



REGISTRATION NUMBER: 2018/110720/07

DRAFT IMPACT ASSESSMENT

**THE PROPOSED CLEARANCE OF VEGETATION FOR THE
ESTABLISHMENT OF A COLLEGE ON PLOT 27, RAYTON,
BLOEMFONTEIN, FREE STATE.**

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Report prepared by:



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Site Information:

Farm / Erf Name : Rayton Small Holdings
Farm Number : 22
Farm Portion : 0
21 Digit Surveyors Code : F00300660000002200000
District : Mangaung Metropolitan
District Municipality : Mangaung Metropolitan Municipality
Local Municipality : Mangaung Metropolitan Municipality
Site coordinates (Centre of site) : 29°4'4.68" S and 26°11'5.56" E

Farm / Erf Name : Rayton Small Holdings
Farm Number : 21
Farm Portion : 0
21 Digit Surveyors Code : F00300660000002100000
District : Mangaung Metropolitan
District Municipality : Mangaung Metropolitan Municipality
Local Municipality : Mangaung Metropolitan Municipality
Site coordinates (Centre of site) : 29°4'4.68" S and 26°11'5.56" E

1 Environmental Impact Assessment

1.1 Assessment Methodology

The main objective of the EIA process will be to assess and quantify the potential impacts that were identified by the project team, specialists and I&AP during the Scoping Phase.

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

The environmental significance assessment methodology is based on the following determination:

$$\text{Environmental Significance} = \text{Overall Consequence} \times \text{Overall Likelihood}$$

1.1.1 Determination of Consequence

Consequence analysis is a mixture of quantitative and qualitative information and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: **Severity/Intensity, Duration and Extent/Spatial Scale**. Each factor is assigned a rating of 1 to 5, as described below.

Determination of Severity

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

Table 1: Rating of Severity

Type of criteria	1.2 Rating				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant / Harmful	Great / Very harmful	Disastrous Extremely harmful
Social / Community response	Acceptable / I&AP satisfied	Slightly tolerable /	Intolerable / Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable

Type of criteria	1.2 Rating				
	1	2	3	4	5
		Possible objections			/ Possible legal action
Irreversibility	Very low cost to mitigate / High potential to mitigate impacts to level of insignificance / Easily reversible	Low cost to mitigate	Substantial cost to mitigate / Potential to mitigate impacts / Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Determination of Duration

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

Table 2: Rating of Duration

Rating	Description
1: Low	One month
2: Low-Medium	Between 1 and 3 months (Quarter)
3: Medium	3 months to 1 year
4: Medium-High	1 to 10 years

Rating	Description
5: High	More than 10 years

Determination of Extent/Spatial Scale

Extent refers to the spatial influence of an impact. It will be: a) limited to the site and its immediate surroundings; b) extending to the surrounding local area, c) regional (will have an impact on the region) c) national (will have an impact on a national scale); or d) or international (impact across international borders).

Table 3: Rating of Extent

Rating	Description
1: Low	Immediate, fully contained area
2: Low-Medium	Surrounding area
3: Medium	Regional
4: Medium-High	National
5: High	International

Determination of Overall Consequence

Overall consequence is determined by adding the factors determined above and summarised below, and then dividing the sum by 3.

Table 4: Example of calculating Overall Consequence.

Consequence	Rating
Severity	Example 4
Duration	Example 2
Extent	Example 4
SUBTOTAL	10
TOTAL CONSEQUENCE:(Subtotal divided by 3)	3.3

Determination of Likelihood

The determination of likelihood is a combination of **Frequency** and **Probability**. Each factor is assigned a rating of 1 to 5, as described below.

Determination of Frequency

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

Table 5: Rating of Frequency

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

Determination of Probability

Probability refers to how often the activity/event or aspect has an impact on the environment.

Table 6: Rating of Probability

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

Determination of Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarised below, and then dividing the sum by 2.

Table 7: Example of calculating the Overall Likelihood.

Likelihood	Rating
Frequency	Example 4
Probability	Example 2
SUBTOTAL	6
TOTAL LIKELIHOOD (Subtotal divided by 2)	3

1.2.1 Determination of Overall Environmental Significance

Quantitative description or magnitude of Environmental Significance

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of LOW, LOW-MEDIUM, MEDIUM, MEDIUM, MEDIUM-HIGH or HIGH, as shown in the table below.

Table 8: Determination of Overall Environmental Significance.

Significance or Risk	Low	Low-Medium	Medium	Medium-High	High
Overall Consequence X	1 - 4.9	5 - 9.9	10 - 14.9	15 - 19.9	20 - 25
Overall Likelihood					

Qualitative description or magnitude of Environmental Significance

This description is qualitative and is an indication of the nature or magnitude of the Environmental Significance. It also guides the prioritisations and decision-making process associated with this event, aspect or impact.

Table 9: Description of the Environmental Significance and the related action required.

