

Environmental Scoping Report

Establishment of a landfill site on the farm Northleigh 422/RE in the Viljoenskroon district, Free State

January 2017



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EXECUTIVE SUMMARY

The establishment of a landfill site at Viljoenskroon is an initiative by the Moqhaka Local Municipality in the Free State to manage the waste from Viljoenskroon and Rammulotsi. There is an existing landfill site. However, the existing site is within 500 m of the nearest residential houses and poorly managed with no daily covering. There is no access control or on-site management which leads to uncontrolled scavenging and fires that smoulders which causes excessive smoke. The location and present state of the site poses a serious health risk to local residents and has a major pollution risk to groundwater.

The main purpose of the project is therefore for the Moqhaka Local Municipality to establish a new landfill site which will have a lower negative impact on the environment and on local residents and a longer lifetime. Furthermore, by establishing a new landfill site, they will have an opportunity to rehabilitate the existing site.

The establishing of the landfill site includes applications for a Waste License in terms of the National Environmental Management: Waste Act (**NEMWA**), 2008 (Act No. 59 of 2008) and Environmental Authorisation (**EA**) in terms of the Environmental Impact Assessment (**EIA**) Regulations, 2010 under the National Environmental Management Act (**NEMA**), 1998 (Act No. 107 of 1998).

Alternatives

The following alternatives were considered during the study:

- Location: An extensive investigation was conducted to find the best location for the establishment of the landfill site. The following criteria were taken into account for the location of the landfill:
 - The prevailing wind direction, according to information obtained from the South-African Weather Service, is from the north east;
 - The wetland (i.e. Olifantsvlei) passes from the south east to Groot-Rietpan located in the north west of Viljoenskroon;
 - The landowner of the specific property as it will lower the cost of establishing a landfill site if the applicant (i.e. the municipality) is the landowner of the property;
 - The shallow water table closer to the wetland area. These areas are waterlogged and as a result will not be suitable for the establishment of a landfill site; and

- The land surrounding Viljoenskroon is zoned for agricultural use with very high potential.
- Technology: Proposals have been made to implement Pyrolysis of plastic wastes;
- Type of operation: The establishment of a transfer station was investigated whereby waste will be stored at a transfer station in Viljoenskroon temporarily and then transported to a larger landfill site (i.e. Kroonstad);
- No-go: A new landfill will not be established if the waste license is not issued.

(The alternatives will be discussed in more detail in Section 5 of this report)

Baseline Assessments

A baseline site assessment was undertaken by EKO Environmental to identify and assess any potential impacts associated with the establishment of a landfill site.

Geotechnical reports were used to determine the most suitable location for the landfill.

Public Participation

The Public Participation Process will be conducted according to minimum requirements under the EIA Regulations (GN 594) of 4 December 2014 in terms of the National Environmental Management Act, Act 107 of 1998.

Comments and responses during the Public Participation process are included in section 8 and in Annexure 3 of this report.

A previous Public Participation Process was undertaken where the main concerns raised were the shallow water table and the location of the proposed landfill with specific reference to the distance of the landfill to the house of the adjacent landowner and the impact that the landfill will have on him and his business. (Refer to attached document in **Annexure 3**). The location of the landfill was addressed and the site was moved further away from his residence.

TABLE OF CONTENTS

1	EKO ENVIRONMENTAL	2
2	LIST OF APPENDICES	VII
1	INTRODUCTION.....	1
1.1	Background to the existing site:.....	1
1.2	Landfill Classification:	1
1.3	The Need for a new waste disposal facility	4
1.4	The Applicant	5
1.5	The Environmental Assessment Practitioner	5
2	PROJECT DESCRIPTION.....	6
2.1	Establishment of a new landfill site	6
2.2	Existing infrastructure and services.....	6
2.3	New infrastructure and services	6
3	PROPERTY DESCRIPTION	7
3.1	Regional setting	7
3.2	Zoning	7
4	PROJECT MOTIVATION.....	8
5	ALTERNATIVES.....	9
THE FOLLOWING ALTERNATIVES IN TERMS OF SITE SELECTION, TECHNOLOGY AND DESIGN ALTERNATIVES WERE CONSIDERED DURING THE STUDY:.....		
5.1	Site alternatives:.....	9
5.1.1	Alternative 1:	9
5.1.2	Alternative 3:	11
5.1.3	Alternative 3:	13
5.1.4	Alternative 4:	14
5.2	Technological alternatives.....	17
5.2.1	Pyrolysis of plastic waste	17
5.3	Establishment of a transfer station.....	18
5.4	No-go alternative.....	18

6	DESCRIPTION OF THE RECEIVING ENVIRONMENT THAT MIGHT BE AFFECTED AND A DESCRIPTION OF ENVIRONMENTAL ISSUES, POTENTIAL IMPACTS AND CUMULATIVE EFFECTS.....	18
7.1	Geology and soil	18
	<i>Overview</i>	<i>18</i>
7.2	Climate.....	19
7.3	Air quality.....	20
7.4	Groundwater	20
	<i>Overview</i>	<i>20</i>
7.5	Surface water.....	21
	<i>Overview</i>	<i>21</i>
7.6	Land use.....	21
	<i>Overview</i>	<i>21</i>
7.7	Vegetation	22
	<i>Overview</i>	<i>22</i>
7.8	Animal life	23
	<i>Overview</i>	<i>23</i>
7.9	Cultural Heritage	23
	<i>Overview</i>	<i>23</i>
7.10	Noise	24
	<i>Overview</i>	<i>24</i>
7.11	Aesthetics	24
	<i>Overview</i>	<i>24</i>
7.12	Demographics and Regional socio-economic structure	25
	<i>Overview</i>	<i>25</i>
6	PUBLIC PARTICIPATION DURING THE SCOPING PHASE	25
7.1	Consultation process.....	25
7.2	Register of I&APs / Stakeholders / Authorities contacted during the consultation process	28
7	PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT	33
7.1	Assessment Methodology.....	33
6.1	Rating.....	34
7.2	EIA Process	35
	<i>7.2.1 Tasks anticipated for the EIA process</i>	<i>35</i>
	<i>7.2.2 Consultation and public participation process.....</i>	<i>36</i>
8	REFERENCES.....	36

1 List of Appendices

- Annexure 1 Project Team
- Annexure 2 Maps & Layout Plans
- Annexure 3 Public Participation Process
- Annexure 4 Other Information

1 Introduction

This Scoping Report forms part of the Environmental Impact Assessment process currently underway in accordance with the EIA Regulations of 2014 in terms of the NEMA, 1998 (Act 107 of 1998) to obtain a waste license in terms of the NEMWA, 2008 (Act 59 of 2008) to apply for an authorisation for the establishment of a new landfill site on the remainder of the farm Northleigh 422 in Viljoenskroon, Free State.

1.1 Background to the existing site:

The existing site does not comply with the minimum requirements for the management of a landfill and specifically to the required buffer zones to nearest residential houses. The site poses a serious health risk to the surrounding residents. The existing landfill site lacks efficient management: Waste in the landfill is not covered which leads to the waste being windblown and informal reclamation/recycling of waste at the landfill are not properly managed. Poor site management and lack of regular covering and the illegal burning of waste has a negative impact on the ambient air quality of the area.

The current state of the landfill poses a serious threat to the health of nearby residents.

