

# HARDEVELD PV

## PRELIMINARY WATER CONSUMPTION STUDY



Photo: ACCIONA

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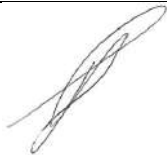
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## LIST OF ACRONYMS

AC	Alternating Current
kV	Kilovolt
MW	Megawatt
MWp	Megawatt Peak
PV	Photovoltaic
SEF	Solar Energy Facility
SWSA	Strategic Water Source Areas
UN	United Nations
Wp	Watt Peak
WUL	Water Use License

## 1. PURPOSE AND SCOPE

This document defines the scope of the study for the definition of water needs and consumption during the **Construction Phase** and in the **Operation Phase** for the Hardeveld PV Project in the Western Cape, South Africa.

## 2. LOCATION

Hardeveld PV (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility (SEF), called Hardeveld PV, located on the Remaining Extent of Farm 423 south-east of Beaufort West in the Western Cape Province. Hardeveld PV will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 120 MW. The project is situated within the Beaufort West Local Municipality within the Central Karoo District Municipality.

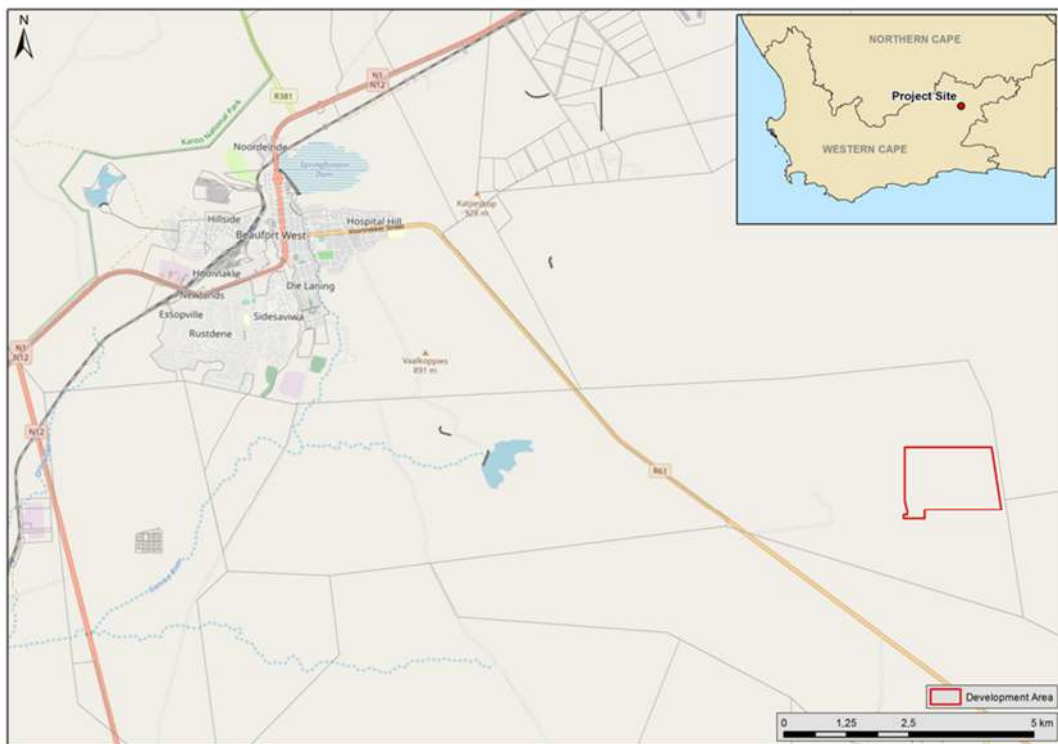


FIGURE 1: HARDEVELD PV PROJECT

### 3. BASIC DESCRIPTION OF THE FACILITIES

The solar photovoltaic (PV) plant will have a maximum net AC electrical generating capacity of 120 MW.

The main elements of the Hardeveld PV Project will be as follows:

- Modules (solar panels),
- Inverters,
- Transformers,
- Medium-voltage grid,
- Transformer Substation, and
- Internal and external roadways.

### 4. WATER NEEDS AND CONSUMPTIONS

#### 4.1. INTRODUCTION

The estimates are based on two distinct phases, the first one being for the **construction** of the solar energy facility, and the second phase corresponding to the **operation & maintenance** of the installed energy-generating infrastructure.

