordinated using a Trimble R10 GNSS Receiver connected to the Trimble VRSnow CORS network.

A DJI M600 UAV carrying a Riegl MiniVUX2 LiDAR sensor collected full wave form point-cloud data of survey extents. In unison with the LiDAR capture, nadir georeferenced photography was used to produce an RGB Orthorectified Aerial Image.

LiDAR data was processed in the Riegl Suite (RiProcess, RiPrecision & RiAnalyse). The laser data is combined with GNSS trajectory data recorded by the on-board Applanix GNSS & IMU equipment. A 3D Point Cloud in LAS format was exported from this package.

The Photogrammetry data was processed in Pix4D to produce a High Resolution Ortho-rectified Aerial Image. The image is then exported as a GeoTIFF which is then converted to JPEG formats for ease of use.

2.3 Equipment Utilised

Trimble R10 GNSS Receiver

Serial Number: 5817470219

Last calibrated: Daily (against known Permanent Marks)

DJI M600

Last Serviced: January 2021 (delivery date)

Last Calibrated: Daily (Compass & IMU)

Riegl MiniVUX2 LiDAR

Last Serviced: August 2021 (warranty return)

Last Calibrated: August 2021 (Applanix IMU & GNSS)

2.4 Limitations of Survey

Aerial LiDAR Surveys are conducted utilising remote sensing technologies and thus accuracies obtained are generally relative to site flying conditions, together with the signal return from site features.

The advantage of utilising LiDAR mounted UAV is the ability to capture vast amounts of data in a relatively short time with some ability to penetrate vegetation. Generally, accuracies are to the order of +/- 0.05m where there is a visible feature to provide a reliable signal return.

For detailed design, all hardstand features (i.e. bridge structures or rail tracks) should be verified using traditional measurement techniques such as conventional total station or terrestrial laser scanning methods.

In instances where ground is not visible due to thick grass cover or otherwise, then the penetration of the LiDAR signal may not be an indication of the true ground level. Conversely a return can often be achieved through tree canopy, and LiDAR can still be used to provide limited ground level information through tree canopies (where the canopy can be penetrated and a signal return is obtained at ground level).

A degree of caution should be applied for the appropriateness of using UAV/LiDAR for areas that weren't accessible and thus can't be 'ground truthed'. UAV/LiDAR is best utilised for planning, conceptual design and should be supplemented with more rigorous survey methodology for detailed design and construction applications as appropriate.

Some portions of the site were not inspected visually, it therefore follows that ground features not visible utilising UAV techniques may not be shown on our plan. Visible features have been categorised as having been obtained by remote detection methods. These features, where obtained using remote means should be verified independently for the purposes of detailed design and construction.

Property boundary fencing has also been located using remote methods and should not be used for Cadastral Boundary information.

2.5 Site Specific Limitations

In general, the site was heavily vegetated particularly throughout the southern extents which prevented foot access. LiDAR was generally able to penetrate these areas but there are some areas noted on supplied plans as being too dense to penetrate. Areas containing black berries are particularly problematic and have been noted as such.

Many drainage details were also buried and in generally poor condition. This made getting dimensions and inverts difficult in some spots. These specific items are also shown on supplied plans.

At time of survey, Ti-Tree creek and dams were full of water therefore we have not been able to obtain the true invert/toe of these areas. Where possible we have located levels using GPS measurements as close as safely possible to the water.



Figure 2: Riegl MiniVUX LiDAR UAV in preparation for takeoff.



Figure 3: Coversheet of feature survey with project extents

3 Deliverables

A schedule of survey deliverables for this assignment is listed in Appendix A of this document.

4 Closing

We are committed to delivering survey and geospatial data of the highest standard and quality. Should any of the deliverables require minor changes to conform to Melbourne Water standards, I would ask you to contact me in the first instance for review and amendment.

We thank you for the opportunity to work with you on this project.

Yours faithfully

Nick Herath

Technical Director (Veris)

M +61 439 983 361

E: n.herath@veris.com.au

on behalf of

Water4Good

Appendix A – Deliverables

The following table contains a schedule of survey deliverables provided for this assignment.

Table 1. Survey Deliverables

Filename	Revision and Date	Description
SVY202204004.zip	Initial 29/04/2022	AutoCAD eTransmit deliverable Feature and Level Survey to Melbourne Water drafting standards
SVY202204004_AERIAL.zip	Initial 29/04/2022	AutoCAD eTransmit deliverable Feature and Level Survey including aerial ortho overlay to Melbourne Water drafting standards
SVY202204004.DGN	Initial 29/04/2022	Microstation copy of AutoCAD deliverable
SVY202204004.PDF	Initial 29/04/2022	PDF copy of AutoCAD deliverable
SVY202204004_AERIAL.PDF	Initial 29/04/2022	PDF copy of AutoCAD deliverable with aerial overlay
MW_SVY202204004.MAP	Initial 29/04/2022	Mapinfo GIS polygon with required MW attributes