There is no weighbridge at the existing landfill and records of incoming waste to the landfill are not kept.

The existing landfill is classified as a small landfill site based on its population data and design life.

1.2 Landfill Classification:

Type of waste:

G: General Waste

Landfill size:

According to the Department of Water Affairs (DWA) "Minimum Requirements for Waste Disposal by Landfill", the classification of a landfill in terms of its size is according to its Maximum Rate of Deposition (MRD). This is illustrated in the table below:

Landfill size classes:

Landfill Size Class	Maximum Rate of Deposition (MRD) Tons per day
Communal (C)	<25
Small (S)	>25 <150
Medium (M)	>150 <500
Large (L)	>500

The mass of general waste disposed of by one person with medium to low income is 0.5 kg/day while mass of waste generated by medium to high income person is 3.5 kg/day as indicated by the Department of Water Affairs (1998).

The population of Viljoenskroon (2094) and Rammulotsi (29376) combined is 31 470 (based on 2001 - 2011 Statistics South Africa). This data indicates an average growth rate of 1.48% per annum from 2001 and 2011. Data for population figures for Viljoenskroon and Rammulotsi between 2001 and 2011 are summarised in the table below:

Year	Viljoenskroon	Rammulotsi	Total
2001	2360	24465	26825
2011	2094	29376	31470
2001 - 2011 growth rate %	-1.270	1.672	1.48

To ensure reliability and thoroughness for the landfill classification process the (IRD) and (MRD) calculations will be done using a separate data set for each area that will be dependent on the new landfill. Thus the IRD's and MRD's for Viljoenskroon and Rammulotsi will be calculated separately and combined in order to ensure accurate calculations for this scoping report.

The existing waste stream was estimated by Moqhaka Local Municipality to be approximately 1500 – 2500m³ /month. If the waste has a mass of 0.6 tonnes/m³, the amount of waste would be roughly 14 400 tonnes per year. The existing waste stream (IRD) is approximately 39.4 tonnes/day.

Based on the population figures and an estimate of 0.5 kg waste disposed of per day per person in poor areas (the Rammulotsi population was used) and 3.5 kg waste disposed of per day per person in affluent areas (Viljoenskroon population was used), an estimate of 22.02 ton/day (14.6 ton/day for medium to low

income) and (7.3 ton/day for affluent areas) was calculated which amounts to roughly 5724.42 ton/year (based on 260 day year). Based on this, the Initial Rate of Deposition (**IRD**) is estimated at 22 tonnes/day refer to table below:

Area	Population	ton/day	ton/year (260 day)	Total ton/year	IRD ton/day
Viljoenskroon as affluent area (3.5kg per day)	2094	7.329	1905.54	5724.42	22.017
Rammulotsi as poor area (0.5kg per day)	29376	14.688	3818.88		

The design life of the proposed site is planned to be 20 years.

The MRD can be calculated by the following formula:

$MRD = IRD (1+d)^t$ where d is the expected population growth, and t is the design life. The MRD for the proposed landfill is 26.14 tonnes/day. The landfill size will thus be small (**S**) as the MRD will be between 25 - 150 tonnes/day.

Area	IRD	d (expected population growth %)	d (expected population growth %) per annum	MRD = $IRD(1+d)^t$	Total MRD
Viljoenskroon	7,33	-12,70%	-1,27%	5,68	26,14
Rammulotsi	14,69	16,7%	1,67%	20,46	

The estimated depth of excavatable cover in Viljoenskroon will be limited to between 0.5 m and a maximum of 1m due to the depth of the water table below natural ground level. This may change after completion of the Geo-hydrological studies in the EIA phase of the project. Based on this, the area required for the landfill will vary between 19.6 ha and 39.5 ha. This area has been identified to accommodate for any future expansion of the town population. This will prevent the landfill from expanding to within 500 m from any residence in the future.

Significance to generate leachate: (B- or B+)

To determine the classification of the sites in Viljoenskroon and to determine if leachate management would have to be implemented at the sites, the climatic water balance was calculated from data acquired from the Agricultural Resource Council (**ARC**). The data from the 10 wettest years was used to determine

the climatic water balance using the formula $B_{\text{(climatic water balance)}} = R_{\text{(Rainfall)}} - E_{\text{(Evaporation)}}$. The following is the calculations of the climatic water balance:

Number	Year	Rainfall (R)	Evaporation (E) X 0.7	Total (R – E)
Wettest year	1987 – 1988	839	730.8	+ 107.92
2 nd wettest year	2000 – 2001	542.1	895.65	-353.55
3 rd wettest year	1995 – 1996	755.9	947.94	-192.04
4 th wettest year	1999 – 2000	607.8	816.76	-208.96
5 th wettest year	1988 – 1989	641.7	730.24	-88.54
6 th wettest year	1992 – 1993	422.4	687.68	-265.28
7 th wettest year	1980 – 1981	630.2	826.98	-196.78
8 th wettest year	1998 – 1999	542.7	909.79	-367.09
9 th wettest year	1982 – 1983	210.4	992.32	-781.92
10 th wettest year	2001 – 2002	537.9	660.59	-122.69

The rainfall and evaporation was determined by using the wettest 6 months in each of the years (e.g. Nov – Apr or May – Oct). Please refer to **Annexure 5** for the rainfall data.

The calculations indicate that the sites identified for the establishment of a landfill site in Viljoenskroon will not require leachate management as it is classified as a **B-**. However, due to the shallow water table in the Viljoenskroon area and the potential risk of ground water contamination that will be assessed in the EIA phase, it might become necessary that, the landfill will be lined to prevent the contamination of groundwater.

The final classification of the proposed site: **GMB-**

1.3 The Need for a new waste disposal facility

There is currently a growing need for improved services within the area. The population numbers are increasing in Rammulotsi and with this the increased need for services such as waste disposal.

The current landfill site potentially has a significant threat to ground water sources due to the relative low regional groundwater levels and the poor management of the site. No, or very little covering is done and with insufficient measures to manage runoff. No groundwater monitoring is done to determine the potential impact.

The site is also a health and safety risk in that it exists in an unacceptable close proximity to the nearest residential area.

Because of the poor management (no covering), waste is almost constantly smouldering and generate thick smoke that is blown over the residential areas located down-wind of the prevailing wind direction (north-east) from the site.

Viljoenskroon and Rammulotsi is therefore in great need of a new waste disposal facility to dispose general waste in an environmentally sound manner.

1.4 The Applicant

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1.5 The Environmental Assessment Practitioner

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The project team:

Project Manager: Louis De Villiers

Environmental assessment Practitioner: Louis De Villiers

Assistant Environmental Assessment Practitioner: Louis De Villiers

Refer to **Annexure 1** attached hereto for the expertise of the project team to conduct the relevant studies.

2 Project description

2.1 Establishment of a new landfill site

The proposed project will consist of the establishment of a new landfill site and all associated structures and infrastructure for the disposal of general waste from Viljoenskroon and Rammulotsi.

2.2 Existing infrastructure and services

The proposed area where the new landfill will be established on the remainder of the farm Northleigh 422 is an open area and has no infrastructure or services.

2.3 New infrastructure and services

Buildings: An office building with a guard house and a recycling facility will be constructed at the proposed landfill site (Refer to site layout plans in **Annexure 2**).

