

**DRAFT ENVIRONMENTAL MANAGEMENT PLAN FOR THE
PROPOSED TOWNSHIP ESTABLISHMENT AND ASSOCIATED
INFRASTRUCTURE ON PART OF PORTION 2 OF THE FARM
COOYONG 1100-LS, HAENERTSBURG LIMPOPO PROVINCE**

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ABBREVIATIONS

BA	Basic Assessment
BC	Body Corporate
DWA	Department of Water Affairs
EA	Environmental Authorisation
ECO	Environmental Control Officer
EMC	Environmental Monitoring Committee
EMP	Environmental Management Plan
GTM	Greater Tzaneen Municipality
HOA	Homeowners' Association
IDA	International Dark-Sky Association
LDEDET	Limpopo Department of Economic Development, Environment and Tourism
WUL	Water Use Licence

1. OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN

The purpose of the Environmental Management Plan (EMP) is to provide measures for the mitigation and management of potentially negative impacts and the optimisation of potentially positive impacts that may be associated with the proposed project during the construction, operational and potential de-commissioning phases.

In addition to recommending measures for impact prevention, mitigation and/or management, this EMP provides the structure according to which environmental monitoring must be done – not only over the short term during construction, but also over the long term during the operational phase.

2. ENVIRONMENTAL COMPLIANCE MONITORING: GENERAL

2.1. Environmental Control Officer

An Environmental Control Officer (ECO) must be appointed before commencement of construction / site preparation activities, and must remain on the project for the duration of the construction phase in order to oversee the implementation of and compliance with the EMP and any other environmental requirements, such as that which may be contained in the environmental authorisation. The ECO will be responsible for the following:

- Onsite monitoring of compliance with the measures stipulated in the EMP and environmental authorisation. Site inspections must be done at least on a monthly bases;
- Compilation of six-monthly monitoring / compliance reports during the construction phase for submission to LDEDET;
- Liaison with the environmental monitoring committee (refer to Section 2.2 below);
- Formulating, and overseeing the implementation of, remedial and/or management measures in case of negative impacts or environmental damage that may not have been anticipated and provided for in the EMP. Such measures may need to be developed in consultation with relevant authorities, specialists or stakeholders, as the case may be.
- Providing guidance and assistance to all participants in implementing and complying with the EMP.
- The designated ECO is to keep an Environmental Register in which any and all environmental incidents, transgressions of the EMP or authorization and/or comments or complaints received from the public and affected parties will be recorded. The regular monitoring reports are also to form part of the Register. The Register must available for perusal by representatives of LDEDET if necessary.
- Maintaining a complaints register and an incident register, in which any complaints or incidents during the construction phase are noted along with a description of how the incidents or complaints were mitigated and photographs where relevant.
- Must be fully conversant with the contents of the Environmental Impact Report and this EMP.
- Must be fully conversant with the environmental authorization for the project and any conditions that may be stipulated therein.

2.2. Environmental Monitoring Committee

An Environmental Monitoring Committee (EMC) should be established at the outset of the construction phase.

- All stakeholders who participated during the EIA must be given the opportunity to become part of the EMC;
- The ECO must submit copies of all monitoring reports to the members of the EMC at the same time as submission to LDEDET;
- Members of the EMC should be afforded the opportunity to participate in site inspections at intervals agreed to between the EMC, applicant and contractor. For safety reasons, a limited number of EMC representatives will be able to participate in inspections, and prior arrangements must be made for these visits. The ECO and at least one representative of the contractor must accompany EMC members on such an inspection.

2.3. Environmental Awareness Plan

- At the outset of the construction phase, the ECO must present an environmental awareness plan to the lead contractor for presentation to the construction workers, with specific concentration on those aspects that directly affect the workers or in which workers will be directly involved.
- A copy of the construction-phase environmental awareness plan must be available onsite – at the site camp and/or site office – at all times during construction.

2.4. General

- The EMP must be available at the site camp and/or site office during the whole of the construction phase.
- All buyers of property within the development must be issued with a legally binding copy of the EMP, which must also include any other conditions that may have been stipulated in the environmental authorisation.
- All persons employed by the applicant or their sub-contractors must abide by the requirements of the EMP and environmental authorisation. Any members of the construction, operation or maintenance workforce found to be in breach of any of the specifications contained within the EMP may be ordered to leave the site and/or to pay a fine, but the developer remains ultimately responsible for activities undertaken on the site and for compliance with the EMP.
- Complaints about irresponsible behaviour or actions that cause or may cause environmental damage or pollution must be reported to the ECO, who in turn will notify LDEDET.
- The Contractor or applicant (to be agreed upon between the aforementioned two parties) shall be responsible for and shall bear the cost of any delays or corrective or remedial actions required as a result of non-compliance with the specifications and clauses of the EMP.
- The developer or their contractors may not direct a person to undertake any activity which would cause them to breach the specifications contained within the EMP.
- Should a contractor be in breach of any of the specifications contained in the EMP, the developer must, in writing, instruct the responsible Contractor regarding corrective and/or remedial action required, specify a timeframe for implementation of these actions, implement a penalty and/or indicate that work shall be suspended should non-compliance continue.

3. MANAGEMENT AND MITIGATION MEASURES: CONSTRUCTION PHASE

3.1. Responsibility

Impact prevention, mitigation and/or management measures during the construction phase are ultimately the responsibility of the applicant, although the lead contractor will be responsible for the day-to-day implementation of the EMP, and different components may be implemented by different sub-contractors, for instance erosion control measures will mostly be the responsibility of the earthworks contractor. The applicant is responsible for ensuring compliance of all his agents / contractors with the EMP.

3.2. Timeframe

The measures specified in the following sections for minimisation and mitigation of construction-phase impacts will be limited to the construction phase, after which the recommended operational phase measures will become applicable.

The construction and operational phases will overlap to some extent, as building construction is anticipated to continue on some stands when other parts of the development have already been completed and are in use. In that case, construction-phase mitigation measures will remain applicable wherever relevant.

3.3. Monitoring

- Environmental compliance monitoring should be done by an independent Environmental Control Officer (ECO) on at least a monthly basis;
- Compliance monitoring reports must be submitted to LDEDET at least every six months;
- Environmental officers / inspectors from LDEDET may inspect the site without prior notice, but for safety reasons must report to the site office upon entering the site and must be accompanied by a representative of the contractor when on the site;
- Should any instances of non-compliance be found, the ECO must bring this to the attention of the contractor or site foreman, along with recommended measures for rectifying the non-compliance;
- In case of serious and/or repeated non-compliance, the ECO should notify LDEDET.

3.4. Reporting

Monitoring reports, indicating the level of compliance with the specifications of the EMP, must be submitted to the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) by the ECO at six-monthly intervals and at the end of the construction phase.

