

DRAFT ENVIRONMENTAL IMPACT REPORT

APPLICATION FOR A WASTE MANAGEMENT LICENCE IN TERMS OF THE
NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (NO. 59 OF 2008):
ALKALINE HYDROLYSIS WASTE MANAGEMENT SYSTEM AT THE INTERVET
MALELANE RESEARCH UNIT FARM NEAR HECTORSPRUIT:
MPUMALANGA PROVINCE.
PROJECT REFERENCE: 12/9/11/L240/6

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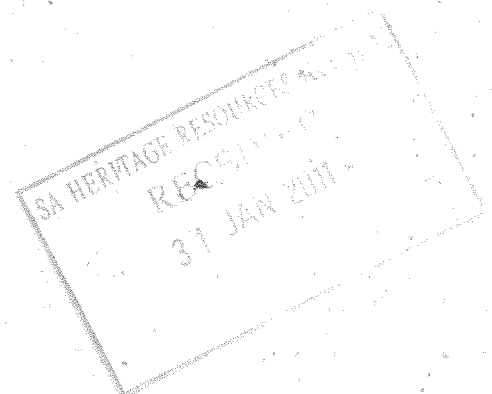
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FOR SUBMISSION TO:

DEPARTMENT OF ENVIRONMENTAL AFFAIRS
NATIONAL GOVERNMENT

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1. EXECUTIVE SUMMARY

This initial phase of the **Environmental Investigation Process** was conducted over a period of 3 months in the Malelane/Hectorspruit area of Nkomazi. The proposed establishment of an alkaline hydrolysis waste management system will allow the Intervet Malelane Research Unit to dispose of biological material in a safe and controlled manner. This will bring the Unit in line with acceptable standards which are employed in various European countries and in abattoirs in South Africa.

The public participation process was advertised locally and regionally in the printed media, on site and at various facilities of interest and public access in the town of Malelane. The immediate neighbours of the property were contacted specifically and engaged in a **Focus Group Meeting**. The **Nkomazi Municipality** was informed and the Environmental Manager was invited to participate at all levels of the process.

The **Draft Scoping Report** was made available for comment at the **Malelane Library, the offices of Nkomazi Council and to all individuals and departments that registered**. No other additional contributions were made by **Interested and Affected Parties** at this stage of the process. The Final Scoping Report was then submitted to the Department of Environmental Affairs (DEA: National) and approved on 2 November 2010. Included in the submission was a Plan of Study for the Environmental Impact Assessment Phase.

The **Environmental Impact Assessment (EIR Phase)** investigated the **significance** of impacts, **alternative** options and **mitigation** measures where applicable. The EIR also includes a **Construction Environmental Management Programme**.

Provided the Intervet Malelane Research Unit (IMRU) abides by the Operational Standards prescribed by the suppliers of the hydrolysis machine and provided the contractor implements the conditions of the CEMP, it is recommended that the proposed Waste Management System is implemented at the IMRU.

The Draft Environmental Impact Report is submitted to all registered Interested and Affected Parties (I&AP's) for perusal and comments.

2. ABBREVIATIONS

AHP	Alkaline Hydrolysis Plant
ASAP	As Soon As Possible
Asl	Above sea level
BEE	Black Economic Empowerment
cm	centimetre
CEMP	Construction Environmental Management Programme
DEDET	Department of Economic Development, Environment and Tourism
DWA	Department of Water Affairs
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
ESCOM	Electricity Supply Commission
GPS	Geographical Positioning System
I&AP's	Interested and Affected Parties
IEM	Integrated Environmental Management
IMRU	Intervet Malelane Research Unit
m	metre
mm	millimetre
m/s	metre per second
NA	Not Applicable
NHBRC	National Housing Building Regulations Council
OMP	Operational Management Plan
PDI	Previously Disadvantaged Individual
RES	Rhengu Environmental Services
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resources Agency
sqm	square metre

3. GENERAL INFORMATION

Project Title	Environmental Impact Assessment: Application for a Waste Management Licence in terms of the National Environmental Management: Waste Act, 2008 (No. 59 of 2008): Alkaline Hydrolysis Waste Management System at the Intervet Malelane Research Unit farm near Hectorspruit, Mpumalanga Province. Project Number: 12/9/11/L240/6.
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Fax Number	086 685 8003
Date of Report	November 2010

Date of Focus Group Meeting/s	1. 08.06.10: Meeting with Interested and Affected Parties. 2. 18.01.11: Meeting with Department of Environmental Affairs.	
Persons Present	Meeting 1: IAP's Dr. Tom Strydom Piet Kruger E. Zeelie Daan Erasmus Jean Michel Postal Cameron Svacha D. Kruger Ralf Kalwa Meeting 2: DEA Dr. Tom Strydom Piet Kruger Sabona Kgasi Sindiswa Duma See Minutes attached in Appendix 2.	Intervet (Pty) Ltd. Malelane Research Unit. Waste Resolution Technologies. Farmer and Neighbour. Echo Square Services. Intervet Pharma Research and Development. Farmer and Neighbour. Farmer and Neighbour. Rhengu Environmental Services. Intervet (Pty) Ltd. Malelane Research Unit. Waste Resolution Technologies. Department of Environmental Affairs Department of Environmental Affairs

4. LOCALITY INFORMATION

Name of Place & Locality.	The development site is found at the Intervet Malelane Research Farm (Richtershoek area) off the Tonga tar road approximately 25 kilometres east of Malelane. The farm is bordered in all wind directions by farms practicing agricultural land uses. The following GPS Co-ordinates are applicable to define the site position: S 25°36'49.70" E31°39'76.40" S 25°36'21.26" E31°39'45.48" S 25°37'05.23" E31°39'37.32" S 25°36'44.05" E31°39'55.88"
Region/District	The property is found in the Nkomazi Region of the Onderberg, near the towns of Malelane and Hectorspruit in Mpumalanga.
Title Deed	See Appendix 4.1.
Size of Intervet Research Farm	Approximately 86.5ha. 71.1ha is allocated irrigation from the Lomati River.
Magisterial District	Nkomazi District Municipality.
Nearest Town/s	Malelane-Hectorspruit.
Nearest Main Road	Tonga tar road approximately 10km south of the N4 toll road. The farm is well serviced by all weather tar- and gravel roads.

Type of area where the proposed development will take place (mark all applicable blocks).

CBD		Rural	X	City		Recreational area	X
Commercial		Agricultural	X	Town		Inf. Settlement	
Industrial		Staff Housing		Township		Other:	
Tourism	X	Road	X	In a Building	X		

5. PROJECT DESCRIPTION

Current Status, Infrastructure and Research Projects:

- The Intervet Malelane Research Unit (IMRU) was established in 1972 by Hoechst, a German owned crop science and veterinary pharmaceutical company. Since the research unit was established, ownership of the farm has changed several times and at present the farm is owned by Schering-Plough, an American veterinary pharmaceutical company.
- The farm is well serviced by 3 homesteads for veterinary staff and one guest cottage.
- Various access roads and service lines supply potable/irrigation water and power supply (ESCOM).
- A staff compliment of seventeen occupy various permanent positions on the farm.
- Research facilities include: office complex and a hall to present courses and lectures; laboratories (stocked and equipped with microscopes, refrigerators, deep freezers) which are used for parasitological research and testing and a secondary smaller laboratory which is available for dip sample analysis, tick resistance testing and Elisa testing of serum samples for Fasciolasis.
- A variety of facilities which house and support domestic- and farm animals, are found on the farm. These include horse stables; sheep sheds; cattle sheds; animal specific pens; crush pens; tack rooms and feed stores.
- Tick Stables: Sixteen individual cattle stanchions are available for conducting stall studies for efficacy trials of acaricides especially against *Boophilus* spp. Calves can be secured to prevent grooming. The stanchions are equipped with wooden slatted floors each with a stainless steel tray underneath to facilitate tick collection.
- Companion Animal Unit: The companion animal unit comprises 50 individual kennels each equipped with a feeding bowl and an automatic water bowl. The total size of each individual kennel is 6.47 m². Each kennel has a sleeping area equipped with a rubber mat for the dogs to sleep on. The dogs have access to an outside exercise area of approximately 140 m² where they can socialise during the day when they are not utilized in a study.
- Other facilities include an insect breeding room; additional pens; incubator rooms; dipping facilities; post mortem room; clinic; workshops and a tractor shed.
- Animal types include a herd of 30 cattle and 10 sheep. Seven horses and 57 dogs are also housed for various veterinary product trials.
- Grazing: Thirty-two camps of 0.5 ha each are under irrigation and available for field studies. Each camp is equipped with a water- and a feeding trough.
- The following site specific research and studies are undertaken:
 - Anti-parasitics:
 - a) Ectoparasiticides: Efficacy studies:
 - Natural tick infestations in cattle, horses and dogs.
 - Artificial tick infestations in cattle. (Stall studies).
 - Sheep scab in sheep- field studies.
 - Cattle and sheep lice-field studies.
 - Artificial tick- and flea infestations in dogs.