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

Significance	Low	Low-Medium	Medium	Medium-High	High
	ent measures. Where possible improve.	Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	measures and improve managemen t measures to reduce risk, where possible.		implement alternatives.

2 Environmental Impact Assessment

2.1 Geology and Soil

The following impacts may occur on the soil as a result of the construction and operational phase of the activity:

- Loss of topsoil through construction activities,
- Loss of topsoil through erosion as an effect of the natural environment,
- Change in soil characteristics as a result of petrochemical spills.

It should be considered that the proposed site is located on a dolerite outcrop with limited topsoil available on the site. Therefore, it is not expected that large volumes of topsoil will be available to be removed. However, the entire layer supporting the growth of vegetation should be considered as the topsoil layer.

1. Loss of topsoil through construction activities								
Preferred Alternative (Plot 27)								
Potential Impact Description:	During the initial stages of vegetation clearance and levelling of site topsoil can be lost.							
Duration of activity:	Start and end of construction phase							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	2	2	2,333333333	2	1	1,5	3,5
With Mitigation	2	1	1	1,333333333	2	1	1,5	2
Mitigation Measures	<ul style="list-style-type: none"> • Topsoil must be removed from the proposed construction prior to any other activities being undertaken and should be stockpiled separately from any other material or waste. • Topsoil stockpiles should not exceed a height of more than 2m and should not be made on steep slopes or areas prone to erosion. • Topsoil may not be used for any other purposes than levelling of the site after construction. The topsoil will be returned to the surface to ensure vegetation regrowth. • No hazardous substances (i.e. oils, paint, diesel, etc.) will be stored on the site in large volumes. If hazardous substances are stored on the site, they will be stored inside bunded areas with a capacity to store 110% of the volume of the substance. • Vehicles prone to leaking will be fitted with drip trays to prevent the spills from resulting in contamination of soil. • If spills do occur they will be managed by cleaning the spill with the contaminated soil immediately and disposing of it in a hazardous waste bin. 							
Operational Phase								

	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	No Impact expected							
With Mitigation								
Mitigation Measures								
Alternative 2								
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	2	2	2,333333333	2	1	1,5	3,5
With Mitigation	2	1	1	1,333333333	2	1	1,5	2
Mitigation Measures	<ul style="list-style-type: none"> • Topsoil must be removed from the proposed construction prior to any other activities being undertaken and should be stockpiled separately from any other material or waste. • Topsoil stockpiles should not exceed a height of more than 2m and should not be made on steep slopes or areas prone to erosion. • Topsoil may not be used for any other purposes than levelling of the site after construction. The topsoil will be returned to the surface to ensure vegetation regrowth. • No hazardous substances (i.e. oils, paint, diesel, etc.) will be stored on the site in large volumes. If hazardous substances are stored on the site, they will be stored inside bunded areas with a capacity to store 110% of the volume of the substance. • Vehicles prone to leaking will be fitted with drip trays to prevent the spills from resulting in contamination of soil. • If spills do occur they will be managed by cleaning the spill with the contaminated soil immediately and disposing of it in a hazardous waste bin. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	No Impact							
With Mitigation								
Mitigation Measures								
Alternative 3								
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	1	2.7	3	3	3	8

With Mitigation	1	2	1	1.3	3	3	3	4
Mitigation Measures	<ul style="list-style-type: none"> • Topsoil must be removed from the proposed construction prior to any other activities being undertaken and should be stockpiled separately from any other material or waste. • Topsoil stockpiles should not exceed a height of more than 2m and should not be made on steep slopes or areas prone to erosion. • Topsoil may not be used for any other purposes than levelling of the site after construction. The topsoil will be returned to the surface to ensure vegetation regrowth. • No hazardous substances (i.e. oils, paint, diesel, etc.) will be stored on the site in large volumes. If hazardous substances are stored on the site, they will be stored inside bunded areas with a capacity to store 110% of the volume of the substance. • Vehicles prone to leaking will be fitted with drip trays to prevent the spills from resulting in contamination of soil. • If spills do occur they will be managed by cleaning the spill with the contaminated soil immediately and disposing of it in a hazardous waste bin. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	No Impact							
With Mitigation	No Impact							
Mitigation Measures	No Impact							
Can the Impact be Reversed	Yes, the impact can be reversed. However, it is highly unlikely that the impact will have a significant effect on topsoil loss with mitigation. The reversing of topsoil loss involves the sourcing of topsoil from areas that have excess soil.							
Will impact cause irreplaceable loss to resource	No, topsoil can be sourced from various sources at high expense. If mitigation measures are followed correctly it is anticipated that there will be a minimal to insignificant loss of topsoil.							
Cumulative Impacts	Cumulative impacts are only foreseen for the site as the areas surrounding this site is already built up with a good infrastructure network. The only cumulative impacts foreseen is the improper storage of topsoil and lack of rehabilitation (i.e. levelling) after the construction phase. This erosion of topsoil will cause channels and gullies to form if there is enough slope or a lack of vegetation which can become progressively worse if the problem isn't remedied.							