Roads: Access to the landfill will be gained from Krige street (Refer to the site layout plans and maps in **Annexure 2**).

Services: Electricity will be supplied by the Moqhaka Local Municipality and will be connected to existing lines in the area.

Water and effluent: No water will be used at the proposed landfill. Storm water management systems will be implemented to divert clean water around the site. A pollution control dam will be established at the lowest point in the landfill area to contain all storm water from the operational area.

Waste: Due to the nature of the project, there will be waste at the facility. Waste will be disposed of and recycled at this facility.

2 Property description

The proposed landfill is located on the remainder of the farm Northleigh 422 approximately 1 500 m from Viljoenskroon and 1 200 m from Rammulotsi (Refer to the locality map in **Annexure 2**). Northleigh 422 is located in the Vaal-Vet Sandy Grassland (Mucina and Rutherford, 2006). The vegetation type is endangered. However, it should be noted that most of the indigenous vegetation on the site have been disturbed and/or removed as a result of crop production.

The remaining portion of Northleigh 422 is 110.356727 ha in size, and is the property of Maqhaka Local Municipality. The farm is bordered by the farm Marne 421 to the northeast, and the farm Vlakvlei 417 to the east, southeast and south of the site. The Rammulotsi Township borders the farm on the western side and Northleigh 422/1 borders the northern side.

The current land-use and zoning of the property is agriculture of high potential. However, the property was purchased by the Moqhaka Local Municipality and included in a future township development scheme. The loss of high potential agricultural soil will thus occur in the event of housing and establishment of a landfill. Because the land is owned by the municipality, this will lower the cost drastically as new land will not have to be purchased.

The border of the landfill has been changed and is now located not closer than 500 m from the residential house on the farm Vlakvlei 417/RE.

This proposed site is located approximately 500 m from the wetland (i.e. Olifantsvlei). Krige Street acts as a buffer between the wetland and the proposed landfill.

The prevailing wind direction in Viljoenskroon is a north-easterly wind. As the site is located to the east of the town and taking into consideration current and future development, any smoke and / or gasses related with the landfill site will generally be carried away from the residential areas and the CBD of the town.

2.1 Regional setting

Province: Free State Province
District Municipality: Fezile Dabi Municipality
Local Municipality: Moqhaka Municipality

2.2 Zoning

The zoning of the farm is agriculture. However, the farm was purchased by the Moqhaka Local Municipality for the purposes of the establishment of a township.

3 Project motivation

4.1 Legal requirement status

The following legal requirements have been followed when the process was conducted:

- National Environmental Management (**NEM**) Act, 1998 (Act 107 of 1998),
- NEM: Waste Act, 2008 (Act No. 59 of 2008),
- NEM: Air Quality Act, 2004 (Act No. 39 of 2004)
- Minimum Requirements for Waste Disposal by Landfill, DWA (Second edition, 1998),
- National Heritage Resources Act, 1999 (Act No. 25 of 1999)

4.2 Proposed project

Due to the state of the existing landfill site in Viljoenskroon, the municipality regards the establishment of a new landfill of very high priority.

The proposed landfill will be established over an area of 34 ha and will have the following facilities available:

- 10 m X 4 m weighbridge,
- Recycling facility,
- 3 X 3 m x 4 m Drop-off zones, and
- An office with a guard house.

The establishment of the new proposed landfill will benefit society and especially the local residents in the following manner:

- The actual land-filling and/or building area will be located more than 500 m from any residence,
- It will have a recycling facility which creates jobs for local residents,
- The recycling facility will ensure that the lifetime of the landfill is prolonged,
- A new landfill with proper management will result in a cleaner environment, and
- The establishment of the new landfill will create an opportunity for the municipality to close and rehabilitate the existing landfill site.

4 Alternatives

The following alternatives in terms of site selection, technology and design alternatives were considered during the study:

4.1 Site alternatives:

4.1.1 Alternative 1:

Site Coordinates:

<u>Farm</u>	<u>Coordinates</u>	
<u>Penrith 321/2</u>	27.194083° S	26.906961° E

Site C is located on the farm Penrith 321/2 to the west of Viljoenskroon. Portion 2 of the farm Penrith is 168.786143 ha in size and is privately owned and will have to be purchased by the applicant if this site is decided upon to be used for the landfill. This farm is bordered in the east, north east by the farm Grootrietpan 45 and Penrith 321/RE to the north. The southern, south eastern side of this site is bordered by the farm Appleby 579.

Positive attributes of the site for landfill establishment:



- The dominant wind direction for the area is a north-eastern wind. As the site is located to the west of the town and taking into consideration current and future development, any smoke and / or gasses related with the landfill site will generally be blown away from the residential areas and the CBD of the town but may impact on neighbouring farm yards which is located on the downwind side of the predominant wind direction.
- The site is located approximately 2km west of the wetland (i.e. Olifantsvlei) and will thus not have a major impact on the wetland. Witpan is situated approximately 1km south of the site.
- The site is located at the intersection of the R59 from Bothaville and the S632. It may thus have a negative aesthetic impact on passing motorists. However, the view to the site is blocked by the bridge over the S632.

Negative attributes of the site for landfill establishment:

- The land is privately owned by (to be confirmed) and will have to be purchased by the municipality if it proof to be the most appropriate site to establish the new landfill. It will thus increase the cost of establishing the landfill on this site drastically.

- The land use or zoning of this property is high potential agriculture and is currently used for crop production. High potential agricultural soil will be lost if this proposed site is decided on.
- Access to the site can be gained from S632. However, a railway line running parallel to the S632 will have to be crossed to enter the site. Thus, a bridge will have to be constructed over the railway to enter the site. Entrance can also be gained from the R59. However, constructing an access road from the R59 will pose a safety risk for motorists as the bridge over the S632 will impede the view and the access road to the site and motorists using it may not be noticed.



A photograph of the site taken from the bridge over the railroad south of the site.	A photograph of the railroad and Krige Street towards the south west of the site.
	
A photograph taken from the railroad towards the site.	An indication of the bridge over the railway and Krige Street.

4.1.2 **Alternative 3:**

Site Coordinates:

<u>Farm</u>	<u>Coordinates</u>	
<u>Koningsdal 395/2</u>	27.220251° S	26.913961° E

Site D is located on the farm Koningsdal 395/2 to the south west of Viljoenskroon. The proposed portion of this farm has an area of 170.6295ha and is privately owned. The farm is bordered in the east by Koningsdal 395/3, the north Koningsdal 395/1 and the south Koningsdal 395/RE. To the west of the site lies the farm Ethelsdale 405/RE. Witpan is situated about 530m North, North East of the site.