- Sheep blowfly strike (*Lucilia cuprina*).
- *Stomoxys* and *Musca* species in cattle, horses, dogs and cats.
- Stability and stripping studies in cattle plunge dipping tanks and spray races.
- b) Endoparasiticides:
 - Sheep stall and field studies.
 - Cattle stall and field studies.
 - Horse stable and field studies.
 - Dogs and cats-natural infestations.
- Other studies include bioequivalence; residue studies; infective models and alliances.

Planned/Proposed Activity:

- Intervet Malelane Research Unit (IMRU) has been operational since 1972 on the farm just outside Malelane-Hectorspruit in the Mpumalanga Province. The prime function of this facility is to test the viability and effectivity of Veterinary Products and to provide the facilities for Veterinary Products Research.
- In some instances, once the tests and trials have been completed, some of the animals are euthanized and this biological material is either incinerated and or disposed of via applicable Service Providers, e.g. Enviro Serv.
- During an internal Environmental Audit in early 2009 it was confirmed that the incinerator facility at the unit was outdated and not permitted as per the latest environmental legislation and conditions. The Environmental Audit found that the Unit would have to improve the on-site disposal procedures of its biological material.
- The latest technology for the waste disposal of biological material (which is being used by many European countries and some abattoirs in South Africa) includes the use of an Alkaline Hydrolysis System where the biological tissue is digested using potassium hydroxide, heat and water. The effluent/end product is organic in nature and can be used as compost.
- It is proposed that a small building (approximately 30sqm) is constructed near the companion animal unit which will house the Tissue Digester. See Appendix 4.3. which describes the process and the apparatus in detail. Also see Appendix 4.7. for Standard Operational Procedures.

Planned Infrastructure Specifics and Project Specifics:

- A small building (approximately 30sqm) must be constructed using brick and mortar. The roof will be covered using tiles.
- No new roads have to be constructed to the proposed facility.
- All service lines (sewerage, power and water) are in adjacent buildings and this facility will link up with existing systems.
- A Tissue Digester will be installed inside the building. This is a specialised piece of equipment that breaks down specific organic materials through a catalysed thermo-chemical process, thereby affecting a pre-determined level of hydrolysis of the various individual constituents that once made up such organic tissue. In the case of the IMRU this organic material will consist of biological material such as carcass tissue from deceased animals.

How does this Digester Work:

- The system uses heat, water and a metal base as the three main components to rapidly digest organic waste.
- The process leads to the degradation of proteins, the major solid constituent of all animal cells and tissues.
- The protein coats of any viruses are also destroyed and the peptide bonds of protein based infectious organisms are broken down during the process.
- Simple fats consist of three fatty acid chains bound through ester bonds to a molecule of glycerol. Ester bonds are also hydrolyzed, yielding basic soaps during the process. Finally, poly-unsaturated fatty acids and carotenoids (pigments) undergo molecular re-arrangements and are destroyed during the hydrolysis process.

Digestible Material:

- The tissue digestors are specifically designed to deal with tissue waste.
- Tissue types include: meat; blood; tendons; muscles; fat/fatty tissue; feathers; hooves; hair; hides; skins; bone matter; whole carcasses of smaller animals (bird, dog, cat, sheep, pig). Larger carcasses are usually cut into smaller pieces prior to loading into the digester.

Indigestible Material:

- The digester is not designed to digest waste derived from plants or other inorganic substances such as plastics, synthetic polymers and metals.
- Indigestible materials still benefit from the thermo-chemical treatment in terms of providing pathogen control.

Resulting Effluent:

- Digested tissue waste changes from a solid state to a pathogen free liquid state due to the extensive hydrolysis of the organic fractions that break down the tissue into its original building blocks (amino acids, small peptides, simple sugars, basic soaps and the mineral residue of bones and teeth, i.e. calcium phosphate).
- Depending on the digestive mixtures used to catalyse the process, the liquid cools down into a solid or liquid phase.
- The bone remnants can be removed and land filled or dried and used as calcium phosphate treatment in gardens.

Working Area Specifications:

- A purpose work area will be constructed as per the drawing attached in Appendix 4.3.
- This area will ensure that maximum safeguards against unintentional spillages are in place.
- This will also ensure that the area is kept clean and hygienic in all its facets.
- Water that is used for cleaning purposes can be recycled through the

digester, thereby reducing water consumption and the associated costs.

Process Summary for Intervet Malelane Research Unit:

- **Step 1: Tissue Receiving: Control Station.**
- Step 2: Calculate Tissue Weight.
- Step 3: Calculate Water Requirements.
- Step 4: Calculate Chemical Requirements.
- **Step 5: Load Digester with Tissue, Water and Chemicals.**
- Step 6: Initiate Digestive Cycle Process (12-18 Hours).
- Step 7: Discharge Digester Effluent.
- **Step 8: Dispose via Enviro-Serve Waste Agency.**

6. DESCRIPTION OF NATURAL ENVIRONMENT (Mucina and Rutherford, 2006)

	Mountain	Midslope	Flats	Valley	W/Land	R/Bank	Other
Topography			X	X			
Description	<ul style="list-style-type: none"> • Veld Type: SVI 3 Granite Lowveld: Mucina and Rutherford (2006). • From north to south, the Swazian Goudplaats Gneiss, Makhutswi Gneiss and Nelspruit Suite (granite gneiss and migmatite) and further south, the younger Mpuluzi Granite (Randian) form the major basement geology of the area. • Archaean granite and gneiss weather into sandy soils in the uplands and clayey soils with high sodium content in the lowlands. • This terrain is regarded as stable for building purposes. 						
Climate	<ul style="list-style-type: none"> • Summer rainfall with dry winters. • The annual average for rainfall in the area is around 630 mm. • Generally a frost free region. • Mean annual maximum and minimum temperatures for Skukuza (approximately 80km north of IMRU) are 39.5°C and -0.1°C for January and June respectively. • The mean annual evaporation often exceeds the mean annual precipitation by a factor of two. This results in a water deficit for long periods during the late dry winter season. Rainfall for Malelane averages out at around 638 mm per annum. • Wind direction in the Malelane area is predominantly south to south easterly from January to August and ranges in velocity from 3–4m/s. Northwesterly winds occur during September through to December. 						
Soil Description	Depth	Texture			Dominant Soil Forms		
	Not Applicable	Valley Bottom: Sandy/Loam Flats: Sandy			Not Applicable		
Stability	Buildings, e.g. pump houses, homesteads, offices, laboratories, stables, workshops etc., have been developed on these soils using normal construction methods and processes. Soils are considered as stable.						
Flora Description	<ul style="list-style-type: none"> • As per the classification by Mucina and Rutherford (2006) the farm falls within the Granite Lowveld Veld Type. Under pristine, natural conditions the following vegetation species were found in this area: • Tree species that dominated this veld type include: <i>Sclerocarya birrea</i>; <i>Ficus sansibarica</i>; <i>Trichilia emetica</i>; <i>Peltophorum africanum</i>; <i>Terminalia sericea</i>; <i>Acacia nigrescens</i>; <i>Acacia nilotica</i>; <i>Albizia harveyi</i>; <i>Combretum apiculatum</i>; <i>Combretum imberbe</i>; <i>Combretum zeyheri</i>; <i>Ficus stuhlmannii</i>; <i>Pterocarpus rotundifolius</i>; <i>Acacia exuvialis</i>; <i>Acacia gerrardii</i>; <i>Bolusanthus speciosus</i>; <i>Cassia abbreviata</i>; <i>Combretum collinum</i>; <i>Dalbergia melanoxylon</i>; <i>Gymnosporia glaucophylla</i>; <i>Lannea schweinfurthii</i>; <i>Pavetta schumanniana</i>; <i>Plectroniella armata</i> and <i>Terminalia prunioides</i>. • Shrub species in this vegetation type included: <i>Combretum hereroense</i>; <i>Dichrostachys cinerea</i>; <i>Euclea divinorum</i>; <i>Strychnos madagascariensis</i>; <i>Gardenia volkensii</i>; <i>Hibiscus micranthus</i>; 						

	<p><i>Tephrosia polystachya</i>; <i>Abutilon austro-africanum</i>; <i>Agathisanthemum bojeri</i>; <i>Aptosimum lineare</i>; <i>Baleria elegans</i>; <i>Clerodendrum ternatum</i>; <i>Commiphora africana</i>; <i>Gossypium herbaceum</i> and <i>Pavonia burchellii</i>.</p> <ul style="list-style-type: none"> • Woody Climbers included: <i>Sphedamnocarpus pruniensis</i>. • Herbaceous climbers included: <i>Rhynchosia totta</i>. • Grasses and other Graminoids included: <i>Brachiaria nigropedata</i>; <i>Digitaria eriantha</i>; <i>Eragrostis rigidior</i>; <i>Melinis repens</i>; <i>Panicum maximum</i>; <i>Pogonarthria squarrosa</i>; <i>Aristida congesta</i>; <i>Bulbostylis hispidula</i>; <i>Chloris mossambicensis</i>; <i>Enneapogon cenchroides</i>; <i>Heteropogon contortus</i>; <i>Leptochloa eleusine</i>; <i>Perotis patens</i>; <i>Schmidtia pappophoroides</i>; <i>Sehima galpinii</i>; <i>Tricholaena monachne</i> and <i>Urochloa mosambicensis</i>. • Herbs included: <i>Achyranthes aspersa</i>; <i>Aspilia mossambicensis</i>; <i>Becium filamentosum</i>; <i>Chamaecrista absus</i>; <i>Commelina benghalensis</i>; <i>Commelina erecta</i>; <i>Cucumis africanus</i>; ; <i>Evolvulus alsinoides</i>; <i>Heliotropium strigosum</i>; <i>Hermbstaedtia odorata</i>; <i>Hibiscus praeteritus</i>; <i>Indigofera filipes</i>; <i>Indigofera sanguinea</i>; <i>Kohautia virgata</i>; <i>Kyphocarpa angustifolia</i>; <i>Leucas glabrata</i>; <i>Ocimum gratissimum</i>; <i>Phyllanthus maderaspatensis</i>; <i>Pupalia lappacea</i>; <i>Vahlia capensis</i>; <i>Waltheria indica</i>; <i>Orbea rogersii</i> and <i>Stapelia leendertziae</i>. • The natural flora which occurred on the property historically is largely absent on the Farm. The composition of the vegetation has been modified over the past 30 years through farming practices and cleared for citrus trials and grazing camps for field studies. The natural flora that does exist is represented by some indigenous grassveld and riparian/drainage line trees. • No rare or endangered plants were observed on the property.
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Did the applicant undertake a soil feasibility and or Geo-hydrological study?