Table 1: Mitigation measures applicable to anticipated construction-phase impacts

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
<i>1. Soils</i>			
1.1. Soil erosion and siltation of drainage line	Clearing of vegetation during earthworks will make the site susceptible to soil erosion in case of rains during the period that bare soil is exposed.	1.1.1. Limit the risk of soil erosion.	<p>Earthworks and establishment of roads and services be undertaken entirely during the drier winter season.</p> <p>Erosion-sensitive portions of the site should be terraced before commencement of construction and establishment of services in order to reduce the risk of soil erosion.</p> <p>Vegetation clearance should take place sequentially as construction progresses, instead of clearing the entire site at the outset of construction.</p> <p>Storm water should be channelled away from exposed areas.</p> <p>Soil stockpiles (if any) must <u>not</u> be placed in the natural flow path of storm water and must be protected from possible erosion, e.g. through covering of the stockpiles with tarpaulin or hessian, and limiting the height and angle of the stockpile. Soil stockpiles should not exceed 2 m in height.</p>
		1.1.2. Effectively remediate erosion if it does take place.	<p>Should any signs of erosion be found, remedial action such as backfilling, compaction and re-vegetation should be taken immediately to avoid exacerbation of the erosion.</p> <p>Any erosion channel(s) that may develop should be backfilled and compacted as soon as possible, and the area(s) restored to a proper condition. The contractor should ensure that cleared areas are effectively stabilised to prevent and control erosion. The cause of the erosion at a particular site must be investigated (e.g. concentration of storm water over a sensitive section) and addressed to prevent a recurrence of erosion.</p> <p>It is the responsibility of the Contractor to ensure that cleared areas are effectively stabilised to minimise erosion. The following are examples of methods that can be employed to this end:</p> <ul style="list-style-type: none"> - mulch or chip cover; - straw stabilising; - watering (with or without added dust control substances such as soil binders and anti-erosion compounds); - planting/sodding; - hand seeding/ sowing; - hydroseeding; - mechanical cover or packing structures; - gabions; - hessian cover;

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
			- geo-textile or shade net silt fences.
	Soil erosion may lead to siltation of the drainage line onsite	1.1.3. Limit siltation.	By preventing and mitigating soil erosion (through the measures specified above) siltation will be minimized. Silt traps should be installed wherever feasible, in order to intercept sediment transported by storm water. A civil engineer should be able to advise on the best locations and size for these.
1.2. Slope instability or failure	Slopes, particularly in the eastern part of the site, may fail if soil is saturated with water.	1.2.1. Prevent slope failure.	Divert storm water away from areas susceptible to slope failure. Runoff from the adjacent, higher-lying northern property should ideally be collected and channelled away from the slopes via the storm water reticulation system. Areas susceptible to slope failure should be terraced prior to commencement of establishment of services and roads to reduce the risk of slope failure. The cut faces should be as near as possible to the vertical to prevent erosion of these faces, and the cuts can be protected with retaining walls which should be free-draining. Establishment of services and internal roads must be done during the winter season. Property owners should be made aware of the dangers of soil saturation, and general storm water management on this site will be of the utmost importance to prevent small and localized slope failures. Adequate space should be provided between future buildings and cut faces to prevent localised failure of vertical cuts due to loading on the upslope part. Final slope design and layout should be done in conjunction with a competent geotechnical / civil engineer. An engineer must also supervise the establishment of services, roads and buildings to ensure that the particular sites are not at excessive risk of slope failure.
1.3. Soil contamination	Possible contamination of soil during construction, e.g. by cement, bitumen or paint, or by leakage / spillage of sewage from temporary chemical toilets	1.3.1. Prevent spillage of contaminants or of water potentially contaminated by cement, chemicals, sewage, etc.	The Contractor must prevent the discharge of any pollutants, such as cement, concrete, lime, chemicals, fuels or contaminated water which might infiltrate into the ground, resulting in deterioration of groundwater quality. Mixing of cement must take place on an impermeable surface (e.g. concrete slab or plastic tarpaulin) and <u>not</u> directly on bare soil. Potentially contaminated water may not be allowed to flow into the storm water drainage system or to infiltrate into the soil. Chemical toilets must be removed by suitable contractors to minimise the risk of spillage. Contents must be disposed of at a licensed sewage treatment plant.
		1.3.2. Efficiently respond to any	In case of any spillage, the ECO must be informed so that he/she can investigate the

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
		spillage	<p>incident and recommend appropriate mitigation measures.</p> <p>Any significant spillage must be reported to the Department of Water Affairs (DWA) and the Limpopo Department of Economic Development, Environment and Tourism (LDEDET), who may need to conduct a site visit to determine the significance of the spillage and to recommend mitigation measures.</p> <p>Cement / concrete must be removed once it has dried, and be disposed of at a landfill site.</p> <p>Fuel spillage may require specialised clean-up, depending on the volume spilled, and especially if spilled into the drainage line. The ECO should advise in this regard on a case-by-case basis.</p> <p>Appropriate measures must be implemented to address the cause of the spillage and prevent a recurrence of a spillage event.</p>
2. Water			
2.1. Groundwater quality	Possible leakage or spillage of sewage from portable toilets during construction phase, or infiltration of water containing construction-related substances such as cement or paint.	2.1.1. Prevent spillage or infiltration of water potentially contaminated by cement, paint, turpentine, etc.	Refer to 1.3.1.
		2.1.2. Efficiently respond to any spillage	Refer to 1.3.2.
2.2. Storm water	Storm water may cause soil erosion on cleared construction site.	2.2.1. Minimize water-related soil erosion	Refer to 1.1.1.
	Storm water may lead to slope failure, particularly in the eastern part of the site.	2.2.2. Direct storm water away from areas susceptible to slope failure.	Refer to 1.2.1.
3. Flora and Fauna			
3.1. Flora	Alien vegetation should be removed, particularly from the flood line area.	3.1.1. Systematically remove alien vegetation.	<p>A long-term programme for combating alien invasive plant species in the open areas, and particularly in the conservation areas, must be instituted. This must include regular monitoring and follow-up removal / treatment.</p> <p>Preference must be given to mechanical or biological methods of removing alien vegetation. Should there be no feasible alternative to chemical methods, organic products should be favoured. Preference should also be given to products targeted at a specific species or small range of species, instead of broad-spectrum products, and spot-application should take preference over blanket application. Should there be no</p>

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			<p>alternative to the broad-spectrum weed killer Roundup, the variety lacking a wetting agent should be used, to minimise negative impacts on frogs.</p> <p>The site must be regularly monitored for re-growth of alien invasive species, and any new seedlings etc eradicated using methods appropriate for the particular species, whether mechanical, chemical or biological.</p>
3.2. Fauna	Possible killing of fauna, e.g. killing snakes or spiders out of fear, or hunting small fauna for food.	3.2.1. Prevent killing of fauna	Educate labourers as to the importance of not simply killing all snakes and other fauna that is perceived as dangerous.
			Keep contact details in the site office for someone who can be called if catching and relocation of snakes, spiders or other unwanted species is needed.
			No snaring, hunting or poisoning of any fauna will be allowed on or around the site.
		3.2.2. Site preparation and establishment of services must not be done during the breeding season of sensitive species	Site preparation, earthworks and establishment of roads and services must not be done in the breeding season of sensitive species.
			Prior to commencement of construction-related activities (including site preparation), as many individuals of sensitive species (particularly <i>Breviceps sylvestris</i>) as possible must be relocated to a suitable nearby site.
		3.2.3. Minimise impacts of chemicals on fauna	Preference must be given to mechanical or biological methods of removing alien vegetation.
Should there be no feasible alternative to chemical methods, organic products should be favoured.			
Preference should be given to products targeted at a specific species or small range of species, instead of broad-spectrum products, and spot-application should take preference over blanket application.			
			Should there be no alternative to a broad-spectrum weed killer such as Roundup, the variety <u>lacking</u> a wetting agent should be used, to minimise negative impacts on frogs.
4. Air quality			
4.1. Air quality	Possible air pollution in the form of emissions from construction vehicles and equipment.	4.1.1. Limit air pollution	<p>It must be ensured that all vehicles entering the site and machinery used in construction activities are in good working order to prevent unnecessarily high exhaust emissions.</p> <p>Vehicles should not be left to idle for unnecessarily long periods of time.</p>
	Potentially high dust levels during earthworks and site establishment.	4.1.2. Limit levels of airborne dust	<p>Whenever necessary, exposed soil must be watered down at regular intervals to reduce levels of air-borne dust.</p> <p>The Contractor must take all reasonable measures to minimise the generation of dust resulting from construction activities.</p> <p>Where possible, soil stockpiles (if any) should be located in sheltered areas where they are not exposed to the erosive effects of the wind. Soil stockpiles should furthermore be</p>