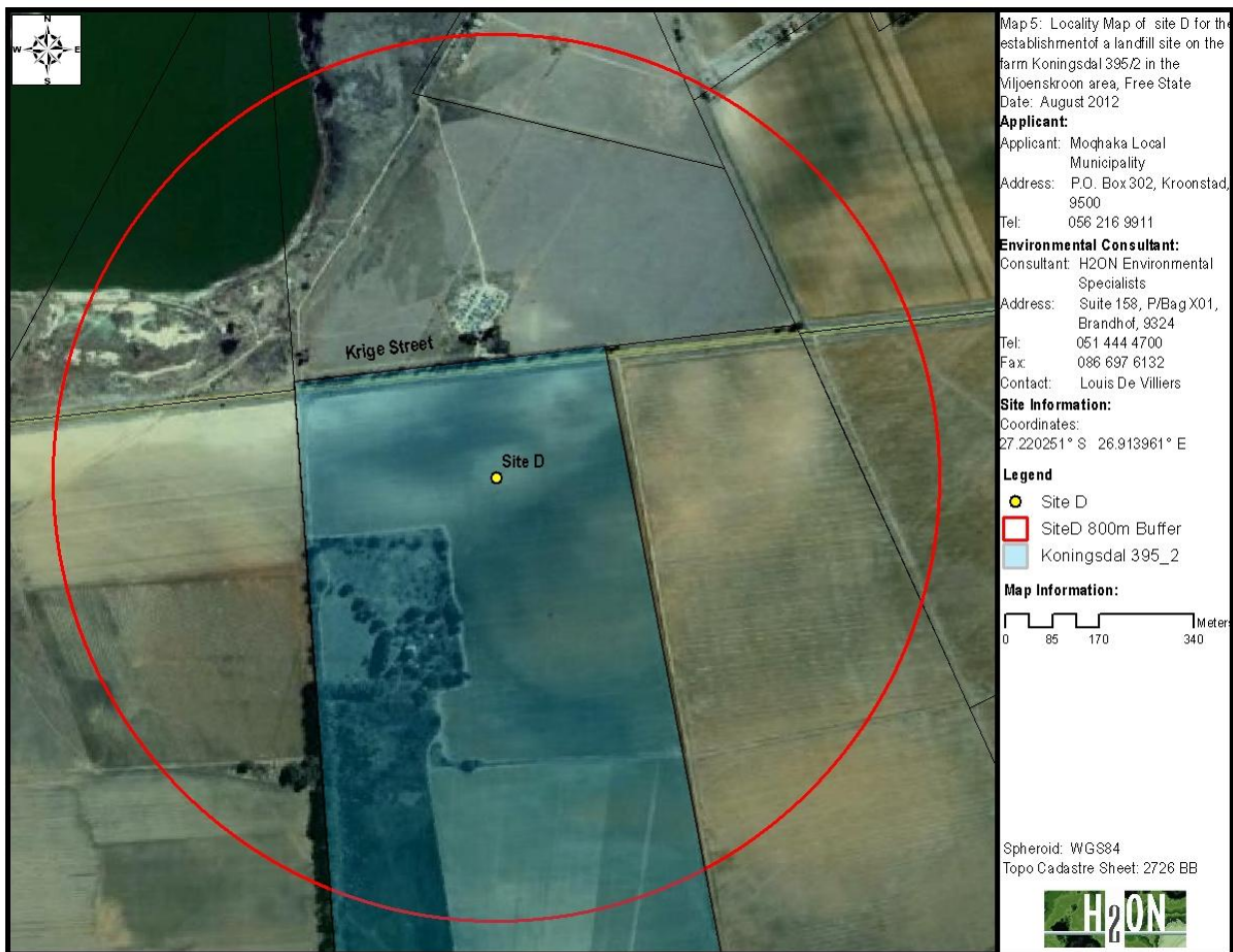
Positive attributes of the site for landfill establishment:

- The landfill site will be accessible from Reitz Street and will potentially be visible from the road as one enters the town on from Bothaville and may have a negative aesthetic impact. However, depending on the location of the site a tree line may be utilized to partially conceal the landfill site.
- The site is located approximately 2.3km west of the wetland (i.e. Olifantsvlei) and will thus not have a major impact on the wetland. Witpan is situated approximately 530m to the north of the proposed site. Reitz street will act as a buffer for any storm water from the landfill to enter it.
- There are no neighbouring houses located within 800m of the site.

- The dominant wind direction for the area is a north-easterly wind. As the site is located to the south west of the town and taking into consideration current and future development, any smoke and / or gasses related with the landfill site will generally be blown away from the residential areas and the CBD of the town.

Negative attributes of the site for landfill establishment:

- The property is privately owned by (to be confirmed) and will have to be purchased from the landowner in order to establish the landfill on this property. This will increase the cost and prolong the process of establishing a landfill site.
- The current land-use or zoning of the land is high potential agriculture and the land is currently used for crop production. If a landfill site is established on this proposed site, high potential agricultural soil will be lost.





A view from north of the site (Reitz Street) taken towards the site.



A view of the trees that may conceal the landfill site.

4.1.3 Alternative 3:

Site Coordinates:

<u>Farm</u>	<u>Coordinates</u>	
<u>Rammulotsi 590</u>	27.197997° S	26.973453° E

This site is located on the farm Rammulotsi 590 to the east of Viljoenskroon. The portion of this farm has an area of 137.81996 ha and is owned by the municipality. The farm is bordered by Rammulotsi neighbourhood to the north, north-west and Viljoenskroon to the west. Northleigh 422 is to the south of the site and Marne 421 to the east. The existing landfill site in Rammulotsi is situated approximately 850m from this proposed site.

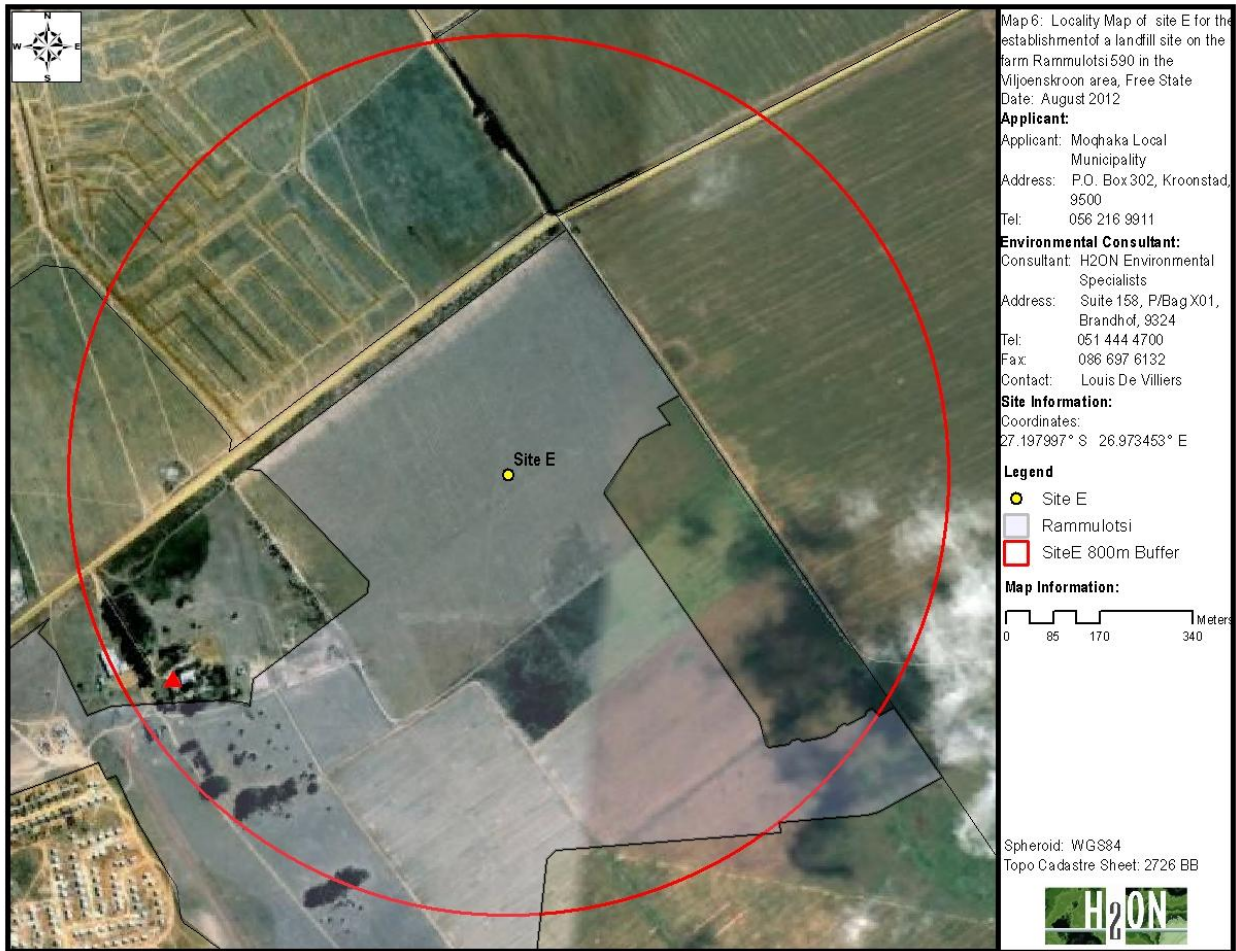
Positive attributes of the site for landfill establishment:

- The site is owned by Moqhaka Local Municipality and the land use or zoning of the land is high potential agriculture. However, the municipality will use the land for future town expansion or development. High potential agricultural soil will be lost when the land is used for town expansion and the establishment of a landfill site. Cost and time will be saved if it is decided that this proposed site will be used for the establishment of a landfill site as the applicant is also the landowner.
- Entrance to the site will be gained from the S1230 in Rammulotsi. The proposed alternative site is not situated near town entrances and will thus not have a negative aesthetic impact on passing motorists.

- The site is located more than 3km north of the wetland (i.e. Olifantsvlei) and will thus not have a major impact on the wetland.
- There are neighbouring houses located approximately 650m from the site and the site is reserved for future town expansion.

Negative attributes of the site for landfill establishment:

- The prevailing wind direction for the area is a north-easterly wind. As the site is located to the east of the town and taking into consideration current and future development, any smoke and / or gasses related with the landfill site will be blown towards the newly planned residential areas.



4.1.4 Alternative 4:

Site Coordinates:

<u>Farm</u>	<u>Coordinates</u>	
<u>Appleby 579/0</u>	27.200290°S	26.904825°E

Site F is located on the farm Appleby 579/0 to the west of Viljoenskroon. The farm Appleby is 466.9769ha in size and is privately owned and will have to be purchased by the applicant if this site is decided upon to be used for the landfill. This farm is bordered in the east by the farm Panbit 578, north by the farm Penrith 321/2. The southern, south eastern side of this site is bordered by the farm Huntersvlei 401.

Positive attributes of the site for landfill establishment:

- The site is located approximately 2.2km west of the wetland (i.e. Olifantsvlei) and will thus not have a major impact on the wetland. Witpan is situated approximately 550m south of the site.
- The dominant wind direction for the area is a north-eastern wind. As the site is located to the west of the town and taking into consideration current and future development, any smoke and / or gasses related with the landfill site will generally be blown away from the residential areas and the CBD of the town.

Negative attributes of the site for landfill establishment:

- The land is privately owned by (to be confirmed) and will have to be purchased by the municipality to establish the landfill on this site. It will thus increase the cost of establishing the landfill on this site drastically.
- The land use or zoning of this property is high potential agriculture and is currently used for crop production. High potential agricultural soil will be lost if this proposed site is decided on.
- Access to the site can be gained from S632 and the R59. However, constructing an access road from the R59 will pose a safety risk for motorists as the bridge over the S632 will impede the view and the access road to the site and motorists using it may not be noticed.
- The site is located at the intersection of the R59 from Bothaville and the S632. It may thus have a negative impact on passing motorists.
- There are some neighbouring houses located in close proximity to the site which may pose to be problematic for the establishment of a landfill site on this property.



A view of the site taken from the north of the site at the railroad.



A view of the house in close proximity to the site.



Houses on the farm Appleby 579/0.



A photograph taken towards the west of the site.

Note:

A negative factor at all sites is that the water table of the area surrounding Viljoenskroon is very shallow and will thus have a very thin unsaturated zone between the landfill base and the saturated subsoil. A landfill site on any land surrounding Viljoenskroon will have to be managed appropriately.

4.2 Technological alternatives

4.2.1 Pyrolysis of plastic waste

The pyrolysis of waste includes the establishment of a pyrolysis plant which can thermo-chemically decompose organic and inorganic material to produce pyro-oil, pyro-gas and carbon which can be used or sold as an end product. The pyrolysis plant and its associated infrastructure will have to be established on the farm Northleigh 422/RE, or relocated to a larger landfill (i.e. Kroonstad).

Positive attributes of the site for landfill establishment:

- The pyrolysis plant will prolong the lifetime of the landfill,
- A smaller area will be required to establish a landfill,
- The plant will create more job opportunities of which numerous will be specialised. This will result in skills development,
- An income will be generated from waste collected.

Negative attributes of the site for landfill establishment:

- An area will still be transformed for the sorting of other waste (excluding plastic) and the burial (i.e. land filling) of some waste streams,
- Should the plant be established in another town, a transfer station will have to be established in Viljoenskroon. The Department of Economic Small Business Development, Tourism and Environmental Affairs (**DESTEA**) waste department indicated that they will not consider a transfer station due to the high level of management that is required to operate such a site,
- A Public - Private Partnership will have to be established between the applicant and other shareholders to establish and manage all aspects of the plant,
- An atmospheric emissions license, among other, will need to be applied for before the plant can go into operation,
- The establishment and commencement with the pyrolysis plant will extend the timeframe of the establishment of a new landfill site which is a very urgent matter,
- The cost of purchasing, operating and maintaining the plant is very high.

4.3 Establishment of a transfer station

The establishment of a transfer station was considered as an alternative whereby waste from Viljoenskroon and Rammulotsi will be stored at a dedicated area in Viljoenskroon and transported to the Kroonstad landfill site on a weekly basis.

However, the DESTEA waste department indicated that they will not consider this alternative due to the lack of management of the landfill sites within the Moqhaka Local Municipality.

4.4 No-go alternative

If the no-go alternative is decided on, a new landfill will not be established and the current landfill will be used as presently. However, this will have a large negative impact on the health of the public and the environment. Refer to **Sections 1.1 and 1.3** in this report.

5 Description of the receiving environment that might be affected and a description of environmental issues, potential impacts and cumulative effects

7.1 Geology and soil

Overview

Viljoenskroon and immediate surrounding area falls in the Bd14 land type: The study area is underlain by the Ecca sandstone, mudstone and shale, with occasional dolerite sills. Aeolian sand overlies nearly all rocks.