Yes	No
	X

Comments:

Buildings e.g. pump houses, homesteads, workshops, laboratories, offices, stables, etc.; have been developed on these soils using normal construction methods and processes. Soils are considered as stable. The tissue digester will be housed in a building addition to existing facilities.

Has the applicant proof of sufficient water for the proposed development?

Yes	No
X	

Comments:

71.1ha is allocated irrigation from the Lomati River.

Are there any known Red Data biota on or near the proposed development?

Yes	No
	X

Comments:

- No rare biota was observed during the site visits or during any other visits to the site.
- No removal of riparian vegetation or any other vegetation is envisaged.

Fauna Description	<ul style="list-style-type: none"> • With the advent of agriculture and research operations the habitat niches for game and naturalised fauna disappeared and a monoculture replaced heterogeneity. Many smaller and larger animals sought refuge in adjacent alternative sites. • Some smaller mammals, birds, reptiles, and amphibians are known to occur in the riparian zone and surrounding farmlands. These have adapted to the changes of the surrounding environment and will not be threatened by the additional building which will be erected on the property as part of existing infrastructure.
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Are there any known rare bird breeding sites on or near the proposed development?

Yes	No
	X

Comments

No breeding sites were discovered at or near the sites.

Are there any known archaeological, cultural- or historical sites on or near the proposed development?

Yes	No
	X

- The site is developed as a Veterinary Products Research Unit. The waste digester will be housed in an additional building the size of a double garage.
- No greenfield, pristine, natural vegetation will be affected.
- No artefacts have been observed during the farming activities which have occurred on the property for decades.
- The proposed building will be sited to fit in with existing laboratories, offices and facilities. This is not a greenfield site.
- Should any artefacts or a find be incidentally discovered during construction, the proponent must engage the services of an accredited archaeologist to deal with the find.
- It is recommended that an Environmental Control Officer (ECO) oversee the implementation of the development phase and the handling of finds will be addressed in the Construction Environmental Management Programme (CEMP).
- Note: See Appendix 2. for a letter from SAHRA dated 9 September 2010 which states that a Phase 1 Archaeological Impact Assessment is not required for this Waste Management Application Project.

What general precautionary measures will be taken if an archaeological, cultural- or historical site is discovered?

- **Should any artefact, or historical site be incidentally discovered during excavations for foundations as well as in future, all works must cease with immediate effect.**
- **The find must be reported to the Project Manager for the development and the ECO for the project. These representatives will initiate an Action Plan in conjunction with SAHRA and the developer to address the management and handling of the find.**

7. ENVIRONMENTAL ISSUES

This chapter describes the **issues, concerns and opinions** identified:

- during the **public participation process, i.e. focus group meetings;**
- by **authorities and the applicant/management authority** during consultation- and pre-application meetings and telephonic discussions;
- by the **consultant** based on previous experience in the area.

7.1. Key Issues: See Issues and Responses Report in Appendix 2.

The following key **issues/impacts** were identified:

Environmental Aspects:

- **Operational Failure: What can go wrong with the alkaline hydrolysis machine?**
- **End Product: What will happen to the end product?**
- **Size of Facility: What is the size of the facility and will the area be banded?**
- **Impact of process on other ingredients and chemicals.**

Economic/Operational Aspects:

- **Costs: The removal of the end product will be costly. If the product is safe, then why not use it on site for compost?**
- **Change of chemicals (potassium hydroxide): How often are the chemicals changed?**
- **Standard Operational Procedure (SOP)? Will the waste handling process under discussion be described in a SOP?**

Social Aspects:

- **Training required to operate the equipment.**

7.2. Ranking of Environmental Issues Identified

To identify the issues, these were ranked as per the four different criteria outlined in the Environmental Impact Assessment Guideline Document for assessing impacts in Environmental Impact Reports.

The environmental elements (issues/impacts) are evaluated according to the following criteria:

1. **Intensity** – 4 Categories were distinguished:

Positive (+), Negative (-), No Impact (0), and Uncertain (U).

The positive- and negative categories were further divided to distinguish between low-, medium-, and significant impacts.

Scores were awarded as follows:

Low = 1, Medium = 2, and Significant = 3.

Issues/Impacts were ranked in order of importance as:

- | | |
|--|-------------------|
| 1. Critical Issues/Impacts with scores | ≥ -5 to -9, |
| 2. Important Issues/Impacts with scores | < - 5 to - 1, and |
| 3. Operational/Management Issues/Impacts with scores | ≥ 0. |

2. **Duration** - Is the impact – **Short-**, **Medium** term, or **Permanent**.

3. **Probability** of impact – **Improbable (I)**; **Probable (?)**; **Definite (D)**,

4. **Extent** – Is the effect **Local**; **Regional**; **National**; or **International**.

NA: Not Applicable

7.3. Environmental Screening: Determination of Significance

KEY OF SYMBOLS TO BE USED IN TABLE			
Intensity of impact/issue:	Significant Impact	Medium Impact	Low Impact
Positive (+)	+ 3	+ 2	+ 1
Negative (-)	- 3	- 2	- 1
Impact uncertain (U)	U		
No envisaged impact (0)	0		
Duration of impact/issue	Short Term = S	Medium Term = M	Permanent = P
Probability of impact/issue	Improbable = I	Probable = ?	Definite = D
Extent of impact/issue	Local = L	Regional = R	National / Int. = N
NA: Not Applicable	TABLE FOR IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS		
ENVIRONMENTAL ELEMENT	DEVELOPMENT PHASE	OPERATIONAL PHASE	TOTAL SCORE
ENVIRONMENTAL ASPECTS: GENERAL			
1. Operational Failure of the Hydrolysis Machine.	NA	0,S,I,L	0
2. Future of the End Product.	NA	+1,P,D,R	+1
3. Size/Magnitude of the Facility.	NA	-1,P,D,L	-1
5. Impact of Process on Chemicals and Ingredients.	NA	-1,P,D,L	-1
ECONOMIC/OPERATIONAL ASPECTS:			
1. Costs: Removal of End Product.	NA	-1,P,D,R	-1
2. Frequency and Replacement of Chemicals.	NA	-1,P,D,L	-1
3. Standard Operational Procedures.	NA	+1,S,D,L	+1
SOCIAL ASPECTS			
1. Training of Staff.	NA	0,P,D,L	+1

7.4. Issues Identified

7.4.1 Critical Issues

No **Critical Issues** were identified during the screening process.

7.4.2 Important Issues

- Size and Magnitude of the Facility.
- Impact of Process on Chemicals and Ingredients.
- Costs: Removal of End Product.
- Frequency and Replacement of Chemicals.

7.4.3. Operational/Management Issues

- Standard Operational Procedures.

7.4.4. Positive Impacts

- Future of the End Product.
- Training of Staff.