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			covered if possible (e.g. hessian cover or tarpaulin).
			Vegetation clearance should take place sequentially as construction progresses, instead of clearing the entire site at the outset of construction.
			All exposed surfaces shall be re-vegetated or paved as soon as is practically possible after construction.
5. Waste management			
5.1. Solid waste management	General solid waste generated at the construction site must be disposed of at a licensed disposal site.	5.1.1. Safely dispose of all solid waste.	All general solid waste must be disposed of at a licensed landfill site or another licensed waste disposal site. It is anticipated that waste will be disposed of at the Tzaneen municipal landfill site.
			Waste may <u>not</u> be dumped on or near the site, <u>nor</u> may it be burned or buried.
			Any soil contaminated during construction (e.g. by cement) must be removed to a suitable disposal site.
			In the unlikely event of any hazardous waste being generated, this may <u>not</u> be disposed of with the general waste, but rather must be collected and disposed of by suitably licensed hazardous waste contractors.
		5.1.2. Provide sufficient refuse bins and discourage littering.	Sufficient refuse bins are to be provided across the construction area for disposal of general solid waste.
			Refuse bins must be emptied regularly. Workers must be instructed as to the importance of not littering, and it is recommended that a fines system be implemented for workers found littering. Litter, such as there may be, must be picked up on a daily basis and disposed of in the bins provided.
5.2. Wastewater	Wastewater generated by construction workers may lead to contamination of soil, groundwater or surface water	5.2.1. Properly and safely manage all wastewater generated during construction	Refer to 1.3.1.
		5.2.2. Effectively and efficiently respond to any spillage	Refer to 1.3.2.
6. Visual impacts			
6.1. Visual impact of construction site	A construction site may present a negative visual impact due to removal of vegetation, a site that might not be	6.1.1. The construction site must be kept as neat and tidy as possible.	Construction workers should be alerted to the importance of not littering. Apart from the potential environmental impacts of littering, it is unsightly and has a negative visual impact.

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	neat, etc.		<p>Sufficient waste bins must be provided onsite and must be emptied regularly.</p> <p>Litter-picking must be done daily, or more often as and when necessary.</p> <p>Any building rubble should not be allowed to accumulate onsite, but must at regular intervals (at least fortnightly) be removed to a licensed disposal site, or to other construction sites where it may be used as fill.</p> <p>Stockpiles of soil or excavated material should be used for backfilling, rehabilitation or landscaping and may not be allowed to remain onsite after construction unless they are shaped to blend into the surrounding topography and re-vegetated.</p>
7. Noise			
7.1. Noise caused by construction activities	Construction-related noise is expected to relate mostly to construction vehicles and machinery involved in earthworks and delivery of materials.	7.1.1. Minimize disturbance to neighbours	<p>Construction activities should be limited to daylight hours.</p> <p>Should any blasting or other particularly noisy activities be required, neighbouring residents or businesses must be notified at least 24 hours in advance. Blasting should furthermore take place during normal business hours, if at all possible.</p> <p>Any complaints about noise must be attended to in a reasonable manner and the ECO informed of the complaint.</p> <p>A complaints register should be maintained, in which any complaints regarding noise are noted.</p>
8. Socio-economic aspects			
8.1. Job creation and economic benefit to local community	Temporary employment opportunities are anticipated to be created during construction, both directly (construction workers) and indirectly (suppliers, service providers, informal traders alongside site).	8.1.1. Maximise local employment and economic benefit.	<p>Where the required skills are available locally, construction workers, artisans and other labour or services (e.g. security guards) should be sourced from the local area (within 50km from the site).</p> <p>Construction materials should, where possible, be sourced from within 50km of the site, in order to support the local economy and to reduce the environmental implications of long-distance transport of construction materials.</p> <p>Where possible, services required during the construction process, such as rental of chemical toilets, plant hire, etc. Should be sourced from the local area, i.e. from within approximately 50km of the site, in order to support the local economy.</p> <p>A limited number of pre-approved informal traders should be allowed to trade onsite or at the entrance to the site during the construction phase in order to capitalise on the construction workers who will be likely to purchase food from these traders. However, it must be ensured that informal traders put up shop in safe positions, outside of the construction area itself. Furthermore, no alcohol may be allowed to be sold at these stalls, and stall owners must adhere to all relevant specifications of the EMP. Stall</p>

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
			owners will also be responsible for keeping their areas neat and litter-free.
8.2. Security	Risk of criminal elements being attracted to the site or construction workers becoming rowdy and violent.	8.2.1. Limit criminality and violence.	<p>No fire-arms to be allowed onsite.</p> <p>No alcohol to be allowed onsite.</p> <p>Only persons involved with the project may be allowed onto the site. Any visitors must report to the site office first.</p> <p>Workers will not be allowed to spend the night onsite, although possibly one security guard may be allowed overnight.</p> <p>When dwellings are being constructed, one worker per stand will be allowed to spend the night onsite. Certified copies of these workers' identity documents must be kept at the HOA office and security office at the site entrance to regulate who spends the night onsite.</p>
9. Health and Safety			
9.1. Fire	Construction activities pose a risk of fire, particularly during "hot" activities such as welding, refuelling of equipment / machinery, and if there are open fires (for heating / cooking)	<p>9.1.1. Prevent occurrence of fire.</p> <p>9.1.2. Effectively and efficiently respond to fire if it does occur.</p>	<p>Extreme caution should be exercised where open flames are used and/or where there is the potential for sparks, such as in the case of blow torches. These activities should only take place in designated areas which are clear of vegetation and other flammable material.</p> <p>Smoking to be restricted to designated smoking areas situated away from flammable materials.</p> <p>No open fires allowed on the site except in designated areas. This includes fires for purposes of cooking, warmth or any other purpose. Vessels should be provided for fires so that labourers do not need to make open fires.</p> <p>Emergency numbers (e.g. fire station, doctor, ambulance service and local hospital) must be posted in a highly visible location at the site as well as being available in the safety file in the site office.</p> <p>Adequate fire fighting equipment must be available at the site at all times during the construction phase. Such equipment must be clearly visible and easily accessible. Equipment must be available in all areas where construction is taking place as well as in any construction camps and cooking areas.</p> <p>It must be ensured that fire-fighting equipment is in good order.</p> <p>At least one person trained in the use of the fire extinguishing equipment must be onsite at all times.</p>