From the above it is evident that the significance of the impact on loss of topsoil is regarded to be Low before and after mitigation for both the preferred alternative and alternative 2. This is mainly due to the lack of soil available on these sites. It is however still recommended that the mitigation measures be implemented to prevent the loss of topsoil through contamination, erosion or unnecessary use during construction.

The significance of the impact of the alternative 3 layout is expected to be Low - Moderate if mitigation measures are not implemented. This area of the site has more soil as it is located at a

lower elevation in the landscape. The significance of the impacts is expected to be Low with the implementation of mitigation measures.

It is expected that there will be a cumulative impact due to the expansion of the city of Bloemfontein and development occurring in the area.

Proposed mitigation:

- Topsoil must be removed from the proposed construction prior to any other activities being undertaken and should be stockpiled separately from any other material or waste.
- Topsoil stockpiles should not exceed a height of more than 2m and should not be made on steep slopes or areas prone to erosion.
- Topsoil may not be used for any other purposes than levelling of the site after construction. The topsoil will be returned to the surface to ensure vegetation regrowth.
- No hazardous substances (i.e. oils, paint, diesel, etc.) will be stored on the site in large volumes. If hazardous substances are stored on the site, they will be stored inside bunded areas with a capacity to store 110% of the volume of the substance.
- Vehicles prone to leaking will be fitted with drip trays to prevent the spills from resulting in contamination of soil.
- If spills do occur, they will be managed by cleaning the spill with the contaminated soil immediately and disposing of it in a hazardous waste bin.

2.2 Climate

It is not expected that the project will directly affect the climate.

2.3 Land Use

Although it is expected that the proposed project will contribute to the loss of natural areas which can be used for agriculture (i.e. grazing) the land in the area has been earmarked for future development. The applicant also intends to keep a large portion of the land vacant and undisturbed. A portion of the footprint of the property has also been disturbed by previous construction activities relating to paved surfaces, a house and barns constructed on it.

Proposed mitigation:

- Impacts on land use is unavoidable. However, a very large portion of the land can remain undisturbed if the preferred alternative is chosen.
- Construction will take only take place in the designated areas in an effort to save the present natural environment.

2.4 Vegetation and Animal Life

The following impacts may occur on the vegetation and animal life as a result of the construction and operational phase of the activity:

- Loss of natural indigenous vegetation
- The growth and spreading of alien plant species.
- Destruction of habitat and loss of animal life.

1. Loss of natural vegetation								
	All Alternative Layouts (Plot 27)							
Potential Impact Description:	Indigenous vegetation has established itself on most of the site together with alien vegetation and pioneer grasses and shrubs. This vegetation will be lost for site 1 but will be preserved for site 2.							
Duration of Impact:	Lifetime of operation							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	4	3	3,5	10,5
With Mitigation	2	3	1	2	4	3	3,5	7
Mitigation Measures	<ul style="list-style-type: none"> • Fence should be erected first and no entry or activities should be allowed on adjacent land which will cause disturbance to vegetation. • No open fires are allowed to prevent veld fires. • No vegetation to be removed unnecessarily. • Protected plant species should be protected and should not be removed. If they are to be removed the necessary permits should be obtained to remove and transplant these species. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	5	2	3,3	2	2	2	6,7
With Mitigation	1	5	1	2,3	1	2	1,5	3,5

Mitigation Measures	While the college in its operational phase there will not be abundant indigenous vegetation left on site 1. Mitigation measures will include the planting of indigenous vegetation on the site to promote the natural environment. Mitigation also includes that site 2 is left undisturbed and that the natural vegetation that is already present be kept in pristine condition.
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2. The growth and spreading of alien plant species								
	All Alternative Layouts (Plot 27)							
Potential Impact Description:	The removal of indigenous vegetation may promote the growth of alien vegetation on bare land. A lack of regular removal of alien species can cause the species to produce seeds and infested a large area.							
Duration of Impact:	Lifetime of operation							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	3	3	3	9
With Mitigation	2	3	1	2	2	2	2	4
Mitigation Measures	After removal of vegetation and levelling of site has taken place, it is recommended that construction activities occur as soon as possible. All alien species near or in the vicinity of the construction zone must be removed as construction progresses. Site 2 will also have to be inspected regularly for invader species as it can spread to site 1 and the surrounding sites.							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	5	2	3	3	3	3,5	11,7
With Mitigation	2	3	1	2	2	2	2	4
Mitigation Measures	Regular removal of alien vegetation during site maintenance and inspection in and around the college area.							

