



## **BULK ENGINEERING SERVICES STUDY: HAKSKEENPAN**



**BVI Consulting Engineers (Northern Cape)**

55 Bult Street  
UPINGTON  
8801

PO Box 1155  
UPINGTON  
8800

Tel: +27 (0)54 337 6600  
Fax: +27 (0)54 337 6699

## PROJECT DETAILS

**PROJECT** : Bulk Engineering Services Study – Hakskeenpan  
**LOCATION** : Mier  
**CONTENTS** : Bulk Engineering Services Report  
**REPORT STATUS** : Final Report (Rev002)  
**DATE** : 30 August 2017

**CONTRACTING AUTHORITY** :



**Economic Development & Tourism**

Department  
Economic Development & Tourism  
NORTHERN CAPE PROVINCE  
REPUBLIC OF SOUTH AFRICA

**CONSULTANT** : BVI Consulting Engineers  
55 Bult Street, Upington, 8801  
Tel: +27 (0)54 337 6600 / Fax: +27 (0)54 337 6699

**AUTHORS** : *Mr. Malcolm Du Plessis*

Report compiled by:



.....  
Malcolm Du Plessis  
Pr Eng (Civil)

30-08-2017  
.....  
Date

# CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	TERMS OF REFERENCE .....	1
1.2	SITE DESCRIPTION.....	2
<b>2</b>	<b>WATER SUPPLY .....</b>	<b>4</b>
2.1	OVERVIEW.....	4
2.2	OPTION ANALYSIS.....	5
2.2.1	<i>Construction of water supply pipelines to the Landside Site and Trackside Site:.....</i>	<i>5</i>
2.2.2	<i>Carting of water to Landside Site and Trackside Site:.....</i>	<i>5</i>
<b>3</b>	<b>SANITATION .....</b>	<b>6</b>
3.1	OVERVIEW.....	6
3.2	OPTION ANALYSIS.....	7
3.2.1	<i>Increasing the capacity of the Rietfontein WWTW and carting of sewage .....</i>	<i>7</i>
3.2.2	<i>On-site treatment.....</i>	<i>7</i>
3.2.3	<i>Chemical ablution facilities &amp; On-site wastewater storage facilities.....</i>	<i>7</i>
<b>4</b>	<b>ROADS AND ACCESS .....</b>	<b>8</b>
4.1	OVERVIEW.....	8
<b>5</b>	<b>SOLID WASTE .....</b>	<b>10</b>
5.1	OVERVIEW.....	10
5.2	EVALUATION OF REGISTERED LANDFILL SITES .....	11
5.3	COST ESTIMATE FOR SOLID WASTE DISPOSAL.....	13
<b>6</b>	<b>ELECTRICITY SUPPLY .....</b>	<b>14</b>
6.1	OVERVIEW.....	14
6.2	OPTION ANALYSIS:.....	14
6.2.1	<i>Submission of an Eskom Application.....</i>	<i>14</i>
6.2.2	<i>Renewable Energy.....</i>	<i>14</i>
6.2.3	<i>Diesel Generators .....</i>	<i>15</i>
6.3	FINANCIAL IMPLICATIONS AND RISK ASSESSMENTS .....	15
<b>7</b>	<b>CONCLUSION.....</b>	<b>16</b>



## LIST OF FIGURES

Figure 1: Locality map	2
Figure 2: Hakskeenpan - Site layout	3
Figure 3: Proposed water connection points	4
Figure 4: Rietfontein Waste Water Treatment Works	6
Figure 5: Site Access	8
Figure 6: Landfill Sites Register	10
Figure 7: Locality of registered landfill sites	11
Figure 8: Groot Mier Landfill Site	11
Figure 9: Loubos Landfill Site	12
Figure 10: Philandersbron Landfill Site	12
Figure 11: Rietfontein Landfill Site	13

# 1 INTRODUCTION

## 1.1 TERMS OF REFERENCE

- I. BVI Consulting Engineers were appointed by the Department of Economic Development and Tourism (hereinafter referred to as the Client) to undertake this Bulk Engineering Services Study (Water, Sewer, Electricity and Roads & Access) for the Hakskeenpan located in the area of Mier within the jurisdiction of the ZF Mgcawu District Municipality.
  
- II. The purpose of the Bulk Engineering Services Assessment is to determine the availability and capacity of existing bulk services. The anticipated Bloodhound event will be used to represent a worst-case scenario to estimate the capacity of available bulk services in the absence of reliable attendance figures. This report presents the findings of a preliminary site and desktop investigation relating to bulk services.
  
