



LEFATSE

Environmental Planning Services (PTY) Ltd

Environmental Impact Assessment

Proposed residential development on the farm Strathearn
2154/1 (Remaining Extent), Magisterial District Bloemfontein,
Free State Province

November 2019

DESTEA Ref: EMB/19,27,28(i),32,2(b)(iii)(aa),4b(ii)(aa),12b(iv)/19/47
NEAS Ref: FSP/EIA/0000320/2019

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Environmental Impact Assessment

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1. PROJECT DESCRIPTION

Lefatse Environmental Planning Services (Pty) Ltd (Lefatse EPS) was appointed to manage an application for Environmental Authorisation (EA) in terms of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) and related regulations for the following (previously approved under Regulations R385 and R366 of April 2006): The proposed development of at least 28 residential units as part of a group housing scheme on the Remaining Extent of Portion 1 of the farm Strathearn 2154, situated in the Magisterial District of Bloemfontein, Free State Province.

Associated activities will, amongst other, include the following:

- Construction of an access road of approximately 13m in width, but less than 1km long; and an entrance gate traversing the 1:100 year flood line (Erf 37005);
- Extension of the existing bulk services, e.g. sewage line and clean water line (Possibly traversing the 1:100 year flood line);
- Construction of a reservoir for storage of water (capacity 330 kilolitres and footprint approximately 144m²) (Erf 37005);
- Construction of a 500kVa (0.5 megawatt) mini-substation (approximately 5.4m x 3.8m totalling 20.52m²) (Erf 37005) extending 11kV to the existing Threatnam substation;
- Phased construction of houses and associated infrastructure during development of the 28 residential units on the property (Erf 37005);
- Establishment of below-ground electricity lines (Erf 37005);
- Establishment of street lighting along the access road (Erf 37005);
- Implementation of storm water control measures, e.g. culverts and flow attenuation measures. This includes a storm water drainage channel within a servitude of 10m in width extending on the northern boundary of the farm on Erf 37004.
- Bulk services that will be associated with the development will be incorporated within the existing services of Mangaung Metropolitan Municipality and done in accordance with the service agreement.

2. SCOPE

A Basic Assessment process in terms of regulations 19 and 20 of the NEMA Environmental Impact Assessment (EIA) Regulations, 2014 as amended was commenced with as part of the EA application for the following listed activities:

Listed activity	Description of project activity
<p>GN. R327 Item 19</p> <p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.</p>	<p>Proposed construction of an access road approximately 13m in width over a distance of approximately 5m over the width of a non-perennial stream traversing the site. It is expected that material may be removed and infilled as part of the earthworks. Approximately 25 - 30 cubic metres of material are anticipated for use during the construction of the low-water crossing over the stream.</p>
<p>GN. R327 Item 27</p> <p>The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.</p>	<p>The clearance of vegetation for the construction of infrastructure associated with the proposed residential development on Erf 37005 (approximately 7 ha in size) of the affected farm, including amongst other: the access road and gate; houses and associated infrastructure; development of gardens; Mini-substation; storm water control measures. Proposed construction of a clean water reservoir (330 cubic metre capacity) on Erf 37005 of the affected farm.</p> <p>Construction of a gravel channel on Erf 37004 and mitre drains on Erf 37005 as part of the storm water control on site.</p>
<p>GN. R327 Item 28(i)</p> <p>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:</p> <p>Will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</p> <p>Will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</p> <p>Excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>Proposed residential development for group housing on Erf 37005 (approximately 7 ha), on the farm Strathearn 2154/1 (Remaining extent) within the urban edge of Bloemfontein. The farm has been included in the Town Planning Scheme of Bloemfontein in September 2012. An application for the amendment of the general plan will be submitted to the local municipality for approval.</p>
<p>GN. R327 Item 32</p> <p>The continuation of any development where the environmental authorisation has lapsed and where the continuation of the development, after the date the environmental authorisation has lapsed, will meet the threshold of any activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014.</p>	<p>A Record of Decision has been issued for the proposed activity on 18 December 2009; however construction has not been commenced with prior to lapsing of the RoD. The applicant intent to continue with the proposed activity.</p>
<p>GN. R324 Item 2</p> <p>The development of reservoirs excluding</p>	<p>Proposed construction of a reservoir with a capacity of 330 cubic metres for storage of water as part of the fire emergency plan and as back up</p>