3. Destruction of habitat and loss of animal life								
	Preferred Alternative (Plot 27)							
Potential Impact Description:	Site 1 will be completely transformed in preparation for the construction of a college and associated structures. This will include levelling and removal of vegetation during the construction phases. During the operational phase the whole area will be cover with pavement with little to no natural environment left. Both the construction and operational phases make no room for possible animal life on site 1. Site 2 however will be left as is and no activities will take place there in order to keep indigenous vegetation and the subsequent animal life.							
Duration of Impact:	Lifetime of operation until after rehabilitation							

	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	3	3	3	9
With Mitigation	2	2	1	1.7	2	3	2,5	4,2
Mitigation Measures	<ul style="list-style-type: none"> No animals may be killed or harmed on the site. No traps will be made or set on the site to catch animals. No animal nests or burrows will be disturbed unnecessarily. Animals will be caught and set free in natural areas adjacent to the construction site. No open fires will be made in order to prevent veld fires from occurring. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	4	2	2,7	2	2	2	5,3
With Mitigation	1	4	2	2	2	2	2	4
Mitigation Measures	<ul style="list-style-type: none"> No animals may be killed or harmed on the site or the surrounding environment. No traps will be made or set on the site or surrounding environment to catch animals. No animal nests or burrows will be disturbed. The Site will be fenced, and no person will be allowed to wonder onto adjacent land and disturb natural areas. 							
Alternative 2								
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	4	2	3,3	3	3	3	10
With Mitigation	3	3	1	2,3	2	3	2,5	5,8
Mitigation Measures	Mitigation measures as per Alternative 1 are relevant.							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	2	2	2	6
With Mitigation	2	4	2	2,7	2	2	2	5,3
Mitigation Measures	Mitigation measures as per Alternative 1 are relevant.							
Alternative 3								
Construction phase								

Additional Impacts	Alternative 3 has an artificial wetland with giant bullfrogs which is a protected species. The habitat and species may be lost as a result of the construction.							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	4	1	3	5	4	4.5	13.5
With Mitigation	3	2	1	2	2	2	2	4
Mitigation Measures	<ul style="list-style-type: none"> No animals may be killed or harmed on the site. No traps will be made or set on the site to catch animals. No animal nests or burrows will be disturbed unnecessarily. Animals will be caught and set free in natural areas adjacent to the construction site. No open fires will be made in order to prevent veld fires from occurring. The Giant Bullfrogs will be caught and relocated to another area with similar conditions to establish a habitat before destruction of the artificial wetland. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	5	5	2	3,3	4	3	3,5	11,7
With Mitigation	4	5	1	3	3	3	3	9
Mitigation Measures	Birdhouses can be built to encourage the birdlife to return.							
Can the Impact be Reversed	Yes, the impact can be reversed by correctly rehabilitating the land and ensuring that natural vegetation grows back, which will encourage animals to return.							
Will impact cause irreplaceable loss to resource	No							
Cumulative Impacts	The area surrounding the site has some agricultural areas but are slowly being turned to business and residential areas which are encroaching into the environment, as Bloemfontein is expanding. This expansion cannot necessarily be stopped and as a result the natural environment has been modified to an extent. This development will have a cumulative impact.							

The property is already disturbed in a manner. Existing buildings are present on site 1 where there is little to no vegetation. Site 2 is relatively undisturbed although there are signs of an old building's foundation and a concrete dam with two boreholes. This area also contains some alien vegetation.

Due to all alternative layouts having the same footprint it is not expected that the impact on the loss of vegetation will differ. It was established that the significance will be Moderate if no mitigation is implemented. With mitigation the impact may be Low. However, due to the proposed location of the preferred layout the impact should be less than the other layouts as it borders the

already disturbed footprint of the existing structures and infrastructure. The preferred alternative has a LOW – LOW MEDIUM impact on the vegetation of the site as existing buildings will be utilized on the old footprint of the site.

Also note that according to the ecologist's report (Van Rensburg, 2019) site 2 contains endangered species of flora and fauna including the The Wild Olive Tree (*O. europaea* subsp. *africana*) and the protected Giant Bullfrog (*Pyxicephalus adspersus*). If alternative 2 and 3 are chosen for the proposed development of the college a specialist will need to be contracted to relocate these species. Van Rensburg also noted that site 2 contains mostly indigenous vegetation with the presence of pioneer and some alien species. Concerning fauna this site is still very much active as Steenbok was noticed during the site visit.

It is possible to assume that there might be a cumulative impact on vegetation, if encroachment into site 2 occurs. This has already happened along the corridor of the Frans Kleynhans Road were more agricultural areas are changing in favour of residential and small business areas.

Proposed mitigation:

- Vegetation will only be cleared within the authorised site.
- Removal of alien plants must adhere to the Alien and Invasive Species Regulations.
- No hunting will occur of animals that are present.
- No fires will be allowed on site.
- Fences should be erected around the construction site before any other activities occurs to prevent encroaching of activities into the surrounding environment and disturbance or destruction to other area.
- If Alternative 3 is chosen, the Giant Bullfrogs should be captured and relocated to an area with similar conditions.
- The necessary permits should be obtained to remove endangered or protected plant species. This must be done by a specialist in order to relocate and transplant the species in other areas if possible.