- III. The Bulk Engineering Services addressed in this report are the following:
  - ✓ Water Supply
  - ✓ Sanitation
  - ✓ Roads and Access
  - ✓ Electricity Supply
  
- IV. The following guidelines and references were used as the basis for the assessment of the above listed services:
  - ✓ The “Guidelines for Human Settlement Planning and Design” also commonly known as “The Red Book”.
  
- V. Due to limited available information, assumptions were based on the currently available site layout and an estimated attendance of 12,000 spectators and 400 staff members for the worst case scenario. Calculations and cost estimates were based on these figures.

## 1.2 SITE DESCRIPTION

- I. The project site in the Hakskeenpan is located in the Mier area within the jurisdiction of the Dawid Kruiper Municipality (refer to Figure 1 – Locality map).
- II. The location of the Hakskeenpan is: Latitude: 26°48'38.90"S, Longitude: 20°13'16.44"E.

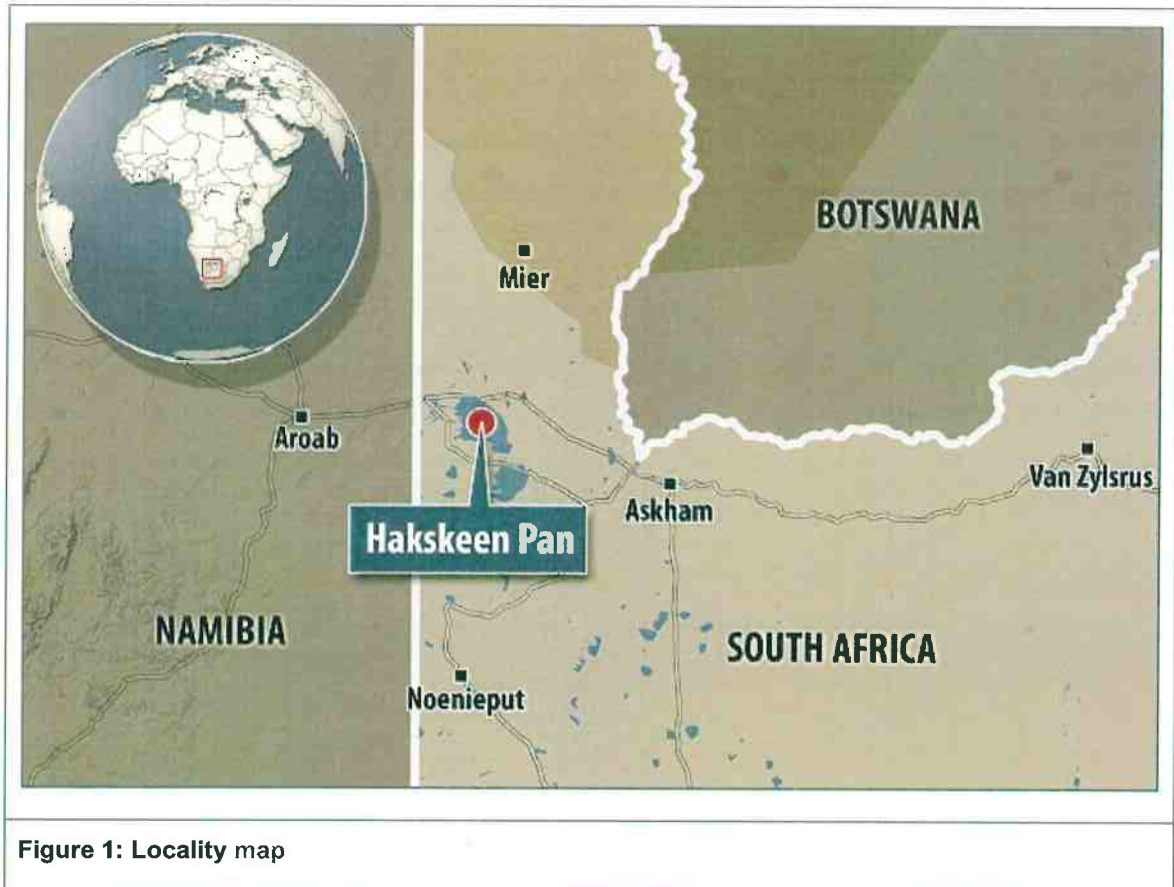


Figure 1: Locality map





## 2 WATER SUPPLY

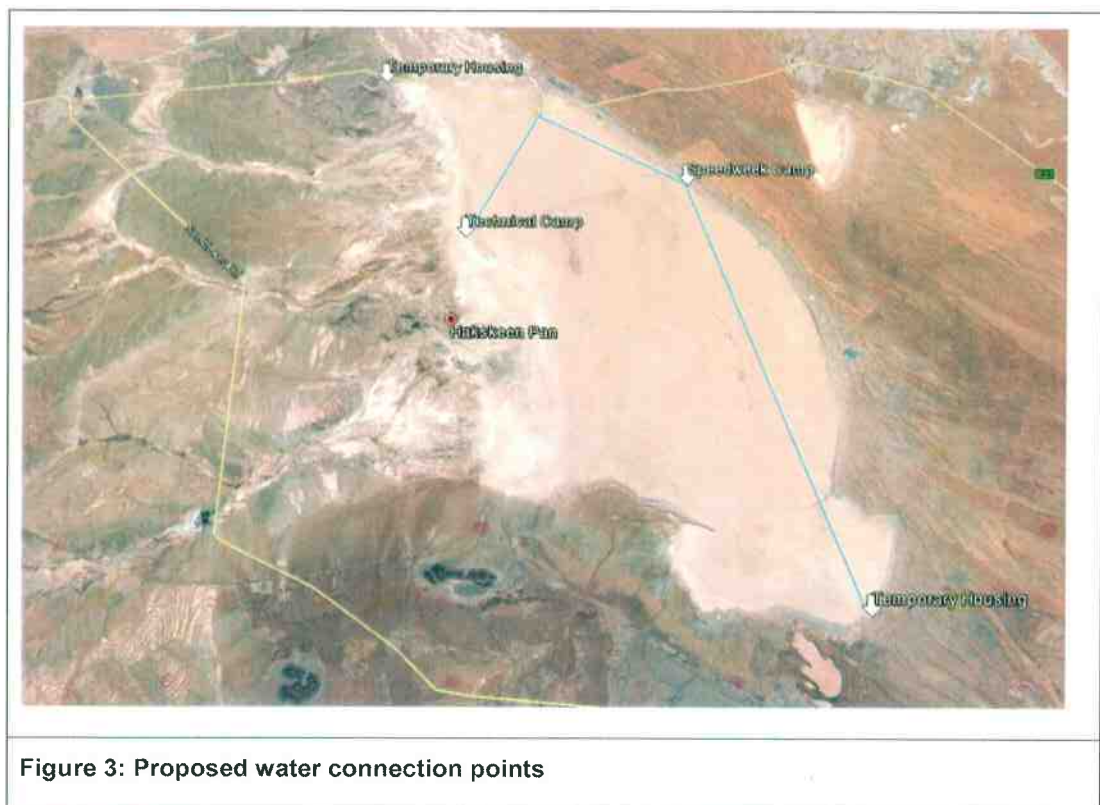
### 2.1 OVERVIEW

The Kalahari-East to Mier Pipeline runs within the R31 road reserve, adjacent to the Hakskeenpan. The pipeline was designed to supply potable water to the Mier area. The design capacity of the pipeline is approximately 13 l/s over twenty-four hours and operates under gravity.

A 21 ML earth-fill reservoir was also constructed approximately 6 km from Groot Mier to provide two weeks' storage capacity in the event of an emergency.

Water provision to Hakskeenpan is not expected to be a problem. Water provision for the Bloodhound event will be required at the Technical Camp, 4 x Temporary Housing Sites and the Speedweek Camp. A water distribution network of approximately 25 km will be required to serve the above-mentioned areas.

In the event that the demand exceeds the supply it is proposed that storage capacity be increased on site to store water during off peak times for use under peak conditions.





## 2.2 OPTION ANALYSIS

### 2.2.1 Construction of water supply pipelines to the Landside Sites and Trackside Sites:

This option entails the construction of a water distribution pipeline system to serve the technical camp, temporary housing sites as well as the speedweek camp. This is based on the existing site layout available. In addition to the above, four days' storage capacity in the form of polypropylene (JoJo) tanks will be required on site in the event of interrupted water supply and to accommodate peak flows.

