WINE ESTATE
CAPITAL MANAGEMENT
SOUTH AFRICA

PROPOSED SOLAR POWER FACILITY
PORTION 7 OF OLYVEN KOLK 187
KENHARDT SOUTH AFRICA

FLOODLINE REPORT

September 2018

Compiled by:

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1 EXECUTIVE SUMMARY

SKCMasakhizwe Engineers (Pty) Ltd (SKCM) was appointed by Wine Estate Management to determine the 1:100 year flood lines for the above mentioned project.

The main objective of the investigation was to calculate the 1:100 year return periods peak flow at representative cross sections along the relevant water courses and plot the floodlines on a drawing. The proposed solar power site is also indicated on this drawing.

As it can be seen from Figure 7, the proposed photovoltaic panels are located above the 1:100 year flood lines. The risk of flooding and associated damage to the structures is in our opinion, low.

2 INTRODUCTION AND TERMS OF REFERENCE

Wine Estate Management is investigating the feasibility of establishing a solar power facility near Kenhardt in the Northern Cape.

The site is situated to the west of the Kenhardt-Pofadder gravel road and approximately 10km north-east of the existing Eskom Aries substation.

SKCM was requested to calculate the 1:100 year return period peak flow at representative cross sections along the relevant water courses and plot the floodlines on a drawing.

This report outlines the methodology followed and the results obtained.

3 FLOOD HYDROLOGY

The study area is situated in an arid region with a very low annual rainfall of 127mm and annual evaporation of between 2 600mm and 2 800mm per annum. Average temperatures vary between approximately 20°C in July and 36°C in January.

There are two main watercourses running through the site. These water courses are shown in Figure 2. The water courses flows in a north easterly direction towards the Graafwater River. Various minor water courses also crosses the site. The slope on the site can be classified as flat (<3.5%). The vegetation is mostly sparse grass and light thorn shrub growing in the watercourses. The uppermost soils of the site are very permeable, with the harder layers below being described as impermeable. The watercourses are partially overgrown with thorn shrub and in general are fairly straight with constant gradients with no natural or manmade ponds or dams.

3.1 Design Flood

The Rational Method and the Alternative Rational Method was considered to determine the design flood. The Rational Method is better suited to catchment areas of less than 15km², whereas the alternative rational method was developed for catchment areas bigger than 15 km². Both methods are however extensively used for both large and small catchment areas. For this report the Rational Method was used to calculate the design flood.

Table 1: Rational Method calculation data

Watercourse Designation		
Parameter	Drainage Line 1	Drainage Line 2
Catchment Area (km^2)	4.20	0.95
Longest Watercourse (km)	3.2	1.90
Average Slope (m/m)	0.013	0.013
Time of Concentration (hours)	0.90	0.55
Runoff coefficient	0.168 (1:100)	0.168 (1:100)
Rainfall intensity (mm/h)	50 (1:100)	75 (1:100)
Peak Flow (m^3/s)	9.8 (1:100)	3.32 (1:100)

4 FLOOD HYDRAULICS

A contour plan was generated using the Google Earth website. Representative cross sections of the water courses were extracted using the contour plan.

Using the formula derived by Manning to determine the flow rate in a given section for a specified water depth and bed slope, graphs depicting flow rate vs flow depth were generated. Manning's roughness coefficient was taken as 0.018 in all instances. From the generated graphs, the flood level depth for the 1:100 year floods could then be determined. These depths were converted into a horizontal offset from the centre of the watercourse. The maximum offset, calculated from the centre of the water course, is 30m. This information, together with onsite observations and Google Earth imagery, was used to generate the flood lines indicated on drawing Figure 7.

5 FLOOD RISK ASSESSMENT

The photovoltaic panel installation is generally situated at least 100m from away from the centre of the water course in order to be positioned well above the 1:100 year flood line. The gradient of the terrain is generally flat (<1.5%). Sheet flooding will occur during abnormal high rainfall. Cut off drains can be constructed above the sites to divert storm water away from the sites to minimise the sheet flooding.

The panels are mounted on a frame structure anchored in the ground. This type of construction will allow the free flow of surface water underneath the panels. Due to the gentle slope of the site, rapid surface water flow is not expected. The risk of flooding and associated damage in the areas indicated for the panel installation, is therefore low.