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
			If a site / construction camp is established, the camp must be situated in a position with a low fire risk, e.g. not close to any highly flammable substances (e.g. fuel) nor close to large amounts of dry vegetation, as activities will take place in the camp which may pose a fire hazard, e.g. workers spending the night onsite will use this camp to make fires for cooking and/or heating, and this will most likely also be the designated smoking area (safe for smoking).
9.2. Health and Safety	Workers may be injured onsite during construction.	9.2.1. Apply security measures and ensure that the specifications of the Occupational Health and Safety Act (1993) are adhered to.	The site must be fenced off and access restricted to those involved in construction. Unauthorized persons may be accidentally injured or may cause damage to the site, as they are not aware of the EMP and other relevant documents, e.g. in terms of safety.
			A first-aid kit should be available and readily accessible onsite at all times. At least one person trained in basic first aid should be onsite at all times when construction is taking place, in case of an accident during construction activities.
			Workers may not be forced to do dangerous work.
			Any relevant necessary safety clothing / equipment must be provided to workers.
			Any trenches or holes that cannot be filled in directly, must be clearly cordoned off by means of danger tape (or similar) to reduce the risk of accident.
			Any relevant specifications forming part of the Occupational Health and Safety Act must be complied with.
			It is recommended that compliance with health and safety legislation be monitored by a safety officer.
10. Traffic			
10.1. Traffic disruption	Slow-moving construction-related vehicles may disrupt traffic and pose a risk of road accidents.	10.1.1. Minimize disruption of traffic by construction-related activities.	As far as possible, heavy vehicles associated with construction should not travel to and from the site during peak times (07:30 – 08:30 and 16:30 to 17:30), to minimise impacts on traffic. This will mostly be applicable to the phase when services are established onsite, as a large number of vehicles may be involved at the same time. This measure need not be applied to contractors constructing individual dwellings, unless it is found that there are in fact traffic disruptions due to vehicles involved in such construction.
			Vehicles associated with construction should as far as possible not be allowed to obstruct the road. They should not stop in the road (wholly or partially) but rather pull off the road or park on the site.
			When work is being done on the access road, care must be taken to erect the necessary safety signage in the R71 and to place flagmen on either side of the section of road affected by the construction work.

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
11. Construction camp (if applicable)			
11.1. If a construction camp is established, bio-physical and socio-economic impacts may be associated with it	Socio-economic impacts.	11.1.1. Minimize negative socio-economic impacts that may be associated with construction camp.	Workers should not be allowed to remain onsite overnight, apart from a small number of pre-approved workers tasked with security of the site and equipment. During construction of dwellings, one worker (with positive identification) per stand will be allowed to spend the night onsite.
			No alcohol to be allowed in the camp, whether by day or by night.
			No firearms to be allowed in the camp.
			No loud music will be allowed within the site / construction camp at any time, so as not to disturb neighbours.
			Only workers with positive identification (proving that they are working on the site) may enter the construction / site camp or spend the night there. Friends or relatives (or any other acquaintances) of workers will not be allowed into the site camp at any time.
			The camp must be clearly fenced off and have a lockable gate in order to enforce entry control.
	Bio-physical impacts.	11.1.2. Minimize negative bio-physical impacts that may be associated with construction camp.	The camp must be established in an area which has already been disturbed.
			The camp must not be placed in an area with steep slope or risk of slope instability.
			The camp must not be placed in any drainage path or within the identified 1:100 year flood line.
			The camp must be situated in a position with a low fire risk, e.g. not close to any highly flammable substances (e.g. fuel) nor close to large amounts of dry vegetation, as activities will take place in the camp which may pose a fire hazard, e.g. workers spending the night onsite will use this camp to make cooking and/or heating fires, and this will most likely also be the designated smoking area.

4. MANAGEMENT AND MITIGATION MEASURES: OPERATIONAL PHASE

4.1. Responsibility

Responsibility for impact prevention, mitigation and/or management measures during the operational phase ultimately rests with the applicant, but day-to-day implementation of mitigation / management measures will be the responsibility of the Homeowner's Association (HOA), Body Corporate (BC) or Section 21 estate management company. The applicant is responsible for ensuring that all bodies, companies or persons acting on their behalf are aware of the specifications of the EMP and the environmental authorisation.

4.2. Timeframe

The measures specified in the following sections for minimisation and mitigation of operational-phase impacts will be applicable for the entire lifetime of the development.

4.3. Monitoring

It is recommended that environmental compliance be monitored annually. It is also advisable that an environmental portfolio be created in the HOA or BC; the incumbent will then be responsible for continually monitoring and ensuring the correct implementation of the EMP.

It is advisable that the EMP be revisited at intervals of 3 years or less to ensure that changes in site conditions or operation are addressed, as well as to incorporate any new or amended legislation that may be applicable.

4.4. Environmental Awareness Plan

- At the outset of the operational phase, the ECO must present an operational-phase environmental awareness plan to the Homeowners Association (HOA) or Body Corporate (BC), whichever is applicable.
- A copy of the operational-phase environmental awareness plan must be provided to all parties purchasing property in the development.

4.5. Environmental monitoring committee

An EMC must be established at the outset of the operational phase. The persons who formed part of the construction-phase EMC may opt to continue on the operational-phase EMC, but all homeowners, residents and business owners in the development will also have the option of forming part of the EMC.

Table 2: Mitigation measures applicable to anticipated operational-phase impacts

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	MITIGATION MEASURES
<i>1. Water</i>			
1.1. Increased peak storm water runoff	Replacement of vegetated areas by “hard” surfaces (paving, buildings, roads, etc) is expected to lead to higher peak storm water runoff	1.1.1. Minimise hard surfaces to maintain a relatively natural runoff pattern as far as possible	Hard surfaces, such as paved or tarred surfaces, should be limited as much as possible. Grassed / vegetated areas should be retained where possible – this to promotes infiltration of storm water to recharge groundwater resources, reduces the peak volume of storm water that needs to be attenuated and reduces the flow velocity of runoff and thereby also the erosive power of the runoff.
			Storm water management infrastructure will be established to manage the 1:5 year flood. This will be established in accordance with the storm water management plan which will be compiled by the civil engineer.
			Where feasible, semi-permeable paving should be used in order to allow some infiltration of surface runoff; the irregular surface will also reduce the flow velocity, thereby reducing its erosive power once it reaches unpaved areas. The selection of appropriate paving products for different parts of the proposed development must be done in consultation with the project engineer to ensure that semi-permeable paving is only laid in suitable areas where infiltration of water will not lead to sagging or failure of the paving.
1.2. Possible contamination of surface water or groundwater resources.	Use of pesticides, particularly those applied to the soil to combat e.g. termites, may lead to contamination of surface water sources	1.2.1. Minimise use of chemicals in gardening / landscaping.	Use of chemicals must be kept to a minimum, particularly in the drainage line and surrounding relatively natural vegetation and sites indicated in the herpetological report. Preference should be given to <u>organic</u> pesticides / herbicides / fertilizer.
			Should chemicals need to be used, target-specific products must be used to prevent unnecessary damage to non-target organisms. Broad-spectrum pesticides and herbicides should be avoided.
			Blanket application of chemicals should be avoided in favour of spot application.
			Chemicals should not be used in the conservation area, except where it is deemed the best method of eradication of certain alien invasive species. Even then, care must be taken to limit impacts, e.g. through spot-application and careful selection of product.
	Leakage or spillage of sewage may lead to contamination of surface water.	Please refer to Table 3, which contains a separate EMP tailored to the onsite wastewater treatment system.	
<i>2. Soils</i>			
2.1. Possible increase in soil erosion and siltation of drainage line	Replacement of vegetated areas by “hard” surfaces (paving, buildings, roads, etc) is expected to lead to higher peak storm water runoff. Furthermore, storm water is anticipated to be	2.1.1. Keep erosion to a minimum	Erosion control measures must be incorporated into the design of the stream crossings, e.g. in the form of gabions along the banks at the stream crossing.
			It must be ensured that storm water does not reach excessive speeds, as that would increase the potential for soil erosion. Energy dissipater structures may be incorporated into the design of storm water infrastructure.

