



SURVEY REPORT

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Rev No.: 1

Date: 2022/10/13

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SURVEY REPORT

FOR THE

TOPOGRAPHICAL SURVEY OF PV PLANT AREA AT TUTUKA POWER STATION

CONDUCTED

BY

MKMAKAFANE (PTY) LIMITED

FOR

ESKOM HOLDINGS SOC LIMITED



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1.0 INTRODUCTION

The purpose of the survey was to do full detail topographical survey for the area identified for PV Plant. The basis of the request is to apply a combination of survey techniques to achieve the survey requirement.

MKMakafane is committed to a cost effective solution and do believe that various surveying techniques including control survey, leveling, and topographical survey that would address the needs of Eskom. All necessary detail can be obtained from these surveying techniques.

For the purposes of the required accuracies for this project, the standard was used to achieve the tolerable accuracies. Any grid more than that standard one will compromise the quality of the survey.

2.0 DESCRIPTION OF THE WORKS

The works include, but is not limited to the following:

- | | |
|----|---|
| 1. | Tachometric survey of the area indicated on the drawing presented by the client |
|----|---|

3.0 MATERIAL USED

3.1 Legislation

The following legislation was applicable to this survey:

Reference	Title	Revision
85 OF 1993	OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS	
107 OF 1998	NATIONAL ENVIRONMENTAL MANAGEMENT ACT AND REGULATIONS	
36 OF 1998	NATIONAL WATER ACT	
103 OF 1993	COMPENSATION FOR OCCUPATIONAL INJURIES AND DISEASES ACT	
8 OF 1997	LAND SURVEY ACT	
TMH 11	TECHNICAL METHODS FOR HIGHWAYS	



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3.2 Equipment used

Phantom4 Pro Drone and,
Trimble R10 GPS System,
Trimble R8s GPS System with the following

PERFORMANCE SPECIFICATIONS

Measurements

- Trimble R-Track technology for tracking L2 Civil Signal (L2C)
- Advanced Trimble Maxwell TM Custom Survey GPS Chip
- High precision multiple correlator for L1 and L2 pseudo range measurements
- Unfiltered, unsmoothed pseudo range measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise L1 and L2 carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- L1 and L2 Signal-to-Noise ratios reported in dB-Hz
- Proven Trimble low elevation tracking technology
- 24 Channels L1 C/A Code, L2C1
, L1/L2 Full Cycle Carrier, WAAS/EGNOS support

Code differential GPS positioning²

Horizontal ±0.25 m + 1 ppm RMS

Vertical ±0.50 m + 1 ppm RMS

WAAS differential positioning accuracy³ Typically <5 m 3DRMS

Static and FastStatic GPS surveying²

Horizontal ±5 mm + 0.5 ppm RMS

Vertical ±5 mm + 1 ppm RM

Kinematic surveying²

Horizontal ±10 mm + 1 ppm RMS

Vertical ±20 mm + 1 ppm RMS

Initialization time Single/Multi-base minimum

10 sec + 0.5 times baseline length in km, up to 30 km

Initialization reliability Typically >99.9%

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4.0 COMMUNICATION CHANNELS

4.1 Contact persons

Eskom Holdings SOC LTD also known as the Client		
Description	Name	Contact Number
Project Manager	Lou Duvenage	082 928 1220
Contract Manager	Johannes Mfalapitsa	072 691 2925
MKMAKAFANE (PTY) LTD.		
Description	Name	Contact Number
Surveyor	Elliot Makafane	074 220 6105
Ass Surveyor	Phomolo Seriba	073 282 5484

4.2 Communication

All formal contractual communications were in writing between the Client Representative and the representation for MKMAKAFANE (PTY) LTD.

The communication channel was between the Client representative **Lou Duvenage** and **Johannes Mfalapitsa** as well as **Elliot Makafane** for MKMAKAFANE (PTY) LTD. These communications were in writing and, verbal.