Listed activity	Description of project activity
<p>dams, with a capacity of more than 250 cubic metres.</p> <p>b. Free State</p> <p>iii. Inside urban areas:</p> <p>aa) Areas zoned for use as public open space.</p>	<p>storage for use in the development for 52 hours. The preferred locality for the reservoir will be on the farm Strathearn 2154/1 (Remaining Extent), Erf 37005 zoned "general residential 5". The alternative site for the reservoir is on the ridge on Erf 37007 which is zoned as "private open space".</p>
<p>GN. R324 Item 4</p> <p>The development of a road wider than 4 metres with a reserve less than 13.5 metres.</p> <p>b. Free State</p> <p>(ii) Inside urban areas.</p> <p>(aa) Areas zoned for use as public open space.</p>	<p>Proposed construction of a central access road approximately 13m in width giving access to each residential unit on Erf 37005, zoned for "General residential 5". An application for amendment of the current approved general plan will be submitted to the local municipality in order to close Erf 37008 (street) of the existing approved layout and extend the boundaries of Erf 37005.</p> <p>The first approximate 100m from the west where the access road will be constructed is currently zoned "Private open space".</p>
<p>GN. R324 Item 12</p> <p>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p>b. Free State</p> <p>iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.</p>	<p>Clearance of vegetation for the proposed construction of the access gate (with security facilities) and access road with a width of 13m over approximately 200m dense vegetated area along the non-perennial stream traversing the site to the west.</p>

3. DETAILS OF THE ASSESSOR

The details of the person responsible for the assessment and preparation of this report are as follow:

Environmental Assessment Practitioner:

Mrs. Hanri van Jaarsveld

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Qualifications of the practitioner:

B.Sc. Microbiology and Zoology

B.Sc. Honours in Zoology

Magister in Environmental Management

Summary of the practitioner's expertise:

H van Jaarsveld has been involved in environmental management since 2007. Personal experience includes amongst other: Coordination of environmental courses presented at the Centre for Environmental Management, UFS; Project management; Applications for Environmental Authorisation in terms of NEMA, 1998 (Act 107 of 1998) and related regulations, including waste licences and atmospheric emission licenses; Application of Integrated Water Use Licenses in terms of the NWA, 1998 (Act 36 of 1998); Environmental compliance auditing on especially road construction projects and mining related operations.

4. METHODOLOGY USED IN ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

The significance of each identified potential impact was assessed by using the following criteria:

- **Duration** of the impact (time scale);
- **Extent** of the impact (spatial scale);
- Degree to which the impact may cause **irreplaceable loss of resources**;
- Degree to which the impact can be **reversed**;
- **Magnitude** (or Nature) of negative or positive impacts;
- **Probability** of the impact occurring;
- **Cumulative impacts**; and the
- Degree to which the impact can be **mitigated**.

The scales to be used to assess these variables and to define the rating categories are tabulated in the tables below.

Table 3: Evaluation components, ranking scales and descriptions (criteria).

Evaluation component	Ranking scale and description (criteria)
DURATION	5 – Permanent 4 - Long term: Impact ceases after operational phase/life of the activity (> 20 years). 3 - Medium term: Impact might occur during the operational phase/life of the activity (5 to 20 years). 2 - Short term: Impact might occur during the construction phase (< 5 years). 1 – Immediate
EXTENT (or spatial scale/influence of impact)	5 - International: Beyond National boundaries. 4 - National: Beyond Provincial boundaries and within National boundaries. 3 - Regional: Beyond 5 km of the proposed development and within Provincial boundaries. 2 - Local: Within 5 km of the proposed development. 1 - Site-specific: On site or within 100 m of the site boundary. 0 – None
IRREPLACEABLE loss of resources	5 - Definite loss of irreplaceable resources. 4 - High potential for loss of irreplaceable resources. 3 - Moderate potential for loss of irreplaceable resources. 2 - Low potential for loss of irreplaceable resources. 1 - Very low potential for loss of irreplaceable resources. 0 – None
REVERSIBILITY of impact	5 - Impact cannot be reversed. 4 - Low potential that impact might be reversed. 3 - Moderate potential that impact might be reversed. 2 - High potential that impact might be reversed. 1 - Impact will be reversible. 0 - No impact.
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	10 - Very high: Bio-physical and/or social functions and/or processes might be <i>severely</i> altered. 8 - High: Bio-physical and/or social functions and/or processes might be <i>considerably</i> altered. 6 - Medium: Bio-physical and/or social functions and/or processes might be <i>notably</i> altered. 4 - Low: Bio-physical and/or social functions and/or processes might be <i>slightly</i> altered. 2 - Very Low: Bio-physical and/or social functions and/or processes might be <i>negligibly</i> altered. 0 - Zero: Bio-physical and/or social functions and/or processes will remain <i>unaltered</i> .