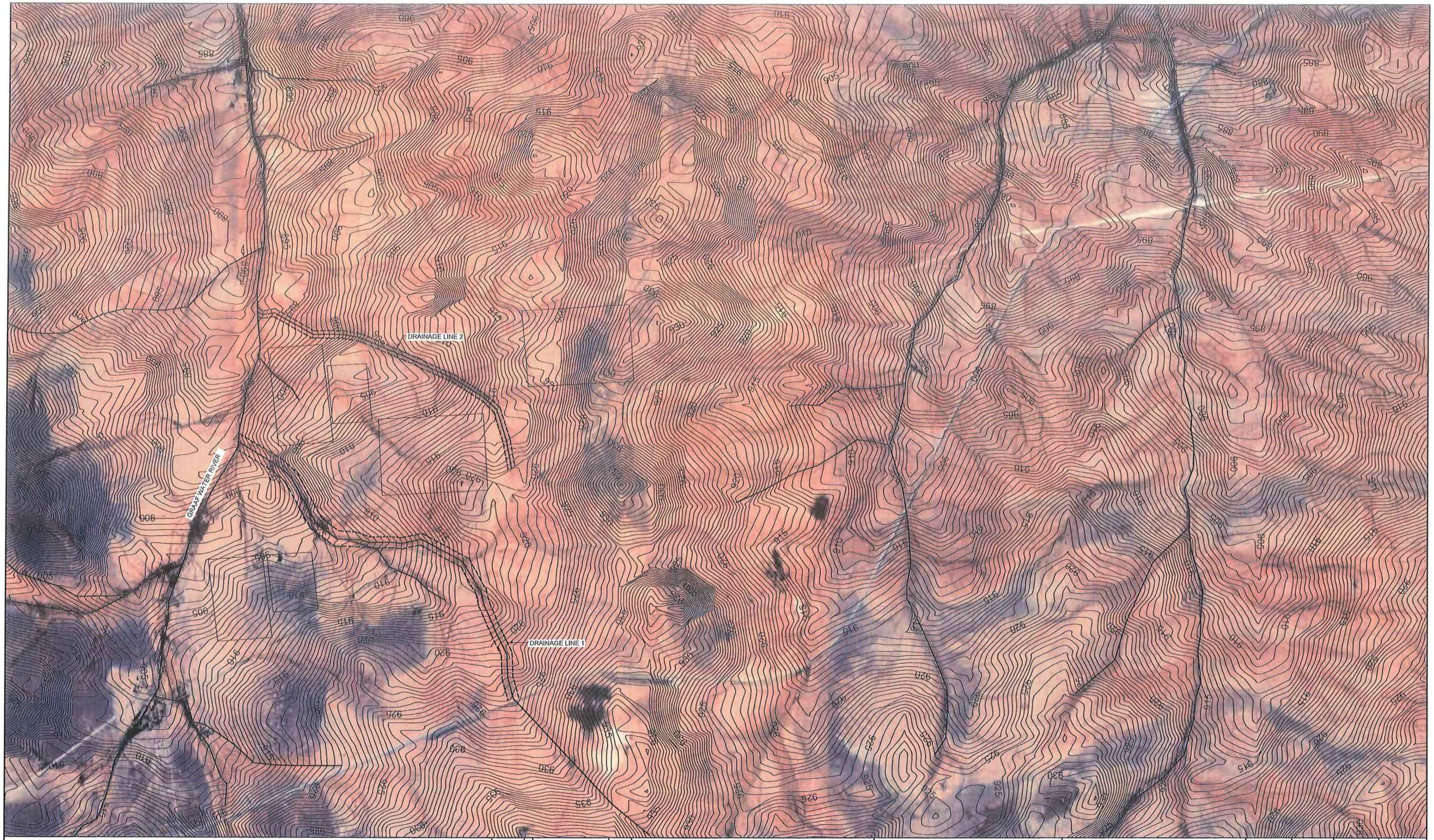
6 DISCUSSION

A conservative approach was adopted during plotting of the floodlines on Figure 7 to compensate for the deficiencies of the computer generated contour lines extracted from Google Earth imagery. The generated contours correlate fairly well with actual conditions on site.

7 CONCLUSION

The proposed development is situated above the 1:100 year floodline. The risk of flooding is low, even during abnormal weather conditions.

MPJ Loubser Pr Eng
For SKCM



DESCRIPTION: **PROPOSED NEW SOLAR POWER FACILITY - PORTION 7 ON OLYVEN KOLK 187, KENHARDT SOUTH AFRICA**

DATE		REFERENCE	BY
06/09/18	1	REPORT	M.dB

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TITLE: FLOOD LINES LAYOUT

CLIENT: WINE ESTATE CAPITAL MANAGEMENT SOUTH AFRICA

	BY	DATE	CH
DESIGNED			
DRAWN	M.dB	2018/09/06	ML
TRACED			

SCALE : 1:5000

DRAWING NO.: FIGURE 7

REVISION: 1