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	MITIGATION MEASURES
	channelled into certain flow paths, instead of sheet wash over large areas		<p>Storm water runoff must not be concentrated in any one place or channel where it flows over unpaved (erodible) surfaces.</p> <p>Storm water must be appropriately channelled away from erosion-prone areas such as bare / cleared areas.</p> <p>Should any signs of erosion be found, remedial action such as backfilling, compaction, placing semi-permeable geo-textiles and/or re-planting with locally indigenous vegetation should be taken immediately to avoid exacerbation of the erosion.</p>
2.2. Possible contamination of soil	Use of pesticides in gardening can contaminate soil	2.2.1. Prevent contamination of soil	Please refer to 3.2.4.
2.3. Soil compaction	Heavy machinery involved in earthworks and construction may compact certain areas	2.3.1. Limit compaction of soil and rehabilitate areas that have been compacted	Machinery and vehicles should, as far as possible, move only along certain paths in order to limit the extent of the area that is compacted. Where possible, these travelling paths should also correspond with areas that will be paved eventually, such as the proposed roadways.
			Machinery and vehicles must remain outside of the conservation area so as to prevent soil compaction in this relatively sensitive section of the site.
			Following the construction phase, compacted sections should be ripped to enable vegetation to re-establish naturally more easily.
2.4. Slope instability or failure	Slopes, particularly in the eastern part of the site, may fail if soil is saturated with water.	2.4.1. Prevent slope failure.	Refer to 1.2.1.
3. Ecology			
3.1. Habitat destruction, degradation or fragmentation	Although degraded, the site currently provides habitat for plant and animal species. This will be negatively affected by the proposed development.	3.1.1. Rehabilitate the relatively natural (albeit degraded) drainage line area	Alien invasive species in the conservation area must be removed, using methods appropriate to the particular species. A long-term programme for combating alien invasive plant species should be instituted; this must include regular monitoring and follow-up removal / treatment of re-growth. Please refer to 3.2.4 for considerations relating to the use of chemicals.
			Dogs should be kept within the confines of their owners' yards, or be kept on a leash when out and about, to limit the risk of their hunting in sensitive areas and in particular the conservation area around the drainage line.
		3.1.2. Provide habitat in gardens / landscaped areas	Cats should have bells on their collars to reduce hunting success and thus their impact on populations of birds and small terrestrial fauna.
			As far as possible, only locally indigenous plant species should be established in gardens so as to serve as foraging or nesting areas for local fauna such as birds and insects.

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	MITIGATION MEASURES
			Species typical to Woodbush Granite Grassland should be re-introduced in the open space and landscaped areas where feasible. A grassland specialist must be consulted in this regard, as factors such as soil pH (which has been affected by years of pine cultivation) is likely to make re-establishment of certain species difficult.
			Lawn grasses such as <i>Cynodon dactylon</i> (couch grass / “kweek”) and <i>Pennisetum clandestinum</i> (Kikuyu) must be avoided.
			Owl boxes may be erected in gardens or open space to serve as alternative nests for owls. Care should be taken to place these in areas where the owls would not feel threatened by dogs or high volumes of traffic, etc.
			Refer to 3.2.4 for measures regarding the use of chemicals.
		3.1.3. Conservation offsets	The applicant will make a contribution to the conservation of the Haenertsburg Grasslands to compensate for (degraded) habitat lost through the development of this site.
		3.1.4. Maintain connectivity between habitats	Boundary walls between stands and around the development should have regularly spaced openings at their base to allow for the movement of small fauna such as frogs, in order to reduce the effect of habitat fragmentation.
			Road crossings should be provided for sensitive species. These may be in the form of “subways” underneath roads which cross migration paths.
		3.2. Disturbance and/or killing of fauna	The development and human presence is likely to disturb the foraging and breeding activities of fauna living on the site.
3.2.2. Translocate specimens of <i>Breviceps sylvestris</i> to suitable habitat during breeding season	It is recommended that a specialist be brought in during the <i>B. sylvestris</i> breeding season (September to October or even November) to translocate as many specimens as possible to habitat that is more suitable for them than is found onsite. Should this be done, please note that permits would need to be obtained from LDEDET before any catching and translocating is done.		
Faunal fatalities can be expected on internal roads (roadkill).	3.2.3. Minimise roadkill		A speed limit of 30km/h should be enforced on internal roads.
			During periods when sensitive fauna can be expected to migrate between areas which necessitates the crossing of roads, residents and workers should be alerted to this fact and a speed limit of 20km/h enforced on sensitive sections of internal roads.
			Road signage should be erected in key areas where fauna such as frogs can be anticipated to cross roads, in order to create awareness among the road users.
			Crossings should be provided for sensitive species. These may be in the form of “subways” underneath roads which cross migration paths.
	Residents or workers may kill specimens of certain faunal species,	3.2.4. Minimise killing of fauna	Residents and workers should be educated as to the ecological importance of all species and the fact that they should not be killed.

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	MITIGATION MEASURES
	such as snakes or insects.		Details should be provided to owners / residents / businesses of person(s) who can safely remove unwanted fauna such as snakes.
	Chemicals used in gardening or in the programme for combating alien invasive vegetation may have a negative impact on fauna, particularly frogs	3.2.5. Minimise impacts of chemicals on fauna	<p>Preference must be given to mechanical or biological methods of removing alien vegetation or other weeds.</p> <p>Should there be no feasible alternative to chemical methods, organic products should be favoured.</p> <p>Preference should be given to products targeted at a specific species or small range of species, instead of broad-spectrum products, and spot-application should take preference over blanket application.</p> <p>Should there be no alternative to a broad-spectrum weed killer such as Roundup, the variety <u>lacking</u> a wetting agent should be used, to minimise negative impacts on frogs.</p>
3.3. Ecological awareness	Regular ecological awareness programmes must be presented to residents and business owners in the development	3.3.1. Raise awareness regarding local fauna	<p>It is recommended that an annual frog census be undertaken within the development, focusing (but not limited to) <i>Breviceps sylvestris</i>. This must be led by a herpetologist, but it is recommended that the community be involved in this through a workshop presented by the specialist and community members participating in the census. This can be coupled with the capturing and translocation of specimens during the breeding season (September to October or November).</p> <p>Awareness creation around the census mentioned above will also make residents more vigilant in terms of slowing down for frogs crossing the road during the breeding season, thereby limiting roadkill.</p> <p>The annual frog census can be complemented by regular (e.g. quarterly) workshops / information sessions at which environmentalists, bird guides, etc give presentations on aspects of the local fauna.</p>
		3.3.2. Raise awareness regarding local flora	It is recommended that regular presentations / workshops be held to highlight aspects of the local vegetation to residents. This can be coupled with informative walks in the nearby grasslands or collaborations with local conservation organisations to perform alien eradication and other activities in the grasslands.
3.4. Fire management	Fire must be managed to prevent unwanted veld fires but allow periodic, controlled burns for the sake of certain grassland plant species	3.4.1. Implement a suitable fire management plan	<p>Uncontrolled fires must be prevented, as they may threaten lives and property in the development, and are also a threat to surrounding pine plantations. No open, unattended fires will be allowed, either in gardens or in public open space.</p> <p>Controlled burns may need to be done in the conservation area from time to time, as fire is an important time of the grassland biome. It is recommended that an annual assessment be done as to the necessity of burning.</p> <p>Burns may only be done on days with little risk of fires getting out of control. The fire risk is indicated daily on the website of the Letaba Fire Protection Association (LFPA),</p>