Evaluation component	Ranking scale and description (criteria)
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	<p>10 - Very high (positive): Bio-physical and/or social functions and/or processes might be <i>substantially</i> enhanced.</p> <p>8 - High (positive): Bio-physical and/or social functions and/or processes might be <i>considerably</i> enhanced.</p> <p>6 - Medium (positive): Bio-physical and/or social functions and/or processes might be <i>notably</i> enhanced.</p> <p>4 - Low (positive): Bio-physical and/or social functions and/or processes might be <i>slightly</i> enhanced.</p> <p>2 - Very Low (positive): Bio-physical and/or social functions and/or processes might be <i>negligibly</i> enhanced.</p> <p>0 - Zero (positive): Bio-physical and/or social functions and/or processes will remain <i>unaltered</i>.</p>
PROBABILITY (of occurrence)	<p>5 - Definite: >95% chance of the potential impact occurring.</p> <p>4 - High probability: 75% - 95% chance of the potential impact occurring.</p> <p>3 - Medium probability: 25% - 75% chance of the potential impact occurring</p> <p>2 - Low probability: 5% - 25% chance of the potential impact occurring.</p> <p>1 - Improbable: <5% chance of the potential impact occurring.</p>
CUMULATIVE impacts	<p>High: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.</p> <p>Medium: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern.</p> <p>Low: The activity is localised and might have a negligible cumulative impact.</p> <p>None: No cumulative impact on the environment.</p>

Once the evaluation components have been ranked for each potential impact, the significance of each potential impact will be assessed (or calculated) using the following formula:

$$\text{SP (significance points)} = (\text{duration} + \text{extent} + \text{irreplaceable} + \text{reversibility} + \text{magnitude}) \times \text{probability}$$

The maximum value is 150 significance points (SP). The unmitigated and mitigated scenarios for each potential environmental impact should be rated as per the table below.

Table 4: Definition of significance ratings (positive and negative).

Significance Points	Environmental Significance	Definition
100 – 150	High (H)	<p>An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.</p> <p>Cumulative Impact:</p> <p>The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.</p>
40 – 99	Moderate (M)	<p>If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.</p> <p>Cumulative Impact:</p> <p>The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern.</p>
<40	Low (L)	<p>An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.</p> <p>Cumulative impact:</p> <p>The activity is localised and might have a negligible cumulative impact.</p>
+	Positive impact (+)	<p>A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.</p>

5. IDENTIFIED ENVIRONMENTAL IMPACTS AND RISKS ASSOCIATED WITH THE PROPOSED PROJECT

The potential impacts were identified through means of the following:

- A desktop study of the study area and a site assessment by the EAP;
- Ecological and Wetland Assessment by a professional ecologist;

- Phase 1 Heritage Impact Assessment by a professional archaeologist and palaeontologist respectively; and
- Involvement from Interested and/or Affected Parties (I&APs) and stakeholders.

This assessment is also based on the following assumptions, uncertainties and knowledge gaps/limitations:

- During the assessment it was assumed that the information provided by the applicant, input from I&APs and stakeholders and input from the specialists were true, correct to the best of their knowledge and unbiased.
- Potential seasonal limitations during the time of the assessments.
- The development is expected to be permanent. The Decommissioning Phase is therefore not assessed.
- The operational activities related to the proposed development will be managed and legislated in terms of other legislative frameworks, e.g. SPLUMA, the Service Level Agreement, etc.

The potential impacts/risks expected to be associated with the proposed development may include the following:

- Clearance and transformation of natural vegetation on the physical footprint to be disturbed during construction;
- Habitat loss and effect on the general biodiversity;
- Loss of protected species during construction;
- Affect on the riparian zone and vegetation of the non-perennial stream;
- Influence on the flow and flooding regime of the stream system;
- Change in storm water flow due to the construction activities and overall development and built-up areas;
- Establishment and spread of alien vegetation;
- Erosion and loss of topsoil;
- Loss of agriculture potential due to a change in land use;
- Potential pollution risk to surface water quality (e.g. spillage) from the bulk sewage pipeline;
- Potential pollution to the surrounding environment due to waste generation;
- Dust generation during construction;
- Elevated noise levels during construction;

- Damage or destruction of objects of potential heritage importance;
- Health and safety risk to employees on site during construction;
- Impact on the general aesthetics of the area and immediate visual impact;
- Risk of veld fires;
- Positive impact on employment opportunities; and
- Positive impact of addressing housing need in Mangaung.