#### 2.2.1.1 Cost Estimate:

DESCRIPTION	UNIT	SPECTATORS	STAFF
People	Number	12000	400
Water demand per person per day	Liters/day	20	60
Daily water demand	Cubic meters	240	24
Water storage days	Days	4	4
Total water storage capacity	Cubic meters	960	96
Number of 10 000 tanks	Number	96	10
Hours of water supply per day	Hours	20	20
Average flow for hours of water supply	Liters per second	3.3	0.3
Pipeline diameter @ 0.6l/s	mm	84	27
Pipeline distance	m	19865	4920
Rate per meter to build a pipeline	R/m	R 400.00	R 250.00
<b>Construction cost</b>	<b>R/m</b>	<b>R 7,946,000.00</b>	<b>R 1,230,000.00</b>

### 2.2.2 Carting of water:

This option entails the carting of water from Rietfontein to the Hakskeenpan.

#### 2.2.2.1 Cost Estimate:

DESCRIPTION	UNIT	SPECTATORS	STAFF
Distance for round trip for 10 000 litre truck	km	40	10
Travel time per trip @ 40km/h	Hours	1	0.25
Time to fill truck	Hours	0.5	0.5
Time to empty truck	Hours	0.5	0.5
Total time per 10 000 litres truck trip	Hours	2	1.25
Operating hours per day	Hours	10	10
Total trips per 10 000 litre truck per day	Number	5.0	8.0
Volume water that can be provided per day by one 10 000 litre truck	Cubic meters	50.0	80.0
Trucks needed	Number	5	1
Rate for water truck per day	R/day	R 5,000.00	R 5,000.00
<b>Cost per day to provide water by truck</b>	<b>R</b>	<b>R 25,000.00</b>	<b>R 5,000.00</b>

#### Note:

1. The total cost for carting of water will depend on the duration of the event.

### 3 SANITATION

#### 3.1 OVERVIEW

Wastewater generated during any event that is hosted on the Hakskeenpan will have to be collected and disposed off at an operational wastewater treatment works.

The closest operational wastewater treatment works is located at Rietfontein, approximately 14km from the Hakskeenpan. The treatment facility consists of a set of oxidation ponds. According to the municipality the system is already hydraulically overloaded due to the additional sewage load received from Philandersbron and Loubos and is unable to accommodate any additional load.



## 3.2 OPTION ANALYSIS

### 3.2.1 Increasing the capacity of the Rietfontein WWTW and carting of sewage

This option entails increasing the capacity of the existing wastewater treatment works at Rietfontein to accommodate the current sewage load from Rietfontein, Philandersbron and Loubos, as well as the sewage load that will be generated during any event hosted on the Hakskeenpan. A figure of 12,400 people was used at a flow of 15 l/c/d for spectators (12,000) and 50 l/c/d for staff members (400) to depict the worst-case scenario.

#### 3.2.1.1 Cost Estimate:

DESCRIPTION	UNIT	SPECTATORS	STAFF
<b>Construction cost</b>	<b>R</b>	<b>R4,750,000.00</b>	
Distance for round trip for 10 000 litre truck	Km	23	21
Travel time per 10 000 litre @ 40km/h	Hours	0.575	0.525
Time to fill truck	Hours	0.5	0.5
Time to empty truck	Hours	0.5	0.5
Total time per 10 000 litres truck trip	Hours	1.575	1.525
Operating hours per day	Hours	10	10
Total trips per 10 000 litre truck per day	Number	7.0	7.0
Volume sewage that can be handled per day by one 10 000 litre truck	Cubic meters	70.0	70.0
Volume of sewage generated	Cubic Meters	180.0	20.0
Trucks needed	Number	3	1
Rate for sewer truck per day	R/day	R5,000.00	R5,000.00
<b>Cost per day to dispose off sewage at Rietfontein WWTW</b>	<b>R</b>	<b>R15,000.00</b>	<b>R5,000.00</b>

### 3.2.2 On-site treatment

Depending on the volume generated, on-site treatment can be considered. This can be achieved by the construction of an on-site treatment facility, such as an oxidation pond system which require low maintenance. A package type plant can also be considered but requires electricity supply and usually has more operation and maintenance requirements. Environmental aspects will have to be considered.

#### 3.2.2.1 Cost Estimate:

The benchmark cost for oxidation ponds depend on the specific site, availability of materials and rates offered by the construction industry at any point in time. An Environmental Impact Assessment will likely be required which will impact on timeframes and cost.