2.5 Surface Water

The following impacts may occur on the surface water as a result of the construction and operational phase of the activity:

- Contamination of surface water through spillages and improper management of hazardous substances.

- Loss of surface water features.

1. Contamination of surface water								
	Significance of impacts expected to be the same for all layouts							
Potential Impact Description:	The use and spillage of hazardous substances (i.e. oil, diesel, paint, etc.) may result in the contamination of surface water during rain events.							
Duration of Impact:	Lifetime of operation							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	3	3	3	9
With Mitigation	2	3	1	2	2	2	2	4
Mitigation Measures	<ul style="list-style-type: none"> • No hazardous substances will be stored on the site permanently in large volumes during construction. All potentially hazardous substances stored on the site should be stored inside bunded areas which can contain 110% of the volume of the substance. • All vehicles will be equipped with drip trays to collect any petrochemical spills from them. • No vehicles or equipment will be washed on the site. • No vehicles or equipment will be serviced on the site. • Paints will be stored under a roof. • Any spills of hazardous substances will be cleaned by removing the spill with the contaminated soil and disposing thereof inside a contaminated soil bin. • Storm water should not be allowed to drain into the surrounding natural areas from the construction site and storm water management measures must be implemented to divert clean water around the site. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	5	2	3,3	3	2	2,5	8,3
With Mitigation	2	3	1	2	2	2	2	4
Mitigation Measures	<ul style="list-style-type: none"> • No hazardous substances will be stored on the site permanently in large volumes. • A spill kit should be on site to absorb any petrochemical spills on pavements. The material should be stored inside the spill kit. • Storm water should not be allowed to drain into the surrounding natural areas from the construction site and storm water management measures must be maintained to divert clean water around the site. 							
Can the Impact be Reversed	No. It should be prevented and managed							
Will impact cause irreplaceable loss to resource	No							

Cumulative Impacts	The development will have a cumulative impact on surface water if not mitigated due to the increasing number of developments in the surrounding area.
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2.Loss of surface water features (artificial wetland)								
Preferred Alternative (Plot 27)								
Potential Impact Description:	Loss of the artificial wetland through destruction or siltation.							
Duration of Impact:	Lifetime of operation							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	4	2	2,7	2	4	3	8
With Mitigation	1	1	1	1	2	2	2	3,3
Mitigation Measures	<ul style="list-style-type: none"> The boundaries of the proposed construction area should not be exceeded to prevent any direct physical impacts from occurring on the artificial wetland. Proper storm water and erosion control measures should be implemented to prevent erosion from occurring in the surrounding environment which may lead to siltation of the artificial wetland. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	5	1	3	2	2	2	6
With Mitigation	2	5	1	2,7	1	2	1,5	4
Mitigation Measures	<ul style="list-style-type: none"> Storm water control measures will be maintained to divert storm water from the site into channels. Stormwater will not be allowed to flow from the operational area in a manner which causes erosion. 							
Alternative 2								
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	3	3	3	9
With Mitigation	2	3	1	2	2	2	2	4
Mitigation Measures	<ul style="list-style-type: none"> The boundaries of the proposed construction area should not be exceeded to prevent any direct physical impacts from occurring on the artificial wetland. The area between the existing structures and the new construction site should be left undisturbed, apart for the connecting road. 							

	<ul style="list-style-type: none"> Proper storm water and erosion control measures should be implemented to prevent erosion from occurring in the surrounding environment which may lead to siltation of the artificial wetland. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	5	2	3,3	3	2	2,5	8,3
With Mitigation	2	5	1	2,7	2	2	2	5,3
Mitigation Measures	<ul style="list-style-type: none"> Storm water control measures will be maintained to divert storm water from the site into channels. Stormwater will not be allowed to flow from the operational area in a manner which causes erosion. The open natural space between the existing and new developments will be maintained and will not be disturbed. 							
	Alternative 3							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	5	4	2	3,7	5	5	5	18
With Mitigation	Artificial wetland will be completely destroyed.							
Mitigation Measures	<p>Alternative layout 3 proposes to remove the artificial wetland to make provision for parking and buildings. There are no mitigation relating to this apart from the relocation of the Giant Bullfrogs from the artificial wetland to another area before destruction of the wetland. However, it was indicated by Van Rensburg in 2019 that the artificial wetland does not have a significant ecological role apart from the Giant Bullfrogs as the wetland is man-made and does not have an in- and outlet.</p>							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	The wetland will be destroyed during the construction phase.							
With Mitigation								
Mitigation Measures	N/A							
Can the Impact be Reversed	No							
Will impact cause irreplaceable loss to resource	Yes							
Cumulative Impacts	With the increase in development in the area it is expected that there will be cumulative impact on wetlands and surface water resources.							