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	MITIGATION MEASURES
			based on factors such as temperature, humidity and wind speed.
			An emergency preparedness plan must be in place for in the event of a burn getting out of control.
			Fire-fighting equipment must be on hand and the fire may not be left unattended for any length of time. It is recommended that the LFPA as well as volunteer fire fighters from the Friends of the Haenertsburg Grasslands (FROHG) be notified in order to be on stand-by and to advise on whether conditions are suitable for burning.
			A fire management plan must be compiled with input from the applicant, a vegetation specialist, the environmental monitoring committee, the LFPA, community environmental organisations (e.g. FROGH) and neighbouring landowners.
4. Waste Management			
4.1. Waste reduction	The inhabitants of the new township will contribute to the generation of solid waste and place added pressure on municipal refuse collection and disposal infrastructure	4.1.1. "Reduce, re-use and recycle"	Educate residents about the importance of reducing waste generation, re-using instead of discarding, and recycling waste such as aluminium, paper and glass.
			It is recommended that, particularly in the cluster housing / "Res 2" component, separate bins be provided in the waste yard for different types of waste.
			Separate bins for recyclable and non-recyclable waste should be provided along the internal streets.
			Promote composting for organic waste. It is recommended that, particularly in the cluster housing component, a compost heap be maintained where organic and garden waste can be disposed of (not only the garden waste generated in the communal landscaped areas, but also in gardens of full-title stands). This compost can then also be used in the landscaped areas.
4.2. Littering	Littering may be expected, particularly along roads used by pedestrians	4.2.1. Minimise littering	Waste bins must placed at regular intervals along internal roads to discourage littering, and must be emptied regularly.
			Bins should be fitted with closing mechanisms to prevent the contents from blowing out.
4.3. Wastewater	Please refer to Table 3, which contains a separate EMP tailored to the onsite wastewater treatment system.		
5. Increased Water and Electricity Demand			
5.1. Water	The expanding residential area will place additional demands on the municipal bulk water supply	5.1.1. Minimise water use	Rainwater collection tanks should be installed where feasible.
			Treated effluent from the onsite wastewater treatment system will be re-used for irrigation of gardens / landscaped areas.
			Any pipe leaks must be attended to swiftly to minimise unnecessary water loss.
			Irrigation of gardens and landscaped areas should take place in early morning or early evening (summer) or late morning (winter) to minimise water loss through evaporation.
			Xeriscaping is recommended for gardens and landscaped areas (xeriscaping = gardening or landscaping in such as way that the need for irrigation is reduced or

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	MITIGATION MEASURES
			eliminated, mostly though using locally indigenous plant species that are adapted to the local climate).
			Installation of low-flow water fixtures (taps, shower heads, etc) in all buildings is recommended.
5.2. Electricity	The expanding residential area will place additional demands on the electricity supply	5.1.2. Minimise electricity usage	Solar water heating or other low-electricity-use technologies such as heat-pump systems are recommended wherever feasible.
			Electricity saving measures should be implemented throughout the development, e.g. roof insulation, energy-efficient appliances, etc.
6. Visual Impacts			
6.1. Visual impact of development	The replacement of vegetated tracts of land with structures is generally viewed as a negative visual impact	6.1.1. Minimise adverse visual impacts	A variety of building styles should be allowed in the estate to mimic the diversity of styles in Haenertsburg. However, certain aesthetic standards must be in place and an aesthetic committee should form part of the HOA or BC to enforce these standards.
			The drainage line area within the 1:100 year flood line will be preserved and rehabilitated as a conservation area.
			Paved areas should be kept to a minimum, with preference given to landscaping with locally indigenous plant species. Vegetated areas should be retained to “break up” the built-up areas visually.
			The HOA, Body Corporate or Section 21 management company will be responsible for ensuring proper maintenance of the development, <i>inter alia</i> keeping the estate neat and tidy and ensuring the upkeep of structures and landscaped areas.
	Lights from the development (street lighting, outdoor security lighting, lights from dwellings, etc) will contribute to light pollution	6.1.2. Minimise light pollution	The International Dark-Sky Association (IDA) guidelines pertaining to outdoor lighting should be followed. These guidelines focus on minimising the upward scatter of light in favour of focusing light on the target areas, e.g. streets, porches or areas at security risk, thereby greatly reducing or even eliminating light pollution.
7. Noise			
7.1. Increased ambient noise levels	Human habitation increases ambient noise levels. Noise relates to vehicles, music, dogs barking, voices, etc.	7.1.1. Limit noise levels	No loud music or noisy activities should be allowed after 21:00 on week nights or after 22:00 on Friday and Saturday nights. No loud activities should be allowed on Sundays, a traditional rest day (this provision excludes music during church services on Sundays and other church events such as possible mid-week worship services).
			Traffic calming measures such as speed bumps should be implemented to prevent vehicles from reaching high speeds with associated high noise levels.

Table 3: Recommended management and mitigation measures pertaining to the proposed onsite wastewater treatment system

RISK	OBJECTIVE	MITIGATION MEASURES	MONITORING	RESPONSIBILITY	REPORTING
1. Water					
1.1. Potential leakage or spillage of wastewater from treatment plant	Maintain a closed system to prevent leakage or spillage	1.1.1. The system will be a closed system with no outflow of untreated or semi-treated water	Regular visual inspection of plant for signs of leakage or particular greening of grass in certain areas, which may be indicative of leakage	Onsite plant manager	Report to DWA within 24 hours in case of spillage
		1.1.2. The treatment plant will be outside any 1:100 year flood line	Not applicable	Not applicable	Not applicable
1.2. Possible overflow of untreated or semi-treated wastewater	Accommodate peak flow to prevent overflow	1.2.1. Sufficient capacity will be available to accommodate temporary increases in flow during peak times.	Daily visual inspection to determine whether emergency ponds are nearing full capacity and whether there is any overflow	Onsite plant manager	Report to DWA within 24 hours in case of spillage
1.3. Possible pollution of stream or groundwater	Monitor groundwater quality and implement mitigation measures if necessary	1.3.6. A groundwater quality monitoring programme must be in place to detect any contamination that may be linked with the treatment plant	Regular groundwater quality testing at two boreholes: directly upslope and directly downslope of the sewage plant. Monitoring to be done quarterly during the first year, thereafter twice annually. Results to be reported to DWA every six months	Applicant, HOA / BC or designated service provider	Report to DWA on six-monthly basis
		1.3.7. Immediately institute appropriate mitigation measures if contamination is discovered			
	Discharge volume must remain below the threshold specified by DWA in the General Authorisation	1.4.3. No more than 2 000 m ³ of treated sewage may be discharged per day	Monthly monitoring of discharge volume	Onsite plant manager	
1.5. Contamination through irrigation with inadequately treated wastewater	Treated effluent used for irrigation must comply with the standards set by DWA: (a) faecal coliforms < 1000 per 100 ml; (b) Chemical Oxygen Demand (COD) < 75 mg/l; (c) pH over 5,5 but under 9,5 pH units; (d) Ammonia (ionised and un-ionised) as Nitrogen < 3 mg/l;	1.5.1. Treatment of wastewater must take place strictly according to the engineers' prescriptions in order to meet wastewater quality standards as set by DWA, and treated wastewater must be monitored on a regular basis to verify water quality.	Quality of wastewater irrigated must be monthly on the last day of the month by grab sampling, at the point where the wastewater enters the irrigation system. Wastewater must be tested for the parameters indicated in this EMP	Applicant to appoint service provider for testing	Report water quality test results to DWA every six months on DW903 and DW904 forms
				Testing must be done by a laboratory accredited under the SA National Accreditation System i.t.o. SABS	