### 3.2.3 Chemical ablation facilities & On-site wastewater storage facilities

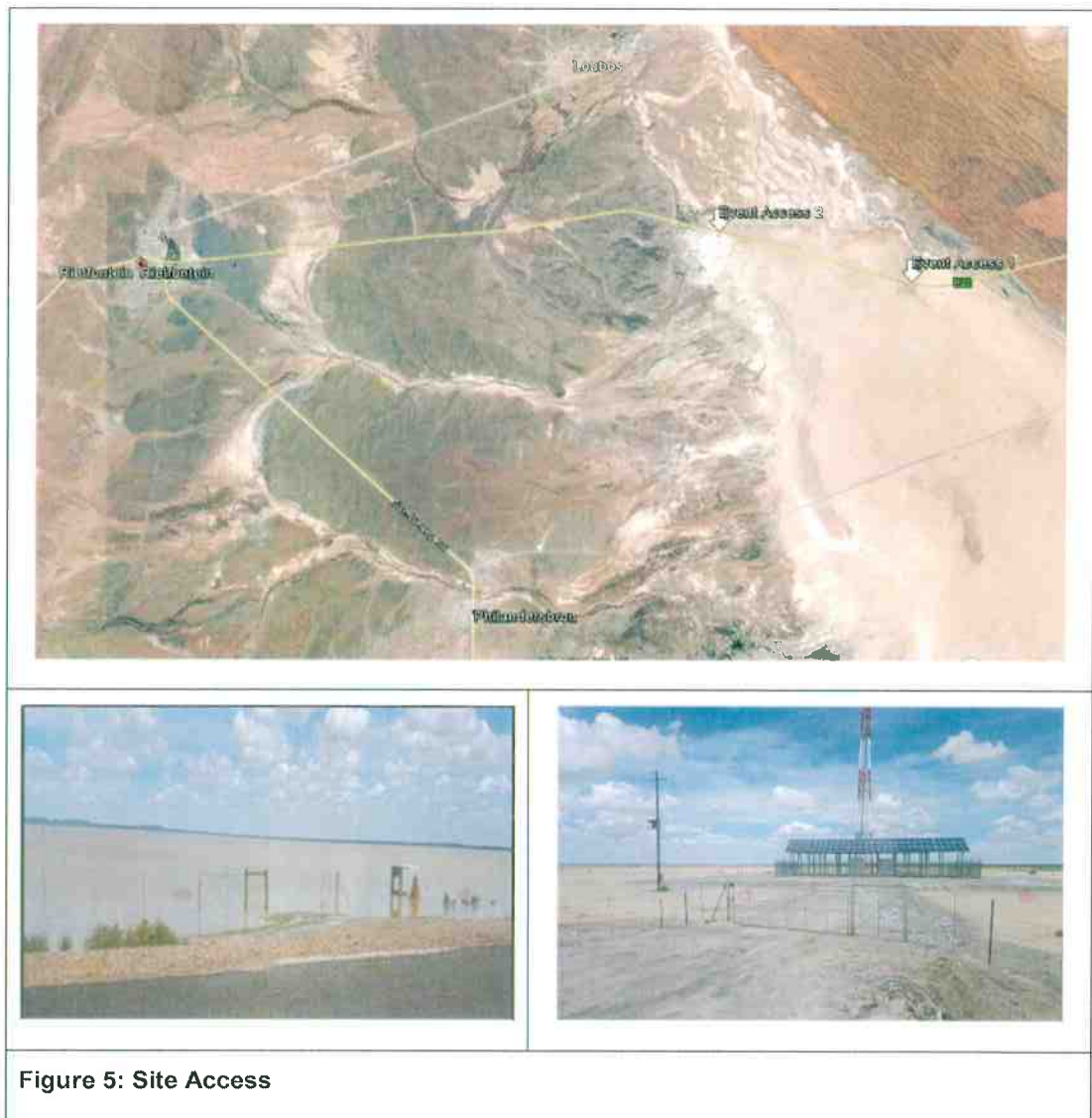
The wastewater collected on site will have to be disposed of at an operational wastewater treatment facility. The only wastewater treatment works in close proximity of the Hakskeenpan is at Rietfontein. The system is already overloaded and cannot accommodate any additional load. Both options will not be viable since the collected wastewater will in any case have to be disposed off at an operational wastewater treatment works.