Note that the only surface water on this property is the artificial wetland situated adjacent the Frans Kleynhans Road and the surface water impact is focused around this wetland. No surface water will be used or abstracted from the site.

The significance of the impacts related to the preferred layout alternative 1 was Low – Moderate during the construction phase. With mitigation the impacts can be reduced to Low. The same was observed for alternative layout 2.

Alternative layout 3 will result in the complete destruction of the wetland. The impacts will be irreversible, and the wetland will be lost.

A cumulative impact on wetlands in the area has already commenced on various other sites. With the increase in development in the area it is expected that there will be a cumulative impact.

For the conservation of the artificial wetland the preferred alternative rates the best with the lowest impact assessment score.

Proposed mitigation:

- Berms will be constructed around the site, if it is found that such berms will be necessary to ensure no siltation of the wetland.
- Stormwater will not be allowed to drain into the natural drainage lines/artificial wetland from the operational area as this area will most certainly contain some contaminants.
- All potentially hazardous substances will be stored in a bunded area which can contain 110% of the volume of the substance.
- Spillages of hydrocarbons will be prevented by using drip trays and a clean-up procedure will be implemented to clean any hydrocarbon spills as soon as possible.
- The site will be monitored for any erosion trenches. Trenches will be rectified, and erosion control measures will be implemented.

2.6 Groundwater

The following impacts may occur on the groundwater as a result of the construction and operational phase of the activity:

- Contamination as a result of spillages of hazardous substances.

1. Contamination of the aquifer through hazardous spillages and substances								
	All alternative Layouts							
Potential Impact Description:	The majority of hazardous substances will originate from equipment and vehicles used during the construction and operational phases. These hazardous substances can and will infiltrate to the aquifer during high rainfall or successive events if the spillages aren't removed immediately. A large parking area for students will also be paved were spillages petrochemical substances can occur.							
Duration of Impact:	Lifetime of operation							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	4	2	3,3	4	4	4	13,3
With Mitigation	2	2	1	1.7	2	3	3	4.2
Mitigation Measures	<ul style="list-style-type: none"> No hazardous substances will be stored on the site in large volumes permanently. If hazardous substances are stored on the site, it will be stored in a bunded area which can contain 110% of the volume of the substance. Spills of hazardous substances (i.e. oil, diesel, paint, etc.) will be cleaned immediately after occurring and the contaminated soil will be disposed of inside a contaminated soil skip. A contractor will be appointed to remove hazardous waste and substances from the site. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	2	2	2	2	4	3	6
With Mitigation	2	2	1	1.7	1	4	2.5	4.2
Mitigation Measures	<ul style="list-style-type: none"> No hazardous substances will be permanently stored on the site in large volumes. Paving should be cleaned regularly with spill kits and absorbing material will be stored inside the kits and disposed of as hazardous waste. A contractor will be appointed to remove hazardous waste and substances from the site. 							
Can the Impact be Reversed	Yes, the impact can be reversed by identifying and immediate clean-up of any hazardous substances. Any contamination to the aquifer itself as a result of hazardous substances infiltrating into the water can be remedied by natural attenuation if the aquifer isn't contaminated any further.							
Will impact cause irreplaceable loss to resource	No as the aquifer has a constant influx of new water and over a period of time will cleanse itself of the pollutants present but may detrimentally affect the water quality in the short to medium term.							
Cumulative Impacts	A cumulative impact may occur and affect the site's water quality if series of small and major spillage occurs on any neighbouring properties and vice versa.							

Note that the entire area is underlain by a dolerite sill and infiltration to the aquifer will be 5% of rainfall as a maximum. The fact that this area is underlain by dolerite is a beneficial factor and protects the deeper aquifer from surface activities and contaminants. If contaminants reach the aquifer it will be through fractures in the dolerite and will be of small scale.

Due to the close proximity of the alternatives to one-another and the similar activities it is expected that the significance of the impacts should be the same. The significance of the impacts was determined to be Moderate during the construction phase without the implementation of mitigation measures. These impacts can be managed and reduced to a significance of Low. Due to the nature of the activity it is not expected that there will be a significant impact on groundwater during the operational phase. The impact was determined to be Low – Moderate if no mitigation is implemented and Low with mitigation and management measures.

A cumulative impact can occur if the surrounding properties also pollute the aquifer from time to time, which will increase the concentration of hazardous substances in the groundwater resource.

To protect the groundwater resource, it is recommended that the preferred alternative be chosen as it sits directly on a hard rock outcrop, protecting the aquifer from infiltrating contaminants.

Proposed mitigation:

- Hazardous substances will be stored inside a bunded area with an impermeable surface which has the capacity to store more than 110% of the volume of the substance.
- Spillages of hydrocarbons will be prevented by using drip trays and a clean-up procedure will be implemented to clean any hydrocarbon spills as soon as possible.