RISK	OBJECTIVE	MITIGATION MEASURES	MONITORING	RESPONSIBILITY	REPORTING
	(e) Nitrate/Nitrite as Nitrogen does not exceed 15 mg/l; (f) Phenol index < 0,1 mg/l; (g) Chlorine < 0,25 mg/l; (h) Suspended Solids < 25 mg/l; (i) Electrical Conductivity < 70 milliSiemens above intake to a maximum of 150 mS; (j) Ortho-Phosphate as phosphorus < 10 mg/l; (k) Fluoride < 1 mg/l; and (l) Soap, oil or grease < 2,5 mg/l; (m) Arsenic < 0,02 mg/l; (n) Cyanide < 0,02 mg/l; (o) Boron < 1 mg/l; (p) Cadmium < 0,005 mg/l; (q) Chromium (VI) < 0,05 mg/l; (r) Copper < 0,01 mg/l; (s) Iron < 0,3 mg/l; (t) Lead < 0,01 mg/l; (u) Mercury < 0,005 mg/l; (v) Selenium < 0,02 mg/l; (w) Zinc < 0,1 mg/l.			Code 0259 for that method, or as approved by the relevant authority	
			Screens must be cleaned regularly and the waste disposed of at an appropriate dumping site together with the dried sludge from the drying beds.		
		1.5.2. A maximum of 2 000 m ³ of treated wastewater may be irrigated per day.	Volume of wastewater irrigated must be metered and the total recorded on a monthly basis	Onsite plant manager	Report to DWA every 6 months
		1.5.3. Should any spillage or leakage of untreated / semi-treated effluent occur, DWA must be notified. DWA may then undertake a site inspection to gauge the significance of the incident.	Record must be kept of any spillage or leakage of untreated / semi-treated effluent.	Onsite plant manager	DWA to be notified in case of leakage or spillage
		1.5.4. Irrigation with treated wastewater must take place above the 1:100 year flood line of any surface water body, and may not take place on land that overlies a Major Aquifer.	Six-monthly check-up (when water quality testing is done) to verify that irrigation has not been shifted to a location within any 1:100 year flood line.	Applicant	Findings to be included in report to DWA every six months
2. System Maintenance					
2.1. Irregular or inadequate maintenance could compromise functionality	Perform regular maintenance as prescribed by the consulting engineers, even if the system appears to be in good working order.	2.1.1. Regular checking of key components of the system to verify continuing functionality	To be specified by engineer	Applicant / HOA / BC	To be specified by engineer
		2.1.2. Regular replacement of key components as a preventative measure, even if components still appear to be functional			
		2.1.3. It must be ensured that monitoring systems and gauges are in good working	All gauges to be monitored by the onsite plant manager at regular	Onsite plant manager	Report to HOA / BC

RISK	OBJECTIVE	MITIGATION MEASURES	MONITORING	RESPONSIBILITY	REPORTING
		order at all times in order facilitate informed management of the treatment system.	intervals (monitoring interval still to be specified by engineer)		
		2.1.4. A maintenance plan must be in place to ensure that planning, such as budget allocation or procurement of service providers, can be put into motion sufficiently ahead of time. Maintenance plan must take into account the lead times applicable to certain types of maintenance, e.g. long delivery times for certain components of the system.	Maintenance plan to be revisited annually and updated where necessary	To be compiled by engineer	Applicant / HOA / BC
3. Air Quality					
3.1. Release of unpleasant odours if the system malfunctions, leaks or malfunctions	Minimize generation of unpleasant odours	3.1.1. Ensure that all components of the treatment plant are in good working order at all times. If the plant is functioning properly, the generation of odours should be minimized.	Bi-monthly monitoring. This does not need to be quantitative monitoring, but simply a qualitative note by the plant foreman / manager as to whether odour levels are low, medium or high, based on his own perception.	Onsite plant manager	Report to HOA / BC
		3.1.2. Prevent leakage or spillage.	Refer to Section 1 of this table.		
		3.1.3. Effectively and efficiently respond to any leakage or spillage.	Refer to Section 1 of this table.		

4. MANAGEMENT AND MITIGATION MEASURES: DE-COMMISSIONING PHASE

It is not anticipated that the development will be decommissioned within the foreseeable future. For all intents and purposes, this is proposed as a permanent development. In the unlikely event of the development being decommissioned, the measures recommended in the sections below (as well as other measures which may be recommended at that stage) will have to be implemented all through the process until rehabilitation of the site has been completed.

In the event of decommissioning, the HOA, BC or other body representing the owners must appoint an environmental consultant to advise on applicable legislation and appropriate measures for impact mitigation and management. Legislation in place at the time of decommissioning must be complied with. This will include environmental and water-related legislation, occupational health and safety legislation, and any other applicable legislation, by-laws and standards. A detailed decommissioning EMP must be compiled at that stage, taking into account the conditions on and around the site at that time, as well as applicable legislation. The following sections contain generic measures that will need to be adhered to, but specific measures will have to be developed at that time to address any issues or conditions that may not be present at this stage.

In case of decommissioning, a decommissioning environmental awareness plan must be compiled by the ECO and presented to the lead contractor responsible for overseeing the decommissioning or destruction activities. A training workshop must also be presented to the workers, and a copy of the environmental awareness plan must be available onsite at all times until decommissioning and site rehabilitation have been completed.

Table 3: Impact mitigation and management measures to be implemented during the decommissioning phase

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
<i>1. Soils</i>			
1.1. Soil erosion	If structures are to be demolished and cleared, the site will be susceptible to soil erosion in case of rains during the period that bare soil is exposed.	1.1.1. Limit the risk of soil erosion.	If structures are to be demolished and the site cleared, it is recommended that this be undertaken during the drier winter season.
		1.1.2. Effectively remediate erosion if it does take place.	Storm water should be channelled away from the exposed area for the duration of the decommissioning phase.
			Should any signs of erosion be found, remedial action such as backfilling, compaction and re-vegetation should be taken immediately to avoid exacerbation of the erosion.
			Any erosion channel(s) that may develop should be backfilled and compacted as soon as possible, and the area(s) restored to a proper condition. The contractor should ensure that cleared areas are effectively stabilised to prevent and control erosion.
1.2. Soil contamination	Possible contamination of soil by wastewater (generated by workers onsite), cement, etc.	1.2.1. Prevent spillage of contaminants or leakage of potentially contaminated wastewater	The site must be re-vegetated directly after site clearing, using locally indigenous species.
			If waterborne sewerage is not available, workers must be provided with portable chemical toilets which form a sealed, closed system. Sanitation facilities must be provided at a ratio of 1 toilet per 30 workers, and the contents must be disposed of at a licensed sewerage works.
		1.2.2. Safely dispose of possibly contaminated waste or soil	Sufficient washing facilities must be provided for workers. Wash areas must be placed and erected in such a manner that the surrounding areas, including soil and groundwater, are not polluted.
			Any contaminated soil must be removed from the site and disposed of at a suitable disposal site, which may be either the municipal general landfill site or a hazardous landfill site, the closest one currently being in Gauteng Province. The ECO will be able to advise as to the appropriate disposal site.
1.2.3. Efficiently respond to any spillage	In case of any spillage, the ECO must be informed so that he/she can investigate the incident and recommend appropriate mitigation measures.		
	Any significant spillage must be reported to DWA, who may need to conduct a site visit to determine the significance of the spillage and to recommend mitigation measures. The incident must also be reported to LDEDET by the ECO.		
<i>2. Water</i>			
2.1. Water quality	Possible contamination of water by runoff containing construction-related substances such as cement.	2.1.1. Prevent spillage of contaminants.	Refer to 1.2.1.
		2.1.2. Safely dispose of possibly contaminated waste	Refer to 1.2.2.