The Viljoenskroon area is characterised by plinthic B horizons and soil forms mostly found in this land type is Avalon, Westleigh and Clovelly (Mucina & Rutherford, 2006 and DEA, 2001)

<p>Potential impacts</p> <p>Soil characteristics will change due to the disturbance of the soil and will become low potential agricultural soil.</p>	<p>Preliminary significance</p> <p>With proper management and the implementation of best practices the impact will be low.</p>
<p>Cumulative impacts</p> <p>There will be a negligible cumulative impact</p>	<p>Preliminary significance</p> <p>Negligible</p>

7.2 Climate

Overview

Viljoenskroon has a mean annual rainfall of approximately 541 – 582mm / annum according to ENPAT Data (DEAT, 2001). According to wind data gathered, it indicates that the prevailing wind in the area is from the northeast (Refer to wind roses in **Annexure 4**)

<p>Potential impacts</p> <p>The climate may change due to the establishment of a landfill site.</p> <p>Adjacent landowners to the southwest of the proposed landfill site may experience bad smelling odours generated by the landfill.</p>	<p>Preliminary significance</p> <p>No impact.</p> <p>If the landfill is managed appropriately, the impact will be low.</p>
<p>Cumulative impacts</p> <p>If the landfill is managed and maintained, there will be a negligible cumulative impact.</p>	<p>Preliminary significance</p> <p>Negligible.</p>

7.3 Air quality

Overview

Due to the fact that the Viljoenskroon area has very little major industrial facilities causing high atmospheric emissions, the overall air quality is good.

Potential impacts	Preliminary significance
The air quality may be negatively impacted upon by smouldering waste in the landfill site.	The impact can be low if the proper management measures are implemented and maintained.
Cumulative impacts	Preliminary significance
An increase in the amounts of waste to be disposed of at the landfill can influence the ambient air quality.	The impact can be negligible if the proper management measures are implemented and maintained.

7.4 Groundwater

Overview

The Viljoenskroon area has a characteristically shallow water table. The wetland area (i.e. Olifants Vlei) that stretches from the southeast to the west of Viljoenskroon is evident of this shallow water table.

The plinthic catena in the Bd14 land type is shallow and is also an indication of the shallow water table.

No water will be used at the facility, therefore there will not be an impact on the quantity of groundwater.

Potential impacts	Preliminary significance
Ground water may be contaminated due to the nature of the activity and the shallow water table.	The impact will be low with proper engineering, lining of the facilities and placement of the facilities away from any recharge structures like dykes and fault zones.
Cumulative impacts	Preliminary significance
There will be a negligible cumulative impact.	Negligible.

7.5 Surface water

Overview

Viljoenskroon is situated in the upper reaches of the Middle Vaal catchment in quaternary drainage region C70K.

Pans occupy 1% of the Bd14 land type. There are two large pans to the west of Viljoenskroon, namely Grootrietpan in the north and Witpan in the south

Potential impacts Surface water resources are contaminated as a result of contaminated storm water.	Preliminary significance The impact on surface water will be low if the correct management and mitigation measures are implemented.
Cumulative impacts The pans have a relative small catchment with very little impact on the water quality.	Preliminary significance Negligible

7.6 Land use

Overview

The land on the farm Northleigh 422/RE is used for agriculture on soil that has a high potential for crop production. However, the proposed site was bought by the Moqhaka Local Municipality for town expansion. Thus, the land on these properties is not used for agriculture at this stage.

It should also be noted that the land is used for grazing of cattle of the communal farmers in the area after crops have been harvested. A large area of the grazing land will be lost to these farmers with the establishment of the landfill.

Potential impacts The loss of high potential agricultural land.	Preliminary significance rating There will be a definite loss of a maximum of 34 ha of agricultural land with the establishment of the landfill site. With the efficient management of
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	<p>recycling and land filling, the area can be smaller.</p> <p>The municipality can consider extending the landfill in phases until the full site is used giving the cattle more grazing land in the future.</p>
<p>Cumulative impacts</p> <p>The expansion of the town and residents may require an expansion of the landfill as the town will produce more waste.</p> <p>If the capacity of the landfill is met due to and increase in numbers in Viljoenskroon, the landfill may be rehabilitated and an new one established at another location.</p>	<p>Preliminary significance</p> <p>Efficient recycling will ensure that the lifetime of the landfill will increase and the need to establish a new facility or to expand the proposed facility will be negligible.</p> <p>The probability of this happening as it is not foreseen that the town of Viljoenskroon will provide enough opportunity to grow more than the growth rate used to calculate the size of the site.</p>

7.7 Vegetation

Overview

Viljoenskroon is situated in the Vaal-Vet Sandy Grassland biome (Mucina and Rutherford, 2206).

According to Mucina and Rutherford (2006) more than 63% of land in the Vaal-Vet Sandy Grassland Biome is transformed for cultivation and this vegetation type is regarded as endangered. Although the majority of the proposed landfill site will be established on land where the indigenous vegetation has been removed for crop production there is still areas comprising of the indigenous vegetation. These area are approximately 7 ha.

<p>Potential impacts</p> <p>Approximately 7 ha of indigenous vegetation will be</p>	<p>Preliminary significance rating</p> <p>Low – The site has been disturbed.</p>
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removed from site as the other parts have been disturbed by crop production.	
The establishment of a landfill site will minimise available land for vegetation growth and may disturb habitats for certain species.	The proposed site has previously been disturbed by agricultural activities. The impact will be negligible.
Cumulative impacts	Preliminary significance
The cumulative impacts will be negligible.	Negligible.

7.8 Animal life

Overview

The proposed site for the establishment of the landfill site has been disturbed previously by agricultural activities (i.e. crop production).

Potential impacts	Preliminary significance rating
There will be no potential impact on animal life as the activities will occur on previously cultivates land.	Negligible
Cumulative impacts	Preliminary significance
No cumulative impacts.	Negligible.

7.9 Cultural Heritage

Overview

The proposed site was previously disturbed by agricultural activities (i.e. crop production). It is therefore not foreseen that there will be any elements of heritage or archaeological value. This area is also not known for significant historical events.

<p>Potential impacts</p> <p>The area is not known for elements of heritage or archaeological value. In addition, all proposed site has been disturbed and used for crop production.</p>	<p>Preliminary significance rating</p> <p>Negligible.</p>
<p>Cumulative impacts</p> <p>No cumulative impacts on paleontological and archaeological asset are foreseen.</p>	<p>Preliminary significance</p> <p>Negligible</p>

7.10 Noise

Overview

No activities currently associated with the Viljoenskroon area result in elevated noise levels that may impact on surrounding environment.

<p>Potential impacts</p> <p>The construction activities and specific activities that will be associated with the Operational Phase, e.g. equipment used to cover waste, will result in elevated noise levels.</p>	<p>Preliminary significance rating</p> <p>The impact is expected to be negligible as the activity will be a minimum of 500m from any neighbouring houses.</p>
<p>Cumulative impacts</p> <p>There are no other developments or activities in the area responsible for elevated noise levels.</p>	<p>Preliminary significance</p> <p>Negligible</p>

7.11 Aesthetics

Overview

The area is generally used for agriculture. However, there is an industrial area to the south of Viljoenskroon. Based on the historic record on the management of the existing landfill, there is a strong feeling that a landfill will have a major negative aesthetic impact on the surrounding environment, irrespective of the location thereof.