2.7 Air Quality and Noise

The following impacts may occur on the air quality and noise levels as a result of the construction and operational phase of the activity:

- During the construction/operational phases there may be an impact on the air quality as a result of dust emissions due to construction activities and movement of vehicles.
- Noise will be generated from equipment during the construction phase. The operational phase will contribute to increased noise levels from the adjacent roads, students and their cars.

1. Dust generation through proposed activities								
	The impacts on air quality is expected to be the same for all 3 alternatives as the activities and conditions will be the same.							
Potential Impact Description:	Stripping the land of vegetation and the process of levelling and construction activities can increase the amount of dust being generated through wind. Vehicles that move over loose and uncover land will also kick up dust. Generated dust can decrease the quality of air on site and surrounding areas.							
Duration of Impact:	Worst at the start of the construction phase and gradually decreases the longer the operational phase is in action.							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	1	2	2	4	4	4,5	8
With Mitigation	2	1	1	1.3	1	4	3	3.3
Mitigation Measures	<ul style="list-style-type: none"> No construction activities which causes elevated dust levels should occur during windy conditions. Vehicles should be driven at slow speeds not exceeding 25km/h on the site during the construction phase. Dust suppression measures must be implemented if dust is a problem and complaints are received. Paving of large open parking areas should commence urgently to further reduce the impacts. Areas intended to be left undisturbed should be fenced and remain undisturbed. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	1	2	1.7	3	4	3,5	5.8
With Mitigation	1	1	1	1	2	3	2,5	2.5
Mitigation Measures	<ul style="list-style-type: none"> No vegetation will be cleared from adjacent land or areas on the site intended as open space. Gardens will be maintained, and areas will be revegetated and paved as soon as possible. Bare open areas where the soil surface is exposed should be avoided and rehabilitated or paved. No dust generating activities should be undertaken at the site during the operational phase. 							
Can the Impact be Reversed	Yes, by covering open land with vegetation and limiting vehicle activities on those areas.							
Will impact cause irreplaceable loss to resource	No							

Cumulative Impacts	A cumulative impact can occur in this area as well as neighbouring areas where significant areas of bare land can cause a build-up of a dust cloud.
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2. Noise generation through proposed activities								
	The impacts on ambient noise is expected to be the same for all 3 alternatives as the activities and conditions will be the same.							
Potential Impact Description:	Noise will be generated by the following activities: (1) construction phase, (2) road noise from vehicles and (3) operation of the college. These sources of noise generation may potential cause animal life to migrate from the area as well as complaints by neighbours.							
Duration of Impact:	Lifetime of operation							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	2	3	4	4	4	10.7
With Mitigation	2	2	1	1.7	4	2	3	5
Mitigation Measures	<ul style="list-style-type: none"> Vehicles will be driven at speeds not exceeding 25 km/h on the site. Construction activities generating noise will only be conducted during normal working hours (7am – 5pm). To limit the impact further the construction period can be shortened. Notify all adjacent landowners before excessive noise will be created. No activities should be undertaken on adjacent land. Vehicles and machinery will be fitted with silencers and will be maintained to reduce noise levels. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	1	2	1.7	2	4	3	5
With Mitigation	2	1	1	1.3	2	4	3	4
Mitigation Measures	<ul style="list-style-type: none"> No excessive noise (i.e. music, etc.) will be generated after 21:00. Noise generating activities will be kept to daytime hours. Vehicles using the site will be maintained to prevent excessive noise. 							

It is expected that certain activities associated with the construction phase will contribute to elevated dust levels in the area due to the open spaces after clearance of vegetation and topsoil. These impacts will be Low – Moderate if not mitigated but can be mitigated to be Low. These impacts will only occur temporarily and not daily. Dust emissions will be elevated during windy

conditions and it is recommended that activities causing dust not be conducted in these conditions.

Note that this site is situated in a corridor that is rapidly expanding with small business and residential areas. Dust that will be generated from this site will be on a small scale but since the neighbours are closely situated, can affect the surrounding areas. Due to the fast-developing nature of this area, traffic noise is already high, and it is not foreseen that an additional increase in traffic will cause an increase in noise.

All the site alternatives have the same impact assessment score of Low after implementation of mitigation measures and rules. This includes that no excessive noise may be made after 21:00 at night during the operational phase and that all construction activities be limited to normal working hours. It is expected that the construction phase will have elevated noise levels and the significance was determined to be Moderate without mitigation.

The additional traffic will contribute to elevated noise levels in the area.

2.8 Archaeological, Palaeontological and Cultural Resources

The HIA indicated that no significant or culturally important features are present on the site. Due to the geology of the area it is unlikely that there will be any paleontological significance artefacts. It is therefore not expected that there will be any impacts on archaeological or paleontological artefacts.

However, if any such culturally important finds are made on the site, a heritage specialist will be consulted and SAHRA will be informed.