7.5. Impacts/Issues: (This Section must be read in conjunction with the contents of the Construction Environmental Management Plan (CEMP))

Environmental Issues	Discussion/Mitigation/Management Approach
<p>1. Operational Failure.</p>	<p>Power Failure:</p> <ul style="list-style-type: none"> • A power failure will cease operations. If the lids remain shut the liquids inside the tanks will remain stable until the power switches on again. • To provide power in the event that the power remains off for the foreseeable future, the Intervet Malelane Research Unit is equipped with a stand-by generator. The generator can be activated at any time to continue the supply of electricity. • No risk to the environment will occur under these conditions. • The diesel system which was used for the incinerator process is still in working order and will be kept on site as an alternative to Eskom if electricity costs become unaffordable in future. <p>Mechanical Malfunction:</p> <ul style="list-style-type: none"> • The heater elements and or other working components can malfunction as is the case with any mechanical apparatus. Fortunately these can be repaired/replaced locally within a few working days. This will ensure that down times are limited. • It is important to note that the manufacturers have not experienced mechanical problems with the machines in operation to date.
<p>2. Future of the End Product.</p>	<p>What will happen to the end product?:</p> <ul style="list-style-type: none"> • The end product will be handled by an accredited Waste Management Service Provider, in this case Enviro-Serv from Johannesburg. • Enviro-Serv will supply on site storage tanks at the Intervet Malelane Research Unit. As the waste product is generated in the hydrolysis tanks, the waste will be transferred into the designated Enviro-Serv Storage Tanks. • The Enviro Serv Tanks will be collected by Enviro Serv and transported to their handling- and storage facility in Johannesburg. • The end product is a sterile, stable, non-malodorous liquid with numerous applications in the agricultural industry where it can be effectively employed as a soil conditioner (improver), compost additive or serve as a feedstock for bio-energy production. • See Appendix 4.8. confirming that Enviro Serv will collect the final waste product.
<p>3. Size and Magnitude of the Facility.</p>	<p>Building Specifics:</p> <ul style="list-style-type: none"> • A designated brick and mortar building (5mX6m) with a tile roof will be constructed to house the

	<p>hydrolysis machine.</p> <ul style="list-style-type: none"> • The machine will rest on concrete floors which will be constructed to function as a bund. • Each bund will be fitted with a concrete drainage chamber to collect any unforeseen spillages in a safe manner. • The Enviro Serv Storage Tanks will be parked on a bunded concrete apron next to the facility.
<p>4. Impact of Process on Chemicals and Ingredients.</p>	<p><u>Chemical and Carcass Ingredients:</u></p> <ul style="list-style-type: none"> • Research has shown that the alkaline hydrolysis process can destroy many chemicals. • The end product, is a sterile, coffee coloured, alkaline solution with a soap like odour that can be released into a sanitary sewer in accordance with local and federal (National) guidelines regarding pH and temperature (Kaye 2003). • In the United States of America the process completely destroyed all representative classes of potentially infectious agents (Kaye 2003). • As an example of the effectiveness to handle infected tissue, and based on many experiments, the European Commission Scientific Steering has approved the alkaline hydrolysis process for transmissible spongiform encephalopathy (TSE) infected material. • In certain instances the alkaline hydrolysis technology has proven to be effective in eliminating radioactively contaminated tissues.
<p><u>Economic/Operational Issues</u></p> <p>1. Costs: Removal of End Product.</p>	<p style="text-align: center;"><u>Discussion/Mitigation/Management Approach</u></p> <p><u>Economics of removing the end product:</u></p> <ul style="list-style-type: none"> • Intervet Malelane Research Unit has budgeted for the removal of the end product by the accredited Waste Management Service Provider Enviro Serv. • This will happen with all biological waste that has been subjected to tests of which the ingredients are not fully characterised. Enviro Serv will thus handle the end product off site. • Biological material which has been subjected to tests of which all the ingredients are well documented and known, will be made available to the Crocodile Farm near Hectorspruit. • It is Intervet Policy to always follow the Precautionary Approach Principle.
<p>2. Frequency and Replacement of Chemicals.</p>	<p><u>Use of Chemicals in the Hydrolysis Process:</u></p> <ul style="list-style-type: none"> • New, fresh chemicals (potassium hydroxide) are added for each new batch of biological waste and tissue that is added to the machine.
<p>3. Standard Operational Procedures.</p>	<p><u>See Appendix 4.7 for a detailed SOP:</u> Essentially the following standard operational approach is required to initiate the break down process:</p> <ul style="list-style-type: none"> • Step 1: Weigh the tissue, load the unit and add water. Duration: 40 minutes. • Step 2: Add catalyst and close the lid. Duration: 10 minutes.

	<ul style="list-style-type: none"> • Step 3: Final inspection and press the start button. Duration: 2 minutes. • Step 4: The hydrolysis process takes place automatically. Duration: 12-24 hours. • Step 5: Switch off the machine and prepare for waste discharge/collection. Duration: 2 minutes. • Step 6: Discharge the liquid into Enviro Serv Containers. Duration: 30 minutes.
<p>Social Issues</p> <p>1. Training of Staff.</p>	<p style="text-align: center;">Discussion/Mitigation/Management Approach</p> <p>Staff Advancement:</p> <ul style="list-style-type: none"> • Unskilled and semi skilled labour have been trained to operate the machine effectively with a period of 2 days. • The local supplier of the machines will be responsible for in service training and back-up after sales service. • Three staff members will be trained to operate the facility.

7.6. Description of Options, Phases and Alternatives

7.6.1. Site Alternatives:

1. No Go Option:

No known environmental reasons were identified which could make this a "No Go" option. All Interested and Affected Parties that registered were supportive of the project in principle and co-operated actively and constructively during the assessments process.

2. The Intervet Malelane Research Unit Site:

The land earmarked for the proposed development is fixed. The hydrolysis unit will replace the redundant incinerator and the site is linked to the operational laboratories, pens and stables near the southern section of the farm. The post mortem room is located conveniently close by as are all the supportive infrastructure such as stores and clinics.

7.6.2. Demand Alternatives:

1. Power Supply:

ESCOM remains the only viable and practical option for a digester facility of this nature. The electricity will be required for lighting and to run the hydrolysis machine. Existing lines are located in adjacent buildings close by and sourcing electricity from this system is assured.

A back-up generator is linked to the facility for emergency purposes.

2. Water Supply:

Water supply will be made available through the existing network near the hydrolysis unit.

3. Waste (Liquid and Solid):

No additional solid waste will be generated during this waste management process. The IMRU has an existing solid waste- and litter management system in place which serves the research community in all its facets. See Appendix 4.4. for the in house operational procedures to handle solid waste.

The liquid waste generated during the hydrolysis process will be transferred into Enviro Serv container tanks/drum which will be collected on site by the Enviro Serv Service Provider. These tanks will be transported to the Enviro Serv waste handling depot in Johannesburg. See Appendix 4.8. confirming this arrangement.

7.6.3. Scheduling Phases/Alternatives:

1. Time of Year (Season):

The digester unit will be housed inside a building and for all practical purposes this will make this 24 hour operation. Waste management will however usually be undertaken within normal working hours and only in exceptional cases will loading of the digester take place after hours.

The construction of the building will be of short duration (6-8 weeks) and can take place all year round. Occasional delays may occur during the wet season but these delays will be of limited nature.

7.6.4. Input/Systems Alternatives:**1. Construction Approach:**

Style, layout, colour and architectural design must be commensurate with the surrounding natural environment and blend in with existing infra-structure which is essentially of an earthy (brown face bricks, non reflective) nature.

Brick and mortar, using face bricks and a tile roof will be used to construct the facility. The floor will consist of bunded concrete with an adjacent concrete bund which will house the Enviro serv containers.

7.6.5. Process Alternatives:

Alkaline Hydrolysis Waste Management Advantages	Incinerator Waste Management Advantages
1. Controlled disposal of waste. No foreign materials end up in the waste cycle. This process places bio-security into the hands of smaller operations.	1. Can burn almost anything. However materials or waste could be added to the incinerator which are detrimental to the environment.
2. Clean, efficient and reliable process. Very easy and simple to operate.	2. Fast and efficient process.
3. A Green Approach to waste disposal of carcasses. Waste control is internalised.	3. No water is required to operate the incinerator.
4. Water is used but it is re-cycled for re-use.	4. No electricity is required to operate the incinerator.
5. No fossil fuels are used.	
6. The operational costs to run an alkaline hydrolysis process is 50% less than the costs associated with an incineration programme. It is thus more affordable.	
7. Operational temperatures are far lower than incineration and thus relatively safer. No steam is generated.	
8. The end product is sterile, stable, non-malodorous liquid with numerous applications in the agricultural industry where it can be effectively employed as a soil conditioner (improver), compost additive or serve as a feedstock for bio-energy production.	
Alkaline Hydrolysis Waste Management Disadvantages	Incinerator Waste Management Disadvantages
1. Uses water in the breakdown of tissue.	1. Uses fossil fuels thereby adding to the pollution footprint in the environment. This process can produce carbon dioxide; carbon monoxide; nitrogen oxides and nitrogen gas.
2. Uses electricity to operate the machinery.	2. Emissions not predictable, e.g. other materials could be inadvertently added.
3. Cannot breakdown man-made	3. Uncontrolled disposal of unwanted

materials, e.g. plastics, syringes. This can however be seen as an advantage in certain circumstances.	materials poses a risk.
4. Electricity costs have increased in the past few months.	4. Waste goes into the general atmosphere.
	5. Must be cleared manually and disposed of by hand. Spillages may occur from oven to disposal site.

Summary of Preferred Alternatives: Key Points:

- No new Greenfield site must be cleared for the new building.
- The preferred site for the building is next to all existing infra-structure and on the site that is occupied by the redundant incinerator.
- The redundant incinerator will be dismantled and all pieces removed. The building for the alkaline hydrolysis plant (AHP) will be constructed on the site presently housing the incinerator.
- All areas in and around the AHP will be bunded to ensure a safe- and controlled working environment.
- The Enviro-Serv container will be stored in the bunded area for collection. All drums will be sealed.
- Service provision for power will be supplied by ESCOM and water will be sourced from existing supply lines.
- Diesel may be used if the electricity costs rise in future. The diesel bunds and tanks are already in use and on site and can be connected to the system should it be required. All tanks are placed on bunded areas.
- A back-up generator is sited adjacent to the AHP and can be activated during emergency situations.
- Water is freely available next to the site in the laboratories and service lines can be connected to the AHP.