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
		2.1.3. Efficiently respond to any spillage	Refer to 1.2.3.
2.2. Storm water	Storm water may cause soil erosion on cleared construction site.	2.2.1. Minimize water-related soil erosion	Refer to 1.1.1.
3. Flora and Fauna			
3.1. Rehabilitation of site	If the facilities are to be demolished and the site cleared, rehabilitation of the site will be required.	3.1.1. Rehabilitate the site to a state approximating the pre-development state or a condition similar to undeveloped areas nearby.	Prepare soil for re-vegetation, e.g. by removing potentially contaminated soil (for disposal at a suitable site), "ripping" compacted soil and adding organic material.
			Re-establish locally indigenous vegetation under the guidance of an ecologist. Re-vegetation can take the form of seeding (or hydro-seeding) broad areas with a mix of indigenous grass seeds, and planting of individual indigenous trees and shrubs. Methods and timing of rehabilitation must be prescribed by an ecologist based on site conditions at the time, and species composition should be dictated by the vegetation communities in open areas in the vicinity.
		3.1.2. Prevent colonisation by alien invasive species	No alien plant species may be established on the site during rehabilitation.
			Any alien vegetation on the site must be eradicated before seeding / planting of indigenous vegetation.
			The site must be regularly monitored for re-growth of alien invasive species, and any new seedlings etc eradicated using methods appropriate for the particular species, whether mechanical, chemical or biological.
4. Waste management			
4.1. Solid waste management	Solid waste generated at the site must be disposed of at a suitably licensed disposal site.	4.1.1. Remove general solid waste to a landfill site.	General solid waste must be disposed of at the Tzaneen landfill site or another licensed waste disposal site.
			General rubble resulting from demolition (if structures are to be demolished) can be used as fill at nearby construction sites (if any), or otherwise disposed of at a licensed landfill site.
			Waste may <u>not</u> be dumped on or near the site.
		4.1.2. Dispose of hazardous waste at a suitable disposal site	Waste must be removed at least once every 2 weeks.
			Refer to 1.2.2.
			Any soil that might be contaminated by fuel or other hazardous substances must be removed and disposed of at a hazardous waste disposal site by suitably licensed contractors. Contaminated soil may <u>not</u> be disposed of at the general landfill site.
5.2. Wastewater	Wastewater generated by construction workers may lead to contamination of soil, groundwater or surface water	5.2.1. Properly and safely manage all wastewater generated during construction	Refer to 1.3.1.

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
		5.2.2. Effectively and efficiently respond to any spillage	Refer to 1.3.2.
5. Health and Safety			
5.1. Fire	Demolition-related activities may pose a risk of fire, particularly during “hot” activities such as welding, refuelling of equipment / machinery, and if there are open fires (for heating / cooking)	5.1.1. Prevent occurrence of fire.	<p>Extreme caution should be exercised where open flames are used and/or where there is the potential for sparks, such as in the case of blow torches. These activities should only take place in designated areas which are clear of vegetation and other flammable material.</p> <p>Smoking to be restricted to designated smoking areas situated away from flammable materials.</p> <p>No open fires allowed on the site except in designated areas. This includes fires for purposes of cooking, warmth or any other purpose. Vessels should be provided for fires so that labourers do not need to make open fires.</p>
		5.1.2. Effectively and efficiently respond to fire if it does occur.	<p>Emergency numbers (e.g. fire station, doctor, ambulance service and local hospital) must be posted in a highly visible location at the site as well as being available in the safety file in the site office (if any).</p> <p>Adequate fire fighting equipment must be available at the site at all times during the decommissioning phase. Such equipment must be clearly visible and easily accessible. Equipment must be available in all areas where construction is taking place as well as in any construction camps and cooking areas.</p> <p>It must be ensured that fire-fighting equipment is in good order.</p> <p>At least one person trained in the use of the fire extinguishing equipment must be onsite at all times.</p> <p>If a site camp is established, the camp must be situated in a position with a low fire risk, e.g. not close to any highly flammable substances (e.g. fuel) nor close to large amounts of dry vegetation, as activities will take place in the camp which may pose a fire hazard, e.g. workers spending the night onsite will use this camp to make fires for cooking and/or heating, and this will most likely also be the designated smoking area (safe for smoking).</p>
5.2. Health and Safety	Workers may be injured onsite during demolition activities.	5.2.1. Apply security measures and ensure that the specifications of the Occupational Health and Safety Act (1993) are adhered to.	<p>A first-aid kit should be available and readily accessible onsite at all times. At least one person trained in basic first aid should be onsite at all times when construction is taking place, in case of an accident during construction activities.</p> <p>Workers may not be forced to do dangerous work.</p> <p>Any relevant necessary safety clothing / equipment must be provided to workers.</p> <p>Any relevant specifications forming part of the Occupational Health and Safety Act must be complied with.</p>
5.3. Security	Risk of criminal elements being attracted to the site	5.3.1. Limit criminality and violence.	<p>No fire-arms to be allowed onsite.</p> <p>No alcohol to be allowed onsite.</p>

ASPECT	ISSUE / IMPACT / RISK	OBJECTIVE	RECOMMENDED MITIGATION MEASURES
			Only workers employed on the site and who have positive identification may be allowed onto the site and particularly into the site camp (if any). No friends or other associates of workers may loiter on the site, enter the camp or spend the night onsite.
6. Site camp			
6.1. If a site camp is established, bio-physical and socio-economic impacts may be associated with it	Socio-economic impacts.	6.1.1. Minimize negative socio-economic impacts that may be associated with construction camp.	Workers will not be allowed to remain onsite overnight, apart from a very limited number responsible for security.
			No alcohol to be allowed in the camp, whether by day or by night.
			No firearms to be allowed in the camp.
			No loud music will be allowed within the camp outside of working hours, so as not to disturb neighbours.
			Friends or relatives (or any other acquaintances) of workers will not be allowed into the site camp at any time.
	Bio-physical impacts.	6.1.2. Minimize negative bio-physical impacts that may be associated with construction camp.	The camp must be clearly fenced off and have a lockable gate in order to enforce entry control.
			The camp must be established in an area which has already been disturbed, i.e. not in the relatively undisturbed, natural sections of the site.
			The camp must not be placed in an area with steep slope or risk of slope instability.
			The camp must not be placed in any drainage path.
			The camp must be situated in a position with a low fire risk, e.g. not close to any highly flammable substances (e.g. fuel) nor close to large amounts of dry vegetation, as activities will take place in the camp which may pose a fire hazard, e.g. workers spending the night onsite will use this camp to make cooking and/or heating fires, and this will most likely also be the designated smoking area.