Refer to the tables below for an assessment of each of the alternatives considered during the application before and after mitigation. The results from the specialist assessments were also used to complete the assessment.

For ease of reference, the alternatives were grouped as follow:

Alternative	Description
Alternative group 1: Proposed residential development	
Alternative 1.1 (Preferred)	Proposed residential development based on the amended general plan.
Alternative 1.2	Proposed residential development based on the previously approved general plan.
Alternative group 2: Proposed reservoir	
Alternative 2.1 (Preferred)	Proposed reservoir with capacity of 330 kilolitres on Erf 37005.
Alternative 2.2	Proposed reservoir with capacity of 330 kilolitres on Erf 37007.
Alternative group 3: Proposed access road	
Alternative 3.1 (Preferred)	Proposed access road on Erf 37005 based on amended general plan.
Alternative 3.2	Proposed access road as Erf 37008 (Street) based on the previously approved general plan.
Alternative group 4: Proposed mini-substation	
Alternative 4 (Preferred and only alternative)	Proposed construction of a mini-substation (500kVa) on Erf 37005, extending 11kV for distribution of electricity to the residential units and access gate.
Alternative group 5: Bulk services (i.e. clean water line and sewage line)	
Alternative 5 (Preferred and only alternative)	Bulk services will be incorporated within the existing services of Mangaung Municipality.

Alternative 1.1 (Preferred): Proposed residential development (amended general plan)

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Planning	Change in land use	Loss of agriculture land	5	1	2	4	4	4	64	M	5	1	2	4	4	4	64	M
		Effect on the overall aesthetics of the area from a natural area to a built up area	5	1	3	4	4	4	68	M	5	1	2	4	4	3	48	M
Construction	Site preparation, landscaping and construction of related infrastructure	Clearance and transformation of natural vegetation	2	1	3	4	6	4	64	M	2	1	2	3	4	4	48	M
		Removal of protected species	2	1	4	3	6	3	48	M	2	1	2	3	4	2	24	L
		Erosion damage and loss of topsoil	2	1	2	2	4	4	44	M	2	1	2	2	2	3	27	L
		Dust generation	2	1	2	3	4	3	36	L	2	1	1	2	2	3	24	L
		Establishment and distribution of weeds and invasive plant species	3	1	3	3	4	4	56	M	3	1	2	2	2	3	30	L
		Visual impact	2	1	3	4	4	4	56	M	2	1	2	3	2	3	30	L
		Change in storm water flow	5	1	0	3	4	4	52	M	5	1	0	3	4	4	52	M

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Site preparation, landscaping and construction of related infrastructure	Destruction of objects of potential heritage importance	2	1	1	4	2	1	10	L	2	1	1	4	2	1	10	L
Construction; Operation	Site preparation and construction of related infrastructure	Negative Socio-economic: Increase in safety risks	3	1	4	4	6	3	54	M	2	1	4	4	4	2	30	L
		Positive Socio-economic: Job creation	4	3	0	3	4	4	56	M	4	3	0	3	6	4	64	M
Construction	Waste generation	Solid waste: Pollution due to disposal of construction rubble and general waste during construction	2	1	3	3	6	3	45	M	2	1	3	2	2	2	20	L
		Pollution due to spillage or discharge of sewage from temporary chemical toilet facilities during construction	2	1	3	3	6	3	45	M	2	1	2	2	4	2	22	L
Operation	Waste generation	Solid waste: Pollution due to disposal of domestic solid waste	4	1	3	3	6	3	51	M	4	1	1	2	2	2	20	L

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Operation	Waste generation	Pollution due to spillage or discharge of sewage and domestic effluent from dwellings	4	2	3	4	8	3	63	M	4	2	3	4	8	2	42	M

Alternative 1.2: Proposed residential development (approved general plan)

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Planning	Change in land use	Loss of agriculture land	5	1	2	4	4	4	64	M	5	1	2	4	4	4	64	M
		Effect on the overall aesthetics of the area from a natural area to a built up area	5	1	3	4	4	4	68	M	5	1	2	4	4	3	48	M