8. PUBLIC PARTICIPATION

1. The process was advertised as follows:

1.1. RES has met with officials from DEA (Provincial) and had discussions telephonically with National: DEA.

DEA: National are the lead authority for this authorisation. The department issued an instruction to commence with the EIA. A Newspaper Advertisement inviting public participation was published in the Lowvelder (local and regional newspaper) on 23 April 2010.

Advertisements were also placed at the entrance/access to the site on the tar road, in the towns of Malelane (Inkomazi Centre) and the local stores in the area.

Furthermore the advertisement was also handed to Prudence Langa: Environmental Manager for the Nkomazi Town Council.

See Appendix 2 for copies of Notices, Advertisements and Newspaper clippings.

2. Although the intention to implement this activity was advertised as prescribed above and potential Interested and Affected Parties were given more than 30 days to register, no involvement from the broader Public nor any Interest Groups was forthcoming. Participation by Interested Groups was therefore limited and channelled towards neighbours and officials from the Nkomazi Municipality.

3. Consultation was formalised through focus group meetings with each neighbour and or official department. Copies of the Scoping Report were submitted for comments as per the distribution list on page 2. No additional input was received from the I&AP's during the comments period on the DRAFT Scoping Report. DEA

4. Issues and Impacts were assessed for significance during the EIR Phase of the project. Where applicable alternatives were submitted for consideration and or measures of mitigation were suggested.

5. The Draft EIR is submitted to the I&AP's for a period of 40 days for perusal and to submit comments or additional input.

6. See Appendix 2 for a comprehensive set of minutes and the Issues and Responses Report.

Any organisations or individuals known that objected/raised concerns towards the proposed development? **No objections were raised. Queries were noted in the Issues and Responses Report.**

Yes	No
	X

How many organisations or individuals objected/raised concerns/issues towards the proposed development?

None.

Comments:

See Appendix 2 for a detailed copy of the Issues and Responses Report.

9. DECOMMISSIONING PHASE

It is unlikely that the proposed development will be decommissioned in the foreseeable future however elements of the site may require a change in land use or have to undergo a process of decommissioning in some form or another. For this event a number of **objectives** are submitted for consideration.

9.1. Decommissioning Objectives

The developer remains responsible for all the decommissioning activities in the area. The infrastructure will undergo a full and comprehensive decommissioning programme. This programme must be described in a **decommissioning plan**.

It is recommended that an **Independent Environmental Assessment Practitioner (EAP)** is appointed at the time **to compile a detailed decommissioning plan** to address all the aspects of the decommissioning process prevalent at the time.

9.2. Decommissioning Approach (Under guidance of an EAP)

Essentially the following approach must be implemented:

9.2.1. Removable Concrete Structures

- All foreign material such as gravel and concrete must be broken up and removed to a designated gravel pit, which will be identified by the Nkomazi Municipality for purposes of rehabilitation.
- All roads, buildings and service infra-structure must be demolished and removed off site.
- All service lines, where applicable (electrical, sewerage and water supply) must be removed and trenches rehabilitated.
- The lie of the land must be returned to fit in with the adjoining land surface or as per recommendations submitted by DEA.

9.2.2. Reinstatement

- All foreign material must be removed and disposed of at a borrow pit earmarked for rehabilitation.
- The disturbed area must be levelled off and contoured to fit in with the rest of the landscape.
- The disturbed area must be ripped, and fertilised to enhance re-vegetation.
- The exposed soil must be brush packed with brushes and grass material from the area, to serve as a seed bank for re-vegetation.
- The reinstated area must be irrigated once a week to promote the re-vegetation process.
- These aspects will require on site monitoring, as the occurrence of natural rainfall will determine the frequency of irrigation required.

10. MONITORING and AUDITING

It is recommended, that in the event that this development proposal is approved, that the developer appoint an independent **Environmental Control Officer (ECO)** to oversee the implementation of the Environmental Management Programme (EMP) and **monitor compliance** of the **Environmental Impact Assessment (EIA)**.

Furthermore, if the proposal is approved, the ECO must ensure that all the **conditions** as set out in the **Record of Decision (ROD)/Environmental Authorisation** issued by the DEA, are met and implemented as stipulated. The ECO must submit a monthly Audit Report to the developer, contractor and to DEA for record and implementation purposes.

The **role of the ECO** and independent audit teams are well defined in the framework of the **Integrated Environmental Management (IEM)**.

11. RECOMMENDATIONS:

Based on the above mitigation measures and the contents of the Construction Environmental Management Programme (CEMP) being implemented the following recommendations are submitted for purposes of summation. This submission is in no order of priority.

This report was circulated to Interested and Affected Parties for comments and perusal. Where applicable these comments were included into the Report.

- Liaise closely with the DEA during the construction process to ensure a sustainable approach to the development.
- Implement and adhere to the contents of the Construction Environmental Management Programme (CEMP).
- Appoint an Ecological Control Officer to oversee the construction phase of the project.
- Adhere to all the design specifications as proposed in this document.
- Construct/implement the facility at the preferred site and initiate the project under the conditions described in the EMP: Construction.
- Sensitise the Contractor/labourers to be aware of the importance of cultural artefacts and implement the recommended procedure (in the CEMP) in the event that such a discovery is made during construction.
- Should any artefact or historical site be discovered during excavations for foundations as well as in future, all works must cease with immediate effect.
- The find must be reported to the ECO and the Project Manager for the project. These representatives will initiate an Action Plan to address the management and handling of the find.
- Implement the waste management procedure (solid and liquid) as per the contents of the CEMP and the SOP's of IMRU.
- Pay special attention to all the aspects pertaining to topsoil protection and topsoil management as described in the CEMP.
- Pay special attention to the aspect pertaining to the handling and management of hazardous materials (where applicable) and specifically fuels.
- Pay special attention to the handling and management of concrete and cement.
- Implement all aspects of site clean up, rehabilitation and site handover as described in the EMP.

An analysis of the environmental impacts and issues has not revealed any fatal flaws. All the impacts and issues identified and discussed during the investigation can be mitigated to an acceptable degree.

Provided the developer implements the implications of this report, the CEMP and the mitigation measures proposed, it is recommended that the activity be implemented at the preferred site.

12. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME (CEMP)

This plan must be read in conjunction with the **Contract Documents**, the **Building Specifications** and where applicable the **Bill of Materials**. This environmental management plan consists of a Construction Management Plan (Construction Environmental Management Plan: CEMP) and will address the construction phase of the proposed development as per the plan described in the Appendix 4.3.

KEY ISSUES: Construction Management Programme

1. This plan is designed for the entire construction period, and includes the rehabilitation of areas where construction activities took place.
2. The Contractor, together with the Environmental Control Officer (ECO) will be responsible to ensure that all construction workers, subcontractors, suppliers and relevant personnel associated with the construction:
 - Understand the contents of the Construction Environmental Management Programme (CEMP).
 - Ensure that all the construction personnel are fully aware of all environmental issues relating to the construction activities.
 - Adhere to all the precautionary and mitigating measures described in the CEMP.
 - Ensure that all the construction personnel understand the implications and stipulations of the Environmental Rules and Regulations described in the Construction Contract.
3. The ECO shall instruct the Project Manager to suspend the works if the Contractor and/or any Sub-Contractors do not comply with the contents of the CMP.
4. The ECO will submit monthly audit reports to DEA, the Contractor and the Developer.
5. The CEMP describes the responsibility of all the staff during the construction phase.
6. The ECO will oversee the operations and ensure **compliance** with the CEMP.
 - **Non Compliance:** The Contractor is deemed NOT to have complied with the CEMP, the ROD (Authorization) and the EIA if:
 - Within the boundaries of the site, site extensions and haul/access roads there is evidence of contravention of the Specifications,
 - Environmental damage ensues due to negligence,
 - The Contractor fails to comply with corrective or other instructions issued by the ECO within a specific time,
 - The Contractor fails to respond adequately to complaints from the public, and/or,
 - Legal action is instituted against the developer in terms of the Environmental laws applicable in South Africa.
7. Prior to construction, the Contractor, in liaison with the ECO will submit a layout plan of the construction site indicating all of the following: storage areas, hazardous substances storage area (if applicable), different stockpile areas, batching plant (if applicable), material stores, waste disposal areas, on site offices, workshops, ablutions, access roads etc. This construction site layout plan must be submitted to DEA and the ECO prior to site establishment.

12. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME: The ECO will monitor compliance of this CEMP		RESPONSIBLE PERSON
ACTIVITY	MANAGEMENT/MITIGATION ACTION	
<p>1. Site Establishment and Management.</p>	<p>1.1. A final walk through the site with the ECO to point out the presence of Rare Plants/Habitat (where applicable), Archaeological and Historical sites/artefacts or any other aspect which requires protection has to be undertaken prior to site establishment. Note: It must be noted that no sensitive sites or biota are found on building site as the construction will occur on presently disturbed sites.</p> <p>1.2. All staff must be trained to respect the importance of rare plants and artefacts (where applicable).</p> <p>1.3. All finds must be reported to the ECO. The ECO will initiate a process to handle the find.</p> <p>1.4. Special features (rocky outcrops; large indigenous trees; rivers; etc.) must be indicated on the development map and demarcated on site prior to construction. Damage to such features must be rehabilitated and or monetary compensation must be made to the developer.</p> <p>1.5. Establish a Site Office where copies of the EIA, EMP, ROD and a register of all applicable procedures (e.g. handling of hazardous materials) must be kept.</p> <p>2. Limit the construction/development site to existing infrastructure and/or to disturbed areas.</p> <p>3. The site has to be safeguarded against fire.</p> <p>4.1. Ensure that the Contractors Site is fully functional in terms of water, sewerage and power supply prior to the contractors coming on site.</p> <p>4.2. Ensure that only approved workers and Sub-Contractors are accommodated and allowed access to the site.</p>	<p>Contractor</p>

	Contractor
<p>5. Demarcate the boundaries of the total construction site for management purposes using steel droppers spaced at regular intervals with a nylon rope/barrier tape between the droppers or any other effective demarcation material/method (danger tape).</p> <p>6.1. The Contractor shall maintain the demarcation line and ensure that materials used for construction on site do not blow on/or move outside the site or pose a threat to any neighbours or adjoining property owners.</p> <p>6.2. Structures must be located in such a manner as to reduce visual intrusion and minimal disturbance to neighbouring properties. Make use of coloured netting or corrugated cladding to hide unsightly features.</p> <p>7.1. Construction activities are restricted within these boundaries, thus all construction equipment, materials and personnel will remain within this demarcated area at all times.</p> <p>7.2. Ensure that access to the site including related infra-structure and machinery is restricted to authorised personnel only.</p> <p>8.1. Temporary access routes and haul roads are to be used within demarcated areas, and vehicle movement is strictly confined to these roads. No vehicle movement outside these areas is permitted without authorisation from the ECO.</p> <p>8.2. Dust control measures, i.e. dampening access routes with water, must be implemented where necessary.</p> <p>8.3. Damage to any existing roads as a result of construction activities will be repaired to the satisfaction of the ECO and the Developer.</p> <p>9. Indicate clearly which activity is designated to each area within the site, e.g. stockpiling of materials etc. Limit these activities to single sites as per 1.2.</p> <p>10. The Contractor shall ensure that all temporary structures/facilities, equipment, materials and waste used for construction activities are removed after completion of development.</p> <p>11. The contractor shall clear and clean the construction site to the satisfaction of the ECO and the developer upon completion of the development.</p> <p>12. Remove all components of demarcation when the construction phase is completed.</p> <p>13. Rehabilitate disturbed areas.</p> <p>13.1. Break up any hardened soil surfaces allowing seeds and rainwater an opportunity to penetrate the soil surface.</p> <p>13.2. Brush pack/landscape bare areas and reduce the potential run off of water.</p> <p>13.3. Shape/level off any unnatural areas to fit in with the surrounding landscape.</p>	

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>2. Site Preparation and Management.</p>	<ol style="list-style-type: none"> 1. When applicable, vegetation clearing must be kept to an absolute minimum. The ECO must be consulted prior to any removal of vegetation. <u>Note:</u> As it stands the site is already clear of vegetation. 2. Selective trimming of woody vegetation (where applicable) may be considered to allow for worker access or infrastructure placement. The ECO will approve all actions in this regard. 3. No large trees (trunk diameter > 250 mm) may be removed. ECO to be consulted if a tree must be removed. 4. Collection of firewood/seeds/fruit or any biological material (where applicable) is strictly prohibited. 5. The Contractor is not allowed to deface, paint or mark and/or damage natural features/vegetation on the site. 6. Topsoil will have to be removed from all areas where permanent structure/s are to be constructed and where construction related activities will occur. 7. Topsoil to be handled twice only; once to strip and stockpile and secondly to replace along the contour, level, shape and scarify. 8. Topsoil is not to be compacted, nor should any object be stored/stockpiled upon it. 9. The Contractor shall prevent pollution incidents on the top soil. ECO to monitor. 10. Contractor to be held responsible for providing construction-, drinking-, and washing water for all the activities on site. 	<p>Contractor/ECO</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>3. Excavation, Backfilling and Levelling.</p>	<ol style="list-style-type: none"> 1. During excavation topsoil has to be stockpiled as specified in 2.6 –2.9. 2.1. Excavation of sand to solid ground to be done carefully and to ensure proper drainage. 2.2. Remove sand and debris, and expose all rocky material to ensure proper binding with concrete. 3. Construction to be done preferably over a stable substratum (rocky substrate) to provide maximum anchoring opportunity. 4. Excess sand must be filled in and landscaped into natural sandbanks blending in with the topography of the surroundings. 5. Excess excavated rocky material (rock and boulders) to be used for erosion control/cladding where applicable or for purposes of landscaping. 6. The Contractor shall backfill according to the requirements of progressive reinstatement, i.e. reinstatement of disturbed areas to topsoil profile on an ongoing basis, immediately after selected construction activities are completed, which will allow for passive rehabilitation. 7. Excess stockpiled building material must be removed completely, and all areas levelled to fit in with the surrounding landscape. 8. Excess sand and soil resulting from levelling activities of the work area to be stored in low heaps on the access road/or already disturbed areas. 9. Excess topsoil to be spread evenly over the area in a manner that blends in with the natural topography. 10. When heavy machinery has cleared the bulk of material stockpiles, the disturbed areas are to be levelled and cleared of any unnatural foreign material manually using shovels. 	<p style="text-align: center;">Contractor</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
4. Stockpiling of Building Materials.	<ol style="list-style-type: none"> 1. Limit to the demarcated sites only. This construction and storage site must always be located above the 1:100 year flood line. 2. Consider single sites a priority where possible. 3. Stockpiles of expensive materials i.e. cement, should be removed easily from site in times of no construction/rainy weather. The use of a shipping container should be considered. 4. Allocate space for waste specific sites e.g. waste site for empty cement bags, cement rubble, wooden rubble, metal off cuts etc. These sites must be fenced off and waste must be removed weekly. 5. Specific sites to be allocated for the storage and handling of fuels and liquids required for operational purposes, e.g. oils, lubricants etc. 	Contractor
ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
5. Materials: Handling and Storage.	<ol style="list-style-type: none"> 1. Fuels and other operational liquids (grease, oils, soaps etc.) required during the construction phase to be stored at a central depot in the construction camp. 2. Fuel Stores and diesel generators to be placed on a concrete, or similar base surrounded by a brick bund/wall. 3. Bunded area to have the volume of 100% of the volume of the largest tank in the storage area plus 100% of the volume of all other tanks/containers. 4. Concrete slab to be sloped towards a sump/drainage chamber to enable any spilt fuel/liquid to be removed. 5. Liquid fuel and gas not be stored in the same storage area. Gas to be stored in a locked metal cage. 6. Tanks containing fuel to have lids, which are to remain firmly shut. 7. Only clean empty tanks/drums to be stored on bare ground. 8. Any waste water collected at the sump to be disposed of at hazardous waste site. 9. A "No Smoking" restriction must be enforced inside and within 5m of these stores. 10. Contractor to ensure that there is adequate firefighting equipment at the fuel stores. The OHAS Act will apply at all times in this regard. 	Contractor

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>6. Servicing and Refuelling of Construction Equipment.</p>	<ol style="list-style-type: none"> 1. Contractor to ensure refuelling/servicing of equipment to be undertaken within the confines of the construction camp. 2. Contractor to change oils/lubricants at designated locations in the construction camp, except for a breakdown or an emergency. 3. Contractor to ensure that drip trays are available to collect any fluid. Any accidental spillages to be cleaned/removed with immediate effect. 4. Ground surface at refuelling/service areas to be protected against pollution caused by spills and or overfills. Drip trays, absorption blankets and plastic sheeting for protection and clean-up to be used at all times. 5. All water run-off from these refuelling/service areas to be collected, contained on site and stored in watertight containers prior to disposal off-site at a hazardous waste site. 6. All equipment that leaks to be repaired immediately or to be removed from site. 7. All soils, which are contaminated accidentally by spillages, must be stored in closed containers and handled by an approved/accredited Spill Control Expert, e.g. Chops Raats - Savuti Spill Control - Cell: 082 678 6399 (Nelspruit). 	<p style="text-align: center;">Contractor</p>
<p>ACTIVITY</p>	<p style="text-align: center;">MANAGEMENT/MITIGATION ACTION</p>	<p style="text-align: center;">RESPONSIBLE PERSON</p>
<p>7. Waste Management: Solid Waste.</p>	<ol style="list-style-type: none"> 1. All waste to be disposed of off-site at an approved landfill site (Nkomazi Landfill Site). 2. Contractor not to dispose of any waste and/or construction debris through burning or by burying. 3. Contractor to supply tamper proof waste bins throughout the site at locations where construction workers are working. 4. If construction workers are to eat on site, contractor has to designate specific areas for this purpose and to provide for access to adequate refuse bins. 	<p style="text-align: center;">Contractor</p>