<p>Potential impacts</p> <p>The proposed landfill site is located more than 1 km east of the R76. It is visible from the R76 and may have a negative aesthetic impact.</p>	<p>Preliminary significance rating</p> <p>The aesthetic impact at the proposed site will be low if the correct mitigation and management measures are implemented.</p>
<p>Cumulative impacts</p> <p>No cumulative impacts</p>	<p>Preliminary significance</p> <p>Significant</p>

7.12 Demographics and Regional socio-economic structure

Overview

The population of Viljoenskroon and Rammulotsi is estimated at approximately 31 468 people.

<p>Potential impacts</p> <p>Design, construction, operation and recycling initiatives on the site may generate new job opportunities.</p> <p>The proposed landfill site will be located further than 500 m from any residential area and will therefore have less of a health risk.</p> <p>The landfill will render a radius of 500 m from the site unsuitable for residential development.</p>	<p>Preliminary significance rating</p> <p>Major positive impact.</p> <p>Positive impact.</p> <p>Negative.</p>
<p>Cumulative impacts</p> <p>Negligible</p>	<p>Preliminary significance</p> <p>Negligible</p>

6 Public participation during the scoping phase

7.1 Consultation process

Project initiation

A Public Participation process under Regulation 41 published in Government Notice R.594 of 4 December 2014 in terms of NEMA, 1998 is undertaken as part of the Scoping Phase that included the following:

- Placement of site notices on various places which will include site notices in public places (i.e. the municipality, library and shops) in Viljoenskroon and the entrance to the proposed sites.
- Placement of an advertisement in the local newspaper (i.e. Kroonnuus),
- A notification and Background Information Document (**BID**) with the Draft Scoping Report will be sent to all potential Interested and Affected parties. This includes the adjacent landowners and relevant authorities. Refer to **Annexure 3** for Public Consultation Process.

A time period of 30 days will be given to the public to register and / or send their issues and concerns regarding the proposed project to Eko Environmental.

Interested and Affected Parties / Stakeholders

Adjacent landowners and relevant stakeholders were notified of the proposed project via written notifications and a Background Information Document (BID). The main purpose of this was to inform the identified I&AP's of the project and obtain any issues related to the proposed project. A BID was sent to all adjacent landowners and relevant stakeholders. The Draft Scoping report was also sent to all potential I&AP for their review.

Refer to the Comments and Response Report under Part 6.2 of this document for an indication of the main issues raised during the Public Participation Process.

Authorities

The following departments and / or organs of state were consulted during the Public Participation process:

- Department of Agriculture;
- South African Heritage Resource Agency;
- Department of Water Affairs;
- Department of Economic Small Business Development, Tourism and Environmental Affairs (also competent authority);
 - Waste Department,

- Environmental Management.
- Fezile Dabi District Municipality;
- Moqhaka Local Municipality (Municipal Manager and Municipal Ward Councillor);

7.2 Register of I&APs / Stakeholders / Authorities contacted during the consultation process

Please note that the table below contains comments received during previous writings and correspondence from I&AP regarding the project. These comments have already been incorporated in the reports.

Contact Person	Organisation	Contact detail	Manner of notification	Comments & Response
Authorities & Stakeholders				
Mr. Ernest Mohlahlo (Municipal Manager)	Fezile Dabi District Municipality	016 970 8625 (Tel) 016 970 8762 (Fax) PO Box 10 Sasolburg 1947	Draft scoping report sent via registered mail on 07/09/2016	No comments received. Final Scoping sent on 17/01/2017.
Mr. Simon Mqwathi (Acting) (Municipal Manager)	Moqhaka Local Municipality	056 216 9100 (Tel) 056 216 9122 (Fax) PO Box 302 Kroonstad 9500	Draft scoping report Hand delivered on 31/08/2016	No comments received. Final Scoping sent on 17/01/2017.
(Municipal Ward Councillor: Ward 22)	Moqhaka Local Municipality	056 216 9100 (Tel) 056 216 9122 (Fax) PO Box 302 Kroonstad 9500	Draft Scoping report sent via Registered mail on 07/09/2016	No comments received. Final Scoping sent on 17/01/2017.
Mr. Jack Morton (Director Land Use and Soil Management)	Department of Agriculture	051 409 2624 (Tel) johanz@nda.agric.za P.O. Box 34521 Faunasig 9325	Draft Scoping Report sent via registered mail on 07/09/2016	No comments received. Final Scoping sent on 17/01/2017.
Mr. Willem Grobler / Boitemelo Melato	Department of Water and Sanitation (Free State)	051 405 9000 (Tel) groblerw@dwaf.gov.za PO Box 528	Draft Scoping Report hand delivered on	On 22/9/2016 the Department of Water and Sanitation registered as an I&AP and mentioned that Storm-

Contact Person	Organisation	Contact detail	Manner of notification	Comments & Response
		Bloemfontein 9300 MelatoB@dws.gov.za 083 633 3641 (C)	07/09/2016	and groundwater management is a concern for them. All future reports will be sent to them. Final Scoping sent on 17/01/2017.
Me. Grace Mkhosana (Regional Director)	DESTEA – EIA Department	051 400 4817 (Tel) 051 400 4842 (Fax) Private Bag X20801 Bloemfontein 9300 mkhosana@detea.fs.gov.za	Draft scoping report hand delivered on 07/09/2016	No comments. Final Scoping sent on 17/01/2017.
Me. Michelle Sello (Manager)	DESTEA Waste departrment	051 400 4781 (Tel) 051 400 4811/42 (Fax) Private Bag X20801 Bloemfontein 9300 sellom@detea.fs.gov.za	Draft scoping report hand delivered on 07/09/2016	Sent letter regarding concerns also raised at public meeting on 22/09/2016. See attached letter in Annexure 3. Final Scoping sent on 17/01/2017.
Identified Interested and Affected Parties				
Mr. Paul and Erik Maree – The Paul Mare Trust (Adjacent landowner)	Vlakovlei 417/RE, 417/1, 417/2, 417/3. Marne 421/RE	056 343 1397 (Tel) 082 870 4309 (P. Mare Cell) 071 364 8714 (E. Mare Cell) pauljmare@telkomsa.net	Draft Scoping Report hand delivered on 31/08/2016	Mr. Mare has been attending all previous meetings where comments were given in the past. These comments were taken into account when compiling the previous reports. They raised the following concerns via formal letter on 02/10/2016 following the receipt of the Draft Scoping Report: 1. They requested to be registered as an I&AP, 2. Mr. Mare indicated that the landfill is located within 500 m from their farm residence which

Contact Person	Organisation	Contact detail	Manner of notification	Comments & Response
				<p>is unacceptable according to legislation,</p> <ol style="list-style-type: none"> 3. Mr. Mare claimed that due to the use of the land earmarked for landfill establishment, the land is now their property, 4. The Draft Scoping Report mentions bad smelling odours which may be experienced to the west and south west due to the prevailing wind direction (i.e. north easterly). The mention of this is indicative that the management at the new landfill will not be sufficient. The Mare house will thus experience odours and smoke with every westerly or south westerly wind, 5. Mr. Mare mentioned that they have numerous boreholes used for drinking water in close proximity. They are concerned that should the landfill cause groundwater contamination, this water will be lost, 6. There is a concern that if the site expands due to the expansion of the town it might occur in the direction of their property which will then result in the facility