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Site preparation, landscaping and construction of related infrastructure	Clearance and transformation of natural vegetation	2	1	3	4	6	4	64	M	2	1	3	3	6	4	60	M
		Removal of protected species	2	1	4	4	6	3	51	M	2	1	3	3	4	3	39	L
		Erosion damage and loss of topsoil	2	1	2	3	4	4	48	M	2	1	2	2	2	3	27	L
		Dust generation	2	1	2	3	4	3	36	L	2	1	1	2	2	3	24	L
		Establishment and distribution of weeds and invasive plant species	3	1	3	3	4	4	56	M	3	1	3	3	2	3	36	L
		Visual impact	2	1	3	4	4	4	56	M	2	1	2	3	2	3	30	L
		Change in storm water flow	5	1	0	3	6	4	60	M	5	1	0	3	4	4	52	M
Construction; Operation	Site preparation and construction of related infrastructure	Negative Socio-economic: Increase in safety risks	3	1	4	4	6	3	54	M	2	1	4	4	4	2	30	L
		Positive Socio-economic: Job creation	4	3	0	3	4	4	56	M	4	3	0	3	6	4	64	M

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Waste generation	Solid waste: Pollution due to disposal of construction rubble and general waste during construction	2	1	3	3	6	3	45	M	2	1	3	3	2	2	22	L
		Pollution due to spillage or discharge of sewage from temporary chemical toilet facilities during construction	2	1	3	3	6	3	45	M	2	1	2	2	4	2	22	L
Operation	Waste generation	Solid waste: Pollution as a result of disposal of domestic solid waste	4	1	3	3	6	3	51	M	4	1	1	2	2	2	20	L
		Pollution as a result of spillage or discharge of sewage and domestic effluent from dwellings	4	2	3	4	8	3	63	M	4	2	3	4	8	2	42	M

Potential cumulative impacts: According to the criteria used during the assessment of the potential environmental impacts and/or risks, the cumulative impacts may be considered high as the proposed development is one of a few similar developments currently being undertaken and/or awaiting approval for in the area. However, with implementation of the amended general plan (i.e. preferred alternative), the

concentration of housing units will be less and therefore the scale of cumulative impacts as a result is also expected to be less. According to the amended site layout the sensitive areas on the prominent hill where most of the protected plant species occur will be excluded from the physical development area and will therefore not be affected. This area will also serve as natural corridor and refuge area for animal species within the area.

The proposed residential development may contribute to the cumulative effect on storm water flow of the area. The volume of storm water and velocity of sheet flow are expected to increase as a result of reduced infiltration of the built-up areas and paved surfaces. Therefore storm water management measures throughout the site must be designed with the necessary capacity and direct surface water to follow the natural drainage as far possible to reduce risks and impacts downstream.

Alternative 2.1 (Preferred): Proposed reservoir (capacity 330 kl) on Erf 37005 (zoned general residential 5)

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Construction of the reservoir in line with the bulk clean water line on Erf 37005	Clearance and transformation of natural vegetation	2	1	0	4	2	5	45	M	2	1	0	4	2	4	36	M
		Removal of protected species	2	1	0	0	2	2	10	L	2	1	0	0	2	2	10	L
		Erosion damage and loss of topsoil	2	1	0	3	4	4	40	M	2	1	0	3	2	3	24	L

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction; Operation		Establishment and distribution of weeds and invasive plant species	3	1	2	2	4	4	48	M	3	1	2	2	2	3	30	L
		Visual impact	4	1	0	3	4	4	48	M	4	1	0	2	2	3	27	L

Alternative 2.2: Proposed reservoir (capacity 330 kl) on Erf 37007 (zone private open space)

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Construction of the reservoir in line with the bulk clean water line on Erf 37005	Clearance and transformation of natural vegetation	2	1	2	4	4	5	65	M	2	1	2	4	4	4	52	M
		Removal of protected species	2	1	3	4	6	4	64	M	2	1	3	3	4	4	52	M
		Erosion damage and loss of topsoil	2	1	2	3	6	4	56	M	2	1	2	3	4	4	48	M

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction; Operation		Establishment and distribution of weeds and invasive plant species	3	1	2	3	4	4	52	M	3	1	2	3	4	3	39	L
		Visual impact	4	2	0	4	4	5	70	M	4	2	0	4	4	4	56	M