## 4 ROADS AND ACCESS

### 4.1 OVERVIEW

Access to the event site will be obtained from the existing access on the R31 as indicated in Figure 5. Appropriate traffic management will be required at both existing entrances.

The R31 falls within the jurisdiction of the Department of Roads and Public Works, Northern Cape, who shall be the relevant authority regarding necessary access wayleaves and traffic management for the event. Traffic Management requirements and conditions will be prescribed by the Department of Roads and Public Works, Northern Cape.





The Department of Roads and Public Works will have to be formally notified in advance of the planned event and proposed access. Typically, the relevant authority is expected to request that a Traffic Management Plan be submitted for approval.

The Traffic Management Plan will generally include, but not be limited to;

- Temporary road signage
- Proposed access layout
- Planned site layout
- Parking facilities
- Emergency access
- Traffic flow analysis and conceptual planning

It is advisable to submit the required event information as soon as possible to allow sufficient time for feedback and approval process from the department in question.



## 5 SOLID WASTE

### 5.1 OVERVIEW

There are four registered solid landfill sites in the vicinity of Hakskeenpan. All of which are classified as Class G: C: B- disposal sites. The landfill classification is as follows;

- Waste class : General Waste (G)
- Size of landfill operation : Communal Landfill
- Site water balance : No significant leachate will be generated in terms of the Site Water Balance, so that a leachate management system is not required.

General Waste refers to any waste that does not fall within the definition of Hazardous Waste. In other words, waste that does not pose a significant threat to public health or the environment.

There is no registered hazardous waste landfill site in the Mier area.

General waste collected during any event must be disposed off at one of the registered solid landfill sites in the Mier area.

It is recommended that hazardous materials be procured from suppliers on a use-or-return basis. Any hazardous materials generated from categorised goods must be appropriately packaged for disposal at a registered hazardous waste landfill site.

The figure below contains the permit details for the respective sites.

Province	Permit Reference No	Waste Disposal Site	Class	Type of Facility	Date Issued	Permit Holder
Northern Cape	18/2/7/D421/D1/Z3/P358	Rietfontein	G:C:B-	Landfill	30/11/1999	The Management Council - Mier Rural Area
Northern Cape	18/2/7/D421/D1/Z5/P359	Philanderstron	G:C:B-	Landfill	30/11/1999	The Management Council - Mier Rural Area
Northern Cape	18/2/7/D540/D18/Z1/P360	Loubos	G:C:B-	Landfill	30/11/1999	The Management Council - Mier Rural Area
Northern Cape	18/2/7/D570/D1/Z1/P361	Groot Mier	G:C:B-	Landfill	30/11/1999	The Management Council - Mier Rural Area

**Figure 6: Landfill Sites Register (General Waste)**



Figure 7: Locality of registered landfill sites

## 5.2 EVALUATION OF REGISTERED LANDFILL SITES

<b>GPS Coordinates</b>	: 26°44'47.09"S 20°19'56.36"E
<b>Distance from Hakskeenpan</b>	: 16 km
<b>Condition</b>	: Fair
<b>Figure 8: Groot Mier Landfill Site</b>	





### 5.3 COST ESTIMATE FOR SOLID WASTE DISPOSAL

DESCRIPTION	UNIT	SPECTATORS	STAFF
People	Number	12000	400
Solid waste production per person per day	Cubic meters	0.0015	0.003
Daily solid waste production	Cubic meters	18	1.2
Solid waste storage days	Days	1	1
Total solid waste storage capacity	Cubic meters	18	1.2
Number of 200 litre tanks	Number	90	6
Cost for 200 litre tank	R/Unit	R 500.00	R 500.00
<b>Cost to provide 200 litre tanks for solid waste collection</b>	<b>R</b>	<b>R 45,000.00</b>	<b>R 3,000.00</b>
Distance for round trip for solid waste truck	Km	32	32
Travel time per trip @ 40km/h	Hours	0.8	0.8
Time to fill truck	Hours	0.5	0.5
Time to empty truck	Hours	0.2	0.2
Total time per solid waste truck trip	Hours	1.5	1.5
Operating hours per day	Hours	10	10
Total trips per solid waste truck per day	Number	7.0	7.0
Volume solid waste that can be handled per day by one solid waste truck	Cubic meters	35.0	35.0
Solid waste trucks needed	Number	1	1
Rate for solid waste truck per day	R/day	R 5,000.00	R 5,000.00
<b>Cost per day to dispose off solid waste per truck</b>	<b>R</b>	<b>R 5,000.00</b>	<b>R 5,000.00</b>

**Note:**

1. The total cost for solid waste disposal will depend on the duration of the event.



## 6 ELECTRICITY SUPPLY

### 6.1 OVERVIEW

The Hakskeenpan falls within the Dawid Kruiper (Mier Local) Municipal Supply area. Eskom is currently the electricity supply authority for the Rietfontein, Mier, Loubos and surrounding areas.