The pre-survey conference was communicated telephonic for the proposed project. The following items were discussed and handed over to the surveyor

1. Survey Scope of Work was discussed
2. TMH 11 Standard Specifications
3. Control points
4. The list of control points that were fixed on site are below

Name	Y	X	Z	Code
BM01	36165.441	2964116.278	1609.162	12mm IP in Concrete
BM02	35134.842	2963917.828	1622.029	12mm IP in Concrete
BM03	33799.085	2963647.613	1608.617	12mm IP in Concrete
BM04	34833.203	2963481.152	1613.467	12mm IP in Concrete
BM05	35758.537	2963416.746	1611.904	12mm IP in Concrete

 <p>The logo for MK MAKAFANE features a stylized globe with a surveying instrument (theodolite) superimposed on it. The globe is colored in shades of green and blue, and the instrument is in orange and white. Below the graphic, the text 'MK MAKAFANE' is written in a bold, orange, sans-serif font.</p>	<h2>SURVEY REPORT</h2>	Doc No.: REPORT-MKM22 Rev No.: 1 Date: 2022/10/13 Page: 5 of 8
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5.0 Methodology

Introduction:

Tacheometric survey (Tacheometry) is a branch of surveying in which horizontal and vertical distance of points are obtained by optical measurement avoiding ordinary and slower process of measurement tape. It is a system of rapid surveying by which horizontal and vertical distances of points are obtained. Tacheometric surveys are usually performed to produce contour and details plans for further work, or to produce coordinates for area and volume calculations. Observation is usually performed from known survey stations, often established by traversing.

Objective:

Produce the topographic and detail plan of the proposed area using surveying software Model Maker.

Theory:

Used a GPS Trimble R8 base and a rover system, able to read distance and direction including measurement of new points from known station to the unknown stations. The stadia procedure is used less and less often these days, more commonly this GPS method is used. This instrumentation has facilitated the development of this method of detail and contour surveying into a very slick operation.

This survey was carried out using section 6.1.4 of THM 11 (Standard Survey Methods TMH11 Draft Version 2.0 February 2013) all the details were pickup by GPS method because there were no obstructions. The following Annexures 16.1 and 16.2 in the TMH11 were referred to in completing this survey.