2.9 Aesthetics

The proposed project may have a negative aesthetic impact on neighbours and motorists using the N1 and roads in the area.

1. Impact on Aesthetics	
	Preferred Alternative (Plot 27)
Potential Impact Description:	The activity may lower overall aesthetic value for the site.
Duration of Impact:	Lifetime of operation.
Construction phase	

	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	2	2.6	5	4	4.5	12
With Mitigation	2	2	2	2	2	2	2	4
Mitigation Measures	<ul style="list-style-type: none"> • Focus will be placed on good housekeeping by the contractor. All tools, machinery, equipment, etc. will be kept and stored neatly on site. • No littering will occur on the site. Bins will be placed on the site for the disposal of general waste. The bins will be emptied at the Noordstort landfill site regularly. • Cement bags and other larger waste products will be kept in one area to be disposed of. • If a skip is used on the site, it will be covered to prevent the waste contained therein to be windblown. • The site will be fenced. • Construction will be done neatly and according to building regulations to prevent the buildings from creating a negative aesthetic impact. • Shiny materials should not be used for roofing to prevent irritation to neighbours and passing motorists. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	5	2	3	3	4	3,5	10,5
With Mitigation	1	1	2	1.3	1	4	2,5	3.3
Mitigation Measures	<ul style="list-style-type: none"> • Most of the site will be paved. Parking areas will not be left bare. • Gardens will be made on the site and will be maintained throughout the project lifetime. • Buildings will comply with building regulations and will be repaired when necessary not to be in a state of disrepair. • Buildings will be maintained by painting them when required. This includes the roofs. • No littering will occur on site or the surrounding environment. Bins will be provided on the site for disposal of general waste. Bins will be emptied regularly, and general waste will be disposed of at the Noordstort landfill at least once a week. 							

The development is proposed on the same property which is small. Therefore, it is not expected that the impact magnitude will vary between the different site layouts on the property as they will all be visible from adjacent properties and motorists passing on the N1. The significance of the impacts will be Moderate without the implementation of mitigation measures. The impacts can however be reduced to Low if housekeeping is implemented and the site is kept neat and clean.

Proposed mitigation:

- Alien vegetation should be cleared regularly.
- Waste should be disposed of in the correct manner regularly.
- Equipment should be stored in the correct location and not in the open.
- Any spills and/or leakages should be cleaned immediately in the correct manner.

- Comply to building regulations and maintain the structures regularly.

2.10 Demographics and Regional Socio-economic Structure

The development will have a positive impact on the demographics and socio-economic structure of the surrounding areas. The development will create multiple jobs during construction and permanent employment during the lifetime of the project. It will also encourage the much need education sector to grow.

Conclusion

It is concluded from the impact assessment above that the following aspects will have to be mitigated:

- Loss of vegetation
- Surface water
- Habitat
- Groundwater
- Noise
- Aesthetics

The loss of vegetation of the construction site will be inevitable for the project to proceed. However, it is recommended that no vegetation be cleared outside the construction area. Furthermore, no protected or endangered species may be removed without obtaining permits. The impact on vegetation loss can be mitigated to reduce the significance of the impacts to Low or Moderate.

It is not expected that there will be a significant impact on surface water resources if alternative 1 or 2 is chosen. However, alternative 3 will result in the destruction of the artificial wetland. Although not regarded as a significantly important wetland it does contain Giant Bullfrogs who created a habitat in the wetland. Should the wetland be destructed a permit should be obtained to relocate the frogs to an area with similar conditions to create a new habitat. It is expected that the impact on surface water will only occur during the construction phase of the project, but the artificial wetland will be lost forever if alternative 3 is chosen.

The project will have an impact of Moderate significance on groundwater in the construction phase if it is not mitigated through the prevention of petrochemical spills causing contamination. However, no hazardous substances will be stored on the site due to the nature of the project and it is unlikely that major impact will occur on the groundwater. During the operational phase of the project it will be important to inspect the sewage line for leaks and reporting them to authorities for repair or to employ a contractor to do so as soon as the leak is detected.

Elevated noise levels are expected to occur during the construction phase of the project, especially during the levelling of the site and compacting of surfaces. However, the construction activities will be limited to normal working hours in an attempt to accommodate neighbours. It is recommended that the hostels used for accommodation of students and lecturers on the site not undertake any activities which may result in disturbance after 21:00 to prevent disturbance to neighbours.

It will be important to implement good housekeeping and keep the site clean and neat. Furthermore, the construction should comply with building regulations and buildings should be maintained to prevent negative aesthetic impacts on motorists or adjacent landowners.

Most of the activities which may contribute to negative impacts on the environment is associated with the construction phase. Furthermore, the significance of impacts on animal life, vegetation and surface water were higher at alternative 3 than alternative 1 and 2. Alternative 2 also contains plant species such as the Wild Olive Tree for which a permit should be applied for to remove it. It is recommended from the above that alternative 1 be authorised.