Eskom supplies these towns via NAMPOWER from Kokerboom substation with an overhead power line. The upstream infrastructure from the desired point of supply at Hakskeenpan is at capacity and cannot accommodate additional loads or electrical connections.

Previous applications submitted to Eskom for electricity connections were not approved because of the lack in electrical supply capacity from Eskom.

The abovementioned information was gathered during an informal discussion with network analyzers and planners from Eskom.

### 6.2 OPTION ANALYSIS:

#### 6.2.1 Submission of an Eskom Application

The submission of the Eskom application for the desired electrical demand can be considered to obtain official feedback on the status quo of the infrastructure and available capacity.

#### 6.2.2 Renewable Energy

Renewable energy options for power supply are as follows:

- The construction of a Solar Photo Voltaic Plant might be considered to supply electricity during the day.
- Area lighting and personal lighting can be facilitated by rechargeable floodlights during the night.
- Warm water heating of water can be achieved by solar water geysers and/ or gas geysers
- Alternative energy sources can also be used for preparation of eatables and cooling of beverages.
- Solar photo voltaic installations can also be hired from suppliers for temporary use.
- Essential installations should however be supplied with diesel generators.
- The option to connect to the existing MTN facility supply can also be investigated.



### 6.2.3 Diesel Generators

Diesel generators are readily available and offer the option of renting diesel generators for temporary use.

It is anticipated that most of the equipment that will be utilized during any event will be fitted with on-board generators. Security lighting at the fuel parks will most likely also be powered by generators.

## 6.3 FINANCIAL IMPLICATIONS AND RISK ASSESSMENTS

	<b>ESKOM APPLICATION</b>	<b>RENEWABLE ENERGY</b>	<b>DIESEL GENERATORS</b>
<b>Initial Capital Investment</b>	Low	High	<b>Low</b>
<b>Maintenance and running costs</b>	None	Low	<b>High</b>
<b>Leading time</b>	High	High	<b>Low</b>
<b>Sustainability</b>	-----	Interim	<b>High</b>

## 7 CONCLUSION

Engineering services were assessed to determine spare capacity on the existing bulk infrastructure and compared to the estimated demand of the Bloodhound event (worst-case scenario).

The findings and conclusions in this report are based on a preliminary desktop study, as well as site investigations.

- **Bulk Water Supply** – Bulk water supply is considered in order should it be decided to construct permanent pipelines to accommodate both the Landside and Trackside sites. Water quality and quantity will be adequate in this instance.
- **Bulk Sewer** – The existing wastewater treatment works at Rietfontein is currently hydraulically overloaded due to additional load from Loubos and Philandersbron and will not be able to accommodate the sewage generated during the event. Temporary storage of wastewater on site will not be viable since it will have to be disposed off at an operational treatment facility. It is recommended that the existing wastewater treatment works at Rietfontein be upgraded, with approval from the Dawid Kruiper Municipality, to accommodate the sewage load generated on the Hakskeenpan. For estimation purposes, a figure of 12,000 spectators at 15 l/c/d and 400 staff at 50 l/c/d will be used respectively.
- **Roads and Access** – Access to the Hakskeenpan will be obtained from the existing access on the R31 which falls within the jurisdiction of the Department of Roads and Public Works, Northern Cape. Prior to any event hosted on the Hakskeenpan, the required event information and applications must be submitted to the Department of Roads and Public Works for approval. Requirements for traffic management and any other requirements will be prescribed by the department.
- **Solid Waste** – There are four registered landfill sites in a radius of approximately sixteen km around the Hakskeenpan. It is recommended that general waste collected at an event be disposed off at one of these sites, with the exception of the Loubos landfill site which is in a poor condition. Hazardous material must be procured on a use-or return basis and any hazardous waste generated must be appropriately packaged for disposal at a registered hazardous waste landfill site.
- **Electricity Supply** – The capacity of the bulk electricity supply infrastructure is inadequate to accommodate the event. Diesel generators are the recommended solution for electricity supply.