Potential cumulative impacts: Clean water from the existing Mangaung Metropolitan Municipal clean water reticulation line will be pumped to the reservoir in accordance with the Service Level Agreement to be finalised. The proposed reservoir will contribute towards the physical disturbed footprint of the development, but the cumulative visual impact and potential impact on natural vegetation and protected plant species will be lower with the construction of the reservoir on Erf 37005 in which case it will form part of the internal reticulation system and the pipeline will follow the access road and other internal services, e.g. electricity lines. Should the alternative on Erf 37007 on the prominent hill be considered, the impact on the natural vegetation and probability of erosion occurring will be higher. The footprint of disturbance will also be greater especially considering that an underground pipeline from the existing municipal service line to the reservoir on the hill will be implemented and another line extending towards the housing units. According to the Ecological and Wetland Assessment Report (2019), a few protected plant species occur on the prominent hill and it is recommended for conservation.

Alternative 3.1 (preferred): Proposed access road on Erf 37005 based on amended general plan

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Construction of the access road, gate and low lying water crossing over the non-perennial stream and within the 1:100 year flood line.	Destruction of riparian vegetation on the affected footprint	2	1	3	4	6	4	64	M	2	1	3	3	4	4	52	M
		Destruction of protected plant species	2	1	3	4	6	4	64	M	2	1	3	4	4	3	42	M
Construction; Operation		Change in the flow and flood regime of the stream	5	1	3	3	6	4	72	M	5	1	2	3	4	3	45	M

Alternative 3.2: Proposed access road on Erf 37008 based on the previously approved general plan

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Construction of the access road,	Destruction of riparian vegetation	2	1	3	4	6	4	64	M	2	1	3	3	4	4	52	M

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction; Operation	gate and low lying water crossing over the non-perennial stream and within the 1:100 year flood line.	on the affected footprint																
		Destruction of protected plant species	2	1	3	4	6	4	64	M	2	1	3	4	4	3	42	M
		Change in the flow and flood regime of the stream	5	1	3	3	6	4	72	M	5	1	2	3	4	3	45	M

Potential cumulative impacts: The access gate, road and low lying water crossing (bridge) will contribute towards the physical disturbed footprint of the development as well as cumulative impact on the change in storm water drainage on site. A localised change in the flow and flood regime of the non-perennial stream is expected to occur during the Construction Phase which will likely extend to the Operational Phase. Due to the small scale and proposed design, the impact is expected to be low without having a large downstream impact provided that surface water is not contained within the stream.

The potential impacts for both alternatives are similar, but the preferred route determination based on the amended general plan has the advantage of one central road giving access to all the residential units, reducing the physical footprint of disturbance. The road will also serve as a lay down route for other services (e.g. underground electrical cables, bulk service lines). This is expected to reduce potential impacts and also assist in the general management and maintenance of the access road and general services.

Alternative 4 (Preferred and only alternative): Proposed construction of a mini-substation on Erf 37005

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Construction of the mini-substation	Destruction of vegetation on the affected footprint	2	1	2	4	4	4	52	M	2	1	2	3	2	3	30	L
		Disturbance of the soil surface and likelihood of sedimentation of the non-perennial stream	2	1	3	3	4	3	39	L	2	1	3	3	2	3	33	L

Potential cumulative impacts: The mini-substation will also contribute towards the physical disturbed footprint of the development. The development is expected to increase the electricity demand for the area; however Centlec has confirmed that the demand can be met and provision therefore has been made.

Alternative 5 (Preferred and only alternative): Bulk services incorporated within the existing Mangaung Metropolitan municipal services

POTENTIAL IMPACT ON ECOSYSTEM SERVICE			BEFORE MITIGATION								AFTER MITIGATION							
			Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	SIGNIFICANCE
Phase	Activity	Potential impact																
Construction	Extension of the existing municipal bulk clean water and sewage pipeline	Physical disturbance and clearance of vegetation	2	1	0	2	2	4	28	L	2	1	0	2	2	4	28	L
Operation	Bulk sewage line	Potential pollution of sewage to the surrounding environment and stream system in the event of leakage	4	2	3	4	8	3	63	M	4	2	3	4	8	2	42	M

Potential cumulative impacts: The development is expected to increase the demand for bulk services in the area, however a service level agreement is currently being finalised. In the event of a leakage from the bulk sewage pipeline, a negative impact on the water quality of surface water is expected, as well as pollution to the surrounding environment. However, this has a low probability of occurring providing that the necessary management measures and monitoring are implemented at all times.