	<p>5. Tamper-proof refuse bins to be emptied on a daily basis. Refuse bins not to be used for any other purpose. The waste to be removed daily to a recognised landfill site. (Nkomazi Landfill Site).</p> <p>6.1. No mixed concrete/cement to be deposited directly onto the ground. Cement mixing must take place on a protective layer of plastic sheeting, conveyor belt and or metal sheet.</p> <p>6.2. Excess concrete or cement from mixing to be deposited in a designated area awaiting removal to an approved landfill site. (Nkomazi Landfill Site).</p> <p>7. Old cement bags/mixing bags/platforms to be discarded in wind and spill proof containers. No cement bags closed and/or open and/empty to lie around the site.</p> <p>8. All loose building rubble and waste from the site to be disposed of at an appropriate fenced off rubble site for future removal to the Nkomazi Landfill site.</p> <p>9. All waste including cigarette boxes, cigarette butts, paper, plastic bags, tin, glass, wires, cable ties, and organic waste e.g. peels and bones to be disposed of in separate/designated refuse bins. This waste to be transported weekly in an appropriate manner (plastic bags) to the approved waste site for disposal and recycling at the Nkomazi Landfill Site.</p>	
<p>ACTIVITY</p>	<p>MANAGEMENT/MITIGATION ACTION</p>	<p>RESPONSIBLE PERSON</p>
<p>8. Waste Management: Liquid Waste.</p>	<p>1. Construction water refers to all water affected by construction activities.</p> <p>2. Contractor may discharge "clean" water over land and allow this water to filter into the ground. Contractor to ensure that no erosion occurs as a result of overland discharge.</p> <p>3. Contractor is encouraged to recycle dirty wash water in minimising the amount of water to be removed from site.</p> <p>4. No River/Stream/Natural Drainage Line (where applicable) to be used for cleaning of tools/equipment. This includes the washing of clothes and bathing/recreational purposes.</p> <p>5. All washing of equipment to be undertaken at the designated facilities.</p>	<p>Contractor</p>

<p>6. All cleaning operations to take place off-site at a location where wastewater can be disposed of in an acceptable manner. Trucks delivering concrete are not to be washed on site or anywhere on site.</p> <p>7. Water from any other cleaning operations to be collected in a "conservancy" tank removed from site and disposed of in the agreed manner.</p> <p>8. Contractor to contain wash water from cement mixing operations by directing the water into a sump for collection. Waste in the sump to be removed to an appropriate landfill site.</p> <p>9. Water and slurry to be contained to prevent the pollution of the ground surrounding the mixing and/or disposal points.</p> <p>10. All visible remains of excess concrete to be physically removed and disposed of as waste.</p> <p>11. A drainage system to be installed to divert run-off from areas of potential contamination/pollution, e.g. vehicle maintenance area, workshops and batching areas.</p> <p>12. No spills to be channelled into natural environment. Contractor to take reasonable precautions to prevent pollution of the ground and water resources.</p> <p>13. Construction waste to be discarded at a registered landfill site (Nkomazi).</p> <p>14. Where permanent toilets are not accessible, adequate temporary (e.g. Enviro-loos) ablution facilities to be put in place on site located near to working areas. 1 Enviro-loo per 12 workers. Toilet paper to be provided by contractor.</p> <p>15. All contaminated soil e.g. refuelling spills/leaks, to be excavated to the depth of contamination, and to be removed to an appropriate landfill site. See par. 6.7.</p> <p>16. Contractor to ensure that no fuels (petrol/diesel), oils, lubricants and/or other chemicals are discarded onto the ground. Use drip trays in all potentially risky situations.</p>	Contractor
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ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>9. Waste Management: Hazardous Waste (Where applicable).</p>	<ol style="list-style-type: none"> 1. Contractor to comply to all national, regional, and local legislation with regards to the storage, transport, use and disposal of petroleum, chemicals, harmful and hazardous materials and substances. 2. Contractor to provide the ECO with a list of all petroleum, chemical, harmful and hazardous materials and substances on site, together with all the storage, handling and disposal procedures for these materials. <p>A register must be kept at the site office containing all the written/prescribed handling procedures.</p> <ol style="list-style-type: none"> 3. Contractor to be responsible for training and education of workers that will be working with these materials. Training to include the proper use, handling and disposal of the substances. 4. Storage of chemicals to be safe, tamper proof and under strict control. 5. Storage and handling of fuels, lubricants, chemicals and other hazardous substances to be protected by placing an impermeable liner beneath the above ground storage tanks in order to prevent accidental contamination of the soil. 6. All storage areas to be bunded and equipped with a peripheral collection drain. 7. Bunded area must be large enough to contain a spillage equivalent to the volume of each container of the substances stored. 8. All petroleum, chemical, harmful and hazardous waste on site to be stored in enclosed bunded areas. Such waste including containers to be disposed of off-site at a hazardous waste disposal site. 9.1. The contractor will ensure that there is a supply of absorbent material (or absorption blankets) readily available on site to absorb, break down and where possible control any spillages that may occur. The amount and type of absorbent material must be appropriate to the volumes of hazardous liquids on site. 9.2. A staff member must be designated to manage this process. 9.3. Any accidental chemical fuel spills to be addressed and reported immediately. Savuti Spill Control in Nelspruit are well versed on the subject and can be contacted as follows: Chops Raats: Cell: 082 678 6399. 	<p style="text-align: center;">Contractor</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
10. Access Roads	<ol style="list-style-type: none"> 1. Adhere to the local speed limit (50km/h) at all times. 2. All construction roads created for the purposes of the development must be designed and planned in advance with the ECO. 3. Construction roads must be designed to incorporate adequate drainage and water attenuation structures. 4. Construction personnel should only use authorised paths and roads. 5. Contractors to limit the number of deliveries where possible through appropriate advance planning. Contractors will be required to submit a delivery timetable. 6. Cement and gravel spillage on the public/tourist roads must be cleared up immediately. 7. Any damage caused by the construction activities to any access or public roads must be rehabilitated thoroughly upon completion of the construction. 	Contractor
ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
11. Construction Staff	<ol style="list-style-type: none"> 1. The Code of Conduct for Contractors as described in the Tender Document will apply to all Construction Staff. The CEMP will be included as a condition of the Tender Document. 2.1. If required, adequate accommodation, ablutions and cooking facilities to be erected at the Contractors Camp. 2.2. If shower facilities (where applicable) are provided the following controls must be put in place: <ul style="list-style-type: none"> • Positioning of the shower and specifically its discharge point must be done to ensure that erosion and build up of detergents does not occur. • All discharge from the shower and other washing facilities must pass through a suitable filter to reduce the load of detergents to the environment. • Filtered water discharge may thereafter be released to the environment, but mechanisms will be investigated to ensure that the water is evenly dispersed so as to not lead to greening up and or swampy conditions in one limited area. • Where possible all waste water will be connected to municipal service lines. 3. A water and sewerage service (Enviro-Loos) to be in place before construction commences. Water and Sewerage to be properly monitored to prevent over usage and overloading. 	Contractor

	<p>4. Boundaries of the accommodation, ablutions and cooking facilities to be clearly demarcated and fenced off where necessary. Preferably the majority of labourers will stay off site.</p> <p>5.1. Dry chemical toilets/Enviro-loos to be available on site during the day.</p> <p>5.2. Toilets to be cleaned and serviced regularly by an accredited service provider. 1 toilet per 12 workers.</p> <p>5.3. Contractor to supply toilet paper.</p> <p>5.4. The entrances to the toilets must be adequately screened from public view.</p> <p>5.5. Where applicable, all temporary facilities must be connected to formal service structures as soon as possible.</p> <p>6.1. A designated place for food preparation and dining to be established on site.</p> <p>6.2. Dishwashing facilities must be provided.</p> <p>7. No open fires are allowed.</p> <p>8. Adequate tamper proof refuse bins to be provided on site and at accommodation units. (Where applicable).</p> <p>9. Staff may be transported in open vehicles, equipped with built up sides and a cover of some sort or type. Existing regulations of the Traffic Ordinance will apply at all times.</p>	
<p>ACTIVITY</p>	<p>MANAGEMENT/MITIGATION ACTION</p>	<p>RESPONSIBLE PERSON</p>
<p>12. Fire.</p>	<p>1. Contractor to take all the necessary precautions to ensure that no fires are caused as a result of activities on site.</p> <p>2. Contractor to supply all accommodation and cooking facilities, site offices, workshop areas, storage areas, with approved fire-fighting equipment.</p> <p>3. All firefighting equipment to be maintained in good operating order.</p> <p>4. No open fires for heating or cooking are allowed on site.</p> <p>5. Closed fires/stoves shall only be permitted at agreed designated safe sites in the construction camp/staff village.</p>	<p>Contractor</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
13. Accidents.	<p>1. Contractor to comply with the Occupational Health and Safety Act (OHASA), National Building Regulations and any other regulations with regard to safety on site.</p> <p>2. Contractor to ensure that all staff is familiar with all the emergency procedures.</p> <p>3. Contractor to ensure that lists of all emergency telephone numbers/contact people are available and are posted at relevant locations, e.g. site office, at all times; and that they are updated regularly.</p> <p>4. Contractor to be responsible for establishing an emergency procedure for dealing with spills/releases of fuels, chemicals, and hazardous substances. All spills/accidents to be recorded (in the Incident Register) and reported to the ECO. The clean up of spills and any damage caused shall be for the Contractor's account.</p>	Contractor/ECO
ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
14. Adverse Weather Conditions and Erosion Protection.	<p>1. Contractor to ensure that no sumps (where applicable) are emptied unnecessarily. Special care to be taken during rainy periods/adverse weather conditions to prevent contents from overflowing.</p> <p>2. Contractor to set up a procedure for rapidly emptying any collection points to prevent them filling with rainwater.</p> <p>3. Contractor to ensure that rainwater does not run off areas containing pollutants, which can result in a pollution threat.</p> <p>4. Contractor to ensure that a procedure is established for dealing with potentially polluted rainwater. Procedures/method statements must be filed in the register in the site office.</p> <p>5. Stockpiles of fine material such as sand, topsoil, cement etc. to be protected from rain runoff and wind.</p> <p>6. During construction, Contractor to protect all areas susceptible to erosion by installing all the necessary temporary and permanent drainage works ASAP. Contractor must also prevent water scouring of the slopes, embankments (where applicable) and any other areas.</p> <p>7. Correct any cause of erosion at the onset thereof through the most appropriate mechanism. Discuss any remedial actions with the resident ECO.</p>	Contractor