Contact Person	Organisation	Contact detail	Manner of notification	Comments & Response
				being closer than 500 m of their residence, 7. The landowner commented that they are willing to assist the municipality in its endeavour to find a sustainable solution without prejudice to their rights with regard to the landfill project. See attached letter in Annexure 3. A letter was submitted with the Final Scoping and some of the comments were addressed in the report. Final Scoping sent on 17/01/2017.
Moqhaka Local Municipality	Viljoenskroon Townlands 411	056 216 9100 (Tel) 056 216 9122 (Fax) PO Box 302 Kroonstad 9500	Draft scoping report sent via registered mail on 07/09/2016	No comments. Final Scoping sent on 17/01/2017.
Mr. Nico Palm (RavCom)	Community business chamber	skv101@mweb.co.za 082 397 0652 Suite 402, Fourth Floor, West Towers, Nelson Mandela Sq, Sandton, 2196	Draft Scoping Report sent via courier 02/09/16	No Comments. Final Scoping sent on 17/01/2017.
Mr. Sello Moletsane	Rammulotsi Trading and Projects (Pty) Ltd	moletsanesd@gmail.com 079 324 6633 (Tel)	Draft report received during meeting on 22/09/2016.	A public meeting was held on 22/9/2016 where Mr. Moletsane raised the following comments: 1. The landfill is close to the primary school which his child attends and the children are exposed to an unhealthy

Contact Person	Organisation	Contact detail	Manner of notification	Comments & Response
				<p>environment,</p> <ol style="list-style-type: none"> 2. On windy days paper and plastic is transferred by the wind to the school and houses, 3. The site has a frequent unhealthy smell and children are exposed to poor air quality, 4. Children will grow accustomed to bad living condition and continue to live there which is not appropriate, 5. The landfill site should be closed and rehabilitated as soon as a new site is approved and constructed. <p>Comments from Mr. Moletsane were addressed in the meeting and all future reports will be sent to him. Final Scoping sent on 17/01/2017.</p>
Ishmael Dikana	Community Representative	Dikana.kit@gmail.com 072 968 1340 (Tel)	Draft report received during meeting on 22/09/2016.	Mr. Dikana attended the meeting without any further comments. All reports will be sent to him. Final Scoping sent on 17/01/2017.

7 Plan of study for the Environmental Impact Assessment

7.1 Assessment Methodology

The main objective of the EIA process will be to assess and quantify the potential impacts that were identified by the project team, specialists and Interested and Affected Parties during the Scoping study.

The concept of significance is at the core of impact identification, evaluation and decision-making during the EIA process and can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood), while impact significance is the value placed on the change by different affected parties (i.e. level of acceptability) [DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5].

The significance is rated from Low to High as indicated in the table below with an explanation of the impact magnitude and a guide that reflects the extent of the proposed mitigatory measures deemed necessary.

Significance	Low	Low-Medium	Medium	Medium-High	High
Impact Magnitude	Impact is of very low order and therefore likely to have very little real effect. Acceptable.	Impact is of low order and therefore likely to have little real effect. Acceptable.	Impact is real, and potentially substantial in relation to other impacts. Can pose a risk to company	Impact is real and substantial in relation to other impacts. Pose a risk to the company. Unacceptable	Impact is of the highest order possible. Unacceptable. Fatal flaw.
Action Required	Maintain current management measures. Where possible improve.	Maintain current management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk, where possible.	Improve management measures to reduce risk.	Implement significant mitigation measures or implement alternatives.

The assessment criteria as mentioned above can be described as follow:

The **nature of impact** is a broad indication of what is being affected and how.

Severity relates to the nature of the event, aspect or impact to the environment and describes how severe the aspects impact on the biophysical and socio-economic environment.

Type of criteria	5.1 Rating				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant / Harmful	Great / Very harmful	Disastrous / Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance / Easily reversible	Low cost to mitigate	Substantial cost to mitigate / Potential to mitigate impacts / Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact / Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Extent refer to the spatial influence of an impact be local (extending only as far as the activity, or will be limited to the site and its immediate surroundings), regional (will have an impact on the region), national (will have an impact on a national scale) or international (impact across international borders).

Rating	Description
1: Low	Immediate, fully contained area
2: Low-Medium	Surrounding area
3: Medium	Within Business Unit area of responsibility
4: Medium-High	Within Mining Boundary area
5: High	Regional, National, International

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

Rating	Description
1: Low	Once a year or once/more during operation/LOM
2: Low-Medium	Once/more in 6 Months
3: Medium	Once/more a Month
4: Medium-High	Once/more a Week
5: High	Daily

Probability considers the likelihood of an impact/incident occurring over time.

Rating	Description
1: Low	Almost never / almost impossible
2: Low-Medium	Very seldom / highly unlikely
3: Medium	Infrequent / unlikely / seldom
4: Medium-High	Often / regularly / likely / possible
5: High	Daily / highly likely / definitely

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Rating	Description
1: Low	Almost never / almost impossible
2: Low-Medium	Very seldom / highly unlikely
3: Medium	Infrequent / unlikely / seldom
4: Medium-High	Often / regularly / likely / possible
5: High	Daily / highly likely / definitely

Should any fatal flaws be identified during the EIA process which will be indicated by a “high” significance rating, the activity related with the potential impact will undergo the “no-go” alternative (i.e. be excluded from the proposed project) if the impact cannot not be managed and / or mitigated to acceptable levels.

7.2 EIA Process

7.2.1 Tasks anticipated for the EIA process

The tasks that will be undertaken as part of the EIA process together with the manner in which it will be undertaken is summarised in the table below.

1. Conduct baseline assessment at all the sites to determine the potential impact on the various spheres of the receiving environment.
2. Consult with the SAHRA on the protection of cultural and heritage resources by a suitably qualified professional in terms of the National Heritage Resources Act.
3. Conduct a geo-hydrological investigation to determine potential ground water impacts.
4. Geotechnical investigation
5. Do a concept design of the site

7.2.2 Consultation and public participation process

The public participation process to be followed during the EIA process will include the following:

- Continues consultation with registered I&APs and the relevant Authorities;
- It is proposed to have one public meeting during the EIA phase for all registered interested and affected parties.
- Updating of the I&AP database throughout the consultation process in order to keep record of all interested or affected persons contacted during the process;
- A copy of the Draft Environmental Impact Assessment Report (EIAR), Environmental Management Programme (EMP) together with any specialist reports (if any) will be made available at a public space in Viljoenskroon for public comment. All registered I&APs will be notified of the availability of the report and provided with a time period of 30 days to comment;
- A copy of these reports will also be made available to the authorities for a period of 30 days for comment;
- Compilation of a Comments & Response Report that will include all comments received during the process (including comments received on any draft reports) as well as the response taken by the EAP to address these comments where possible;
- Internal consultation with the Free State Department of Economic Development, Tourism and Environmental Affairs in terms of the final design / layout of the development; and
- Consultation with the National Department of Environmental Affairs in terms of the following milestones:
 - On finalisation of the design / layout of the development
 - On submission of the draft EIAR
 - On submission of the final EIAR

8 References

Mucina, L. & Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland.
Strelitzia 19. South African National Biodiversity Institute, Pretoria.