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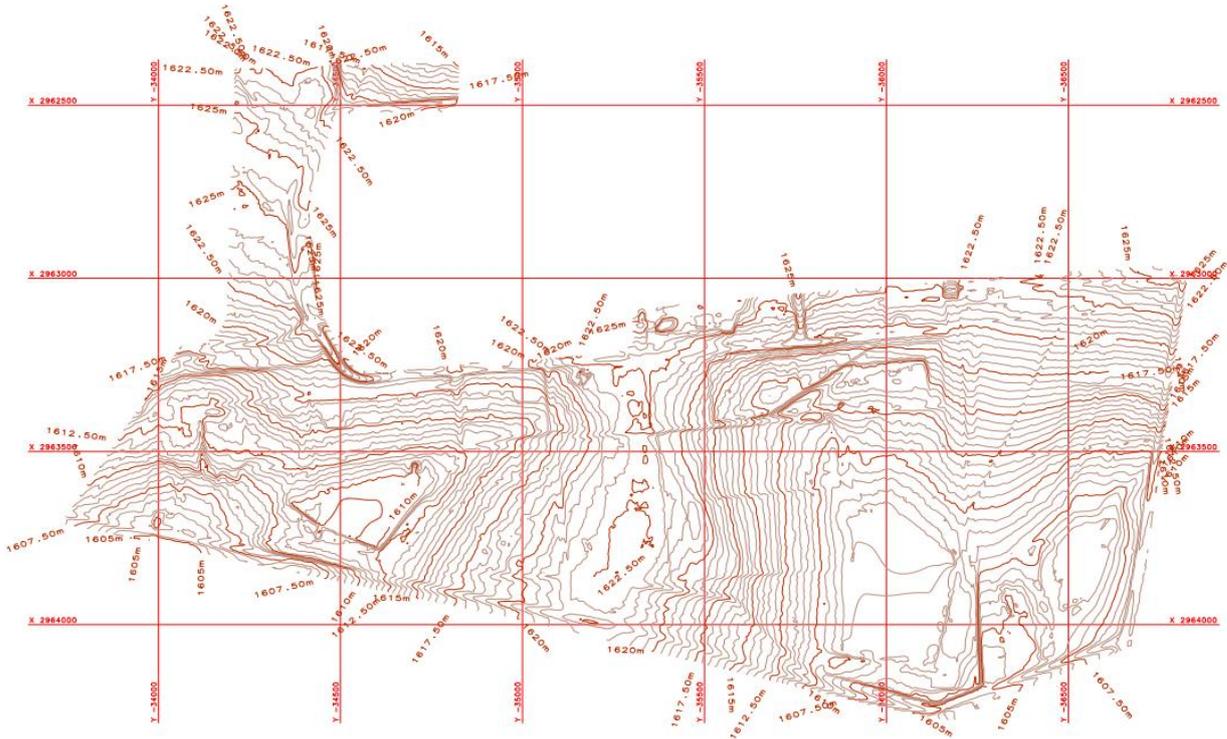
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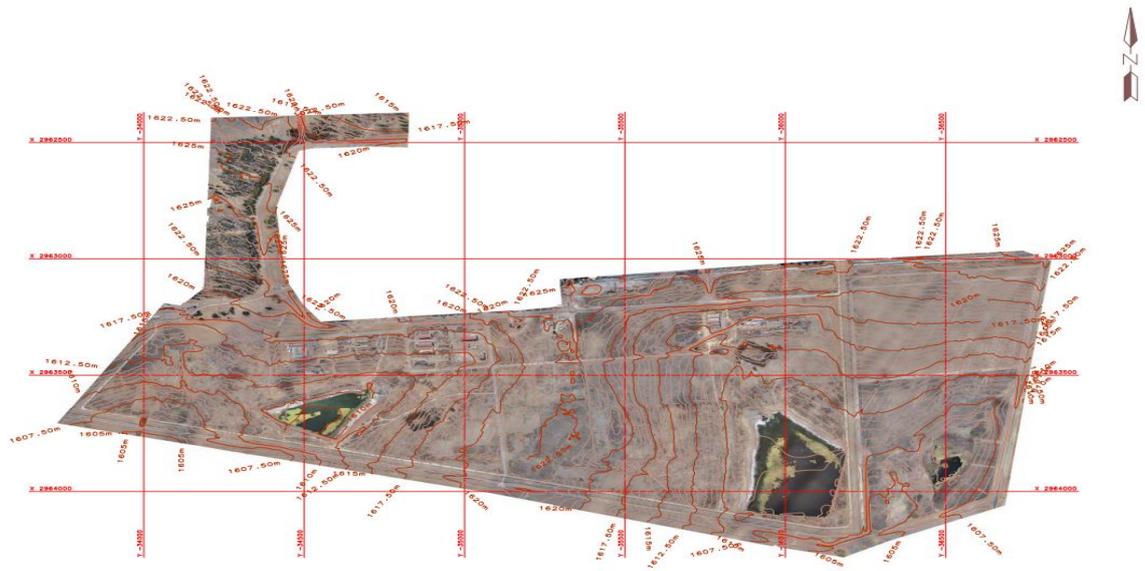
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Below is the layout plans produced from the survey.

Contour Plan



Contour Plan with Image





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Full Topographical Survey with the Image



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Deliverables attached:

- List of coordinated of all the survey
- CAD files of all drawings
- PDF file of all the Layout drawing
- CAD files of contours for the Tache survey
- CAD files of the topographic details

Approval:

	NAME	SIGNATURE	DATE	REGISTRATION
COMPILED BY: MKMAKAFANE (PTY) LTD. REPRESENTATIVE	ME MAKAFANE		13/10/2022	GTcES1506