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>15. Noise, Visual and Dust Impacts.</p>	<p>1.1. Contractor to use the equipment that is appropriate to the task in order to minimise the extent of damage to the environment and minimise the noise levels.</p> <p>1.2. The provisions of SABS 1200A will apply to all areas within audible distance of the site.</p> <p>2.1. Noise levels to be kept within acceptable limits for a rural/research area, and not to be of such a nature as to detract from the experience of persons in the area. No amplified music will be allowed.</p> <p>2.2. Construction activities generating output levels of 85dB or more will be confined to the hours 06h00 to 17h00 Mondays to Saturdays.</p> <p>2.3. The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools and blasting activities.</p> <p>3. The type and colour of both temporary and permanent structures to be of neutral non-reflective colours.</p> <p>4. Lighting temporary/permanent to be placed in such a way not to be of a nuisance to residents and the general public visiting the area.</p> <p>5. Dust to be controlled on site at all times.</p>	<p>Contractor</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>16. Construction: Specific Activities</p>	<p>1. Trenching will be undertaken as follows:</p> <ul style="list-style-type: none"> • Trenching will be minimised through the use of single trenches for multiple service provision. • Planning and selection of trench routes will be indicated on the Site Development Plan, and will consider environmental factors such as erosion and “no go” areas. • Trench routes with permitted working areas will be clearly defined and marked with painted stakes prior to excavation. • All trenches must be clearly marked in order to alert people to the potential hazard thereof. • All open trenches must be patrolled on a minimum of a daily basis to ensure that animals, e.g. lizards, small rodents, have not become trapped. Such animals will be removed and released. • Stripping and separation of topsoil will occur as stipulated by the CEMP. • Soil will be excavated and used for re-filling trenches using the rollover method, i.e. progressive re-instatement: • Soil from the first trench section will be stockpiled. • Soil excavated from subsequent trench lengths will be used to backfill once the services have been laid on an ongoing basis. • The final trench length will be re-filled using the originally stockpiled soil. • Trench lengths will be kept as short as practically possible. • Trenches will be re-filled to the same level as, or slightly higher to allow for settlement of the surrounding land surface to minimise erosion. Excess soil will be stockpiled in an appropriate manner. • Immediately after refilling, the disturbed areas will be stabilised. <p>2.1. The Contractor will minimise the extent of any damage to any drainage line that is necessary to complete the works, and will not pollute any eco-system as a result of construction activities.</p> <p>2.2. The Contractor will not cause any physical damage to any aspects of a watercourse (where applicable), other than that which is necessary to complete the works as specified and in accordance with the accepted method statement.</p> <p>2.3. Construction activities will not permanently alter the surface or subsurface flow of water</p>	<p>Contractor/ECO</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
<p>17. Emergency Procedures: General</p>	<p>through the area. 2.4. In order to avoid erosion at storm water discharge points a 300mm thick gabion mattress will be constructed.</p> <p>1. The Contractor will take all reasonable and active steps to avoid increasing the risk of fire through their activities on site. 2. No general fires for heating or burning of waste material will be tolerated on site. In terms of the Atmospheric Pollution Prevention Act (APPA), burning is not permitted for waste disposal. 3. Precautions (e.g. suitable fire extinguisher, welding curtains) when working with welding or grinding equipment near potential sources of combustion will be taken. 4. All fire control mechanisms (fire fighting equipment) will be routinely inspected by a qualified investigator for efficiency thereof and be approved by local fire services. Such mechanisms will be present and accessible at all times. 5. All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire. 6. The Contractor will advise the relevant authority of a fire outside of a demarcated area as soon as it starts and will not wait until he can no longer control it. 7. The Contractor will ensure that his employees are aware of procedures to be followed for dealing with spills and leaks, which will include notifying the relevant authorities and the ECO- 8. The Contractor will ensure that the necessary materials and equipment for dealing with spills and leaks are available on site at all times. 9. Treatment and remediation of the spill areas will be undertaken to the reasonable satisfaction of the ECO. 10. In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible treat a minor hydrocarbon spillage.</p>	<p>Contractor</p>

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
18. Health and Safety	<ol style="list-style-type: none"> 1. Contractor to provide an Occupational Health and Safety Management Plan to the ECO for approval prior to the commencement of works in terms of the Construction Regulations. 2. Ensure that there is an inspection schedule and log for use by security or contract staff. 3. Fencing and barriers will be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993). 4. Applicable notice boards and hazard warning notices will be put in place and secured. Night hazards will be indicated suitably (e.g. reflectors, lighting, traffic signage). 5. Emergency- and Management Staff contact details will be prominently displayed. 6. Security personnel will be briefed and have facilities to contact relevant management and emergency personnel. 7. No unauthorised firearms or weapons of any kind will be permitted on the site. 8. Fire hazards will be identified and the relevant local authority division notified of any such potential threats (e.g. large brush stockpiles, fuel sources) 9. In the event of use, scaffolding must be adequately secured. 10. Structures vulnerable to high winds must be secured. 11. Due to the nature of the project, the construction activities will not be able to be totally cornered off from adjacent land uses, thus making construction a safety issue. Suitable warning mechanisms must be utilised – including but not limited to danger tape and signage (dangerous animals). 	Contractor

ACTIVITY	MANAGEMENT/MITIGATION ACTION	RESPONSIBLE PERSON
19. Site Clean Up	<p>12. Should the site be closed for a period of more than one week, a report on compliance will be lodged with the Site Manager/ECO, and the following will be confirmed:</p> <ul style="list-style-type: none"> • Stores will be left at as low a volume as practicable, with no leaks. • The store area will be secure and locked. • Fire extinguishers will be serviced and accessible. • The area will be secure from accidental damages. • Emergency and contact numbers will be available and prominently displayed. • Toilets will be empty and secured. • Refuse bins will be empty and secured. • Due to the presence of large scale excavations and machinery, access to the site must be limited to authorised personnel only. • Security staff will patrol and guard the site. <p>1. Contractor to ensure that all temporary structures, materials, and water and waste facilities used for construction activities are removed upon completion of the project.</p> <p>2. All signs of disturbance and contractor activity must be rehabilitated to a state as on day of site handover.</p> <p>3.1. All re-seeding activities will be undertaken at the end of the dry season (middle to end October) to ensure optimal conditions for germination and rapid vegetation establishment.</p> <p>3.2. When ripping for rehabilitation the contractor will rip to refusal or a minimum of 300 mm.</p> <p>3.3. The rehabilitated and seeded areas must be harrowed after spreading the topsoil and fertiliser uniformly.</p> <p>3.4. Inspect rehabilitated area at three monthly intervals during the first and second growing season to determine the efficacy of rehabilitation measures.</p> <p>3.5. Take appropriate remedial action where vegetation establishment has not been successful or erosion is evident.</p> <p>3.6. Only indigenous vegetation is to be used in any landscaping which may be undertaken.</p> <p>4. The ECO must sign off the works and the site during a Final Audit Assessment.</p>	Contractor/ECO

PROTECTION OF THE ENVIRONMENT: DECLARATION OF UNDERSTANDING

The Contractor will not be given right of access to the Site until this form has been signed.

I / we, _____ {Contractor}
record as follows:

I / we, the undersigned, do hereby declare that I / we am / are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.

In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I / we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in-so-far as I / we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options.

In this regard, I / we recognize and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.

I / we have signed the Declaration of Understanding with respect to the Environmental Management Programme.

I / we acknowledge and accept the right of the Employer to deduct, should they so wish, from any amounts due to me / us, such amounts (hereinafter referred to as fines) as the Construction Manager shall certify as being warranted in view of my / our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:

The Project Manager, in determining the amount of such fine, shall take into account inter alia, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance / non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he/she considers it necessary to impose a sanction in order to eliminate / reduce future occurrences.

The Construction Manager shall, with respect to any fine imposed, provide me / us with a written statement giving details of the offence, the facts on which the Construction Manager has based their assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed _____

Date _____

13. REFERENCES

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Kaye G. I. 2003. *Personal communication to H. L. Thacker regarding alkaline hydrolysis: Gordon Kaye, from Alkaline Hydrolysis, Chapter 6 by H. Leon Thacker, Carcass Disposal: A Comprehensive Review, August 2004.*

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