#### 4.2. CONSTRUCTION PHASE

The **Construction Phase** of the Hardeveld PV Project is broken down into two categories of requirements, **Sanitation** (drinking, cooking and cleaning) and **Construction Processes**. The construction duration of the SEF is estimated to be 18 months.

##### 4.2.1 SANITATION WATER REQUIREMENTS

It is estimated that there will be approximately 500 workers on site at the peak of the construction period. The average number of construction workers on site per day is estimated to be approximately 250. The United Nations (UN) suggests that a person needs in the region of 20 - 50 Litres of water a day to ensure their basic needs for drinking, cooking and cleaning (UN-Water, n.d.). The following calculations assume 50 Litres/worker/day with the assumption that **portable chemical toilets** will be used at the construction site.

TABLE 1: CONSTRUCTION SANITATION WATER REQUIREMENTS

Consumption (Litres/worker/day)	Construction Duration	Workers on site	Total Consumption (Litres)	Total Consumption (m <sup>3</sup> )
50	540 days	250	6,750,000	6,750

##### 4.2.2 CONSTRUCTION PROCESS WATER REQUIREMENTS

Water consumption during the construction process is associated primarily with the compaction of roads to meet minimum quality requirements. The requirement is estimated to be 50 Litres/m<sup>3</sup>. A further 7,500 m<sup>3</sup> quantity has been allowed for other general uses such as concrete curing, road maintenance, terrain irrigation etc.

TABLE 2: CONSTRUCTION PROCESS WATER REQUIREMENTS

Construction Process	Consumption (Litres/m <sup>3</sup> )	Construction Quantities	Total Consumption (Litres)	Total Consumption (m <sup>3</sup> )
Compaction of roads	50 Litres/m <sup>3</sup>	35,000 m <sup>3</sup> of granular material	1,750,000	1,750
Others	-	-	-	7,500
<b>TOTAL</b>				<b>9,250</b>

**Note:** Recycled water as opposed to potable water may be used for the above construction processes.

### 4.3. OPERATIONAL PHASE

The **Operational Phase** of the Hardeveld PV Project is broken down into two categories of requirements, **Sanitation** (drinking, cooking and cleaning) and **Plant Maintenance** (module cleaning and road maintenance & irrigation). The operation duration of the SEF is estimated to be a minimum of 20 years.

#### 4.3.1 SANITATION WATER REQUIREMENTS

Employment numbers at a solar energy facility depends largely on the extent to which operational processes are automated. For the purpose of these calculations, it is assumed that the Hardeveld PV Project will employ a maximum of 60 workers at any given point in time during the 20-year operational lifespan of the Plant. The United Nations (UN) suggests that a person needs in the region of 20 - 50 Litres of water a day to ensure their basic needs for drinking, cooking and cleaning (UN-Water, n.d.). Assuming 50 Litres/worker/day, the total annual consumption during the operational phase of the facility is calculated to be **1,095 m<sup>3</sup>**.

#### 4.3.2 PLANT MAINTENANCE WATER REQUIREMENTS

##### Module cleaning

For this purpose it is assumed that the solar PV modules will be cleaned twice per annum. Assuming a module size of ~550 Wp, the facility will see approximately 218 181 units installed. The estimated water consumption is calculated in the following table.

TABLE 3: PLANT MAINTENANCE WATER REQUIREMENTS

Quantity (modules)	Area (m <sup>2</sup> per module)	Water Consumption (Litres/m <sup>2</sup> )	Consumption per Clean (Litres)	Cleans/year	Annual Consumption (m <sup>3</sup> )
218 181	2.58	3	1 688 720	2	<b>3 377</b>

##### Road maintenance

It is assumed that 541 m<sup>3</sup>/year will be required for road maintenance and irrigation purposes.

#### 4.3.3 WATER STORAGE REQUIREMENTS

It is assumed that potable water will be stored in small water tanks on site. A typical example of such would be a standard JoJo 5,000 Litre water tank measuring 1,820 mm in diameter and 2,100 mm in height.

Grey water and sewerage will be discharged to an approved watertight septic tank system, for collection by authorized agents.

### 5. SUMMARY OF WATER CONSUMPTION

The total water consumption estimated for the **Construction Phase** is **16,000 m<sup>3</sup>**, for the total **18-month construction period**.

The total water consumption estimated for the **Operational Phase** is **~4,000 m<sup>3</sup> per annum**, for the **20-year operational lifespan** of the SEF.



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