Proposed Wildebosch Road Extension to Trumali Street at Stellenbosch, in the Western Cape

Specialist Risk Assessment Methodology Report

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1 Risk Assessment Report

The below impact assessment methodologies have been extracted from the specialist studies undertaken for the Wildebosch Road Extension to Trumali Street Project, located at Stellenbosch in the Western Cape.

The site sensitivity verifications do not assess impacts; therefore, an impact rating methodology will not apply to the Socio-economic and Agricultural sensitivity studies.

The below impact ratings will relate to the freshwater aquatic assessment, botanical assessment, and landscape and visual assessment.

1.1 Impact rating methodology: Landscape and Visual Assessment

Calculations

This section outlines the proposed method and calculations for assessing the significance of the potential visual impacts as provided by Zutari (2021). The criteria include the intensity (size or degree of scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale) and the extent (spatial scale). These numerical ratings are used in an equation whereby the consequence of the impact can be calculated as follows:

Significance = consequence x probability

Consequence = type x (intensity +duration + extent)

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is applied to the consequence:

Depending on the numerical result the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

Intensity

The intensity refers to the degree of alteration of the affected environmental receptor, refer to Error! R eference source not found..

Table 1: Description of intensity and assigned numerical values

Numerical Rating	Category	Description
1	**Negligible**	Natural and/ or social functions and/ or processes are negligibly altered
2	**Very low**	Natural and/ or social functions and/ or processes are slightly altered
3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
5	**High**	Natural and/ or social functions and/ or processes are notably altered
6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered

Duration

The duration refers to the length of permanence of the impact on the environmental receptor, refer to **Error! Reference source not found.**.

Table 2: Description of extent and assigned numerical values

Numerical Rating	Category	Descriptors
1	**Immediate**	The impact will continue for less than 1 month.
2	**Short term**	The impact will continue for between 1 month and 2 years.
3	**Medium term**	The impact will continue for 2-5 years.
4	**Long term**	The impact will continue for 6-15 years.
5	**Project life**	The impact will cease after the operational life span of the project
6	**Beyond project life**	The impact will remain for some time after the life of the project.
7	**Permanent**	The impact will remain indefinitely.

Extent

The extent refers to the geographical scale of impact on the environmental receptor, refer to **Error! R eference source not found.**.

Table 3: Description of extent and assigned numerical values

Numerical Rating	Category	Descriptors
1	**Very limited**	Impacts very limited / felt in isolated areas of the study area
2	**Limited**	Impacts limited to specific parts of the study area
3	**Local**	Impacts felt mostly throughout the study area
4	**Municipal area**	Impacts felt outside the study area, at a municipal level
5	**Regional**	Impacts felt outside the study area, at a regional/provincial level
6	**National**	Impacts felt outside the study area, at a national level
7	**International**	Impacts felt outside the study area, at an international level

Probability

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is also considered, refer to **Error! Reference source not found.**.

Table 4: Definition of probability ratings

Numerical Rating	Category	Descriptors
1	**Highly unlikely / None**	Expected never to happen

2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
4	**Probable**	Has occurred here or elsewhere and could therefore occur
5	**Likely**	The impact may occur
6	**Almost certain / Highly probable**	It is most likely that the impact will occur
7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

1.2 Impact rating methodology: Botanical Assessment

The assessment of impacts needs to include the determination of the following:

- The nature of the impact – see Table 5
- The magnitude (or severity) of the impact – see Table 6
- The likelihood of the impact occurring - see Table 6

The degree of confidence in the assessment must also be reflected.

Table 5: Impact assessment terminology

Term	Definition
Impact nature	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

Assessing significance

There is no statutory definition of '*significance*' and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the magnitude of the impact and the likelihood of the impact occurring. The criteria used to determine significance are summarized in *Table 6.*

Table 6: Significance criteria

Impact magnitude	
Extent	*On-site* – impacts that are limited to the boundaries of the rail reserve, yard or substation site.

	Local – impacts that affect an area in a radius of 20km around the development site. *Regional* – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. *National* – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.
Duration	*Temporary* – impacts are predicted to be of short duration and intermittent/occasional. *Short-term* – impacts that are predicted to last only for the duration of the construction period. *Long-term* – impacts that will continue for the life of the Project, but ceases when the Project stops operating. *Permanent* – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Intensity	BIOPHYSICAL ENVIRONMENT: *Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).* **Negligible** – the impact on the environment is not detectable. **Low** – the impact affects the environment in such a way that natural functions and processes are not affected. **Medium** – where the affected environment is altered but natural functions and processes continue, albeit in a modified way. **High** – where natural functions or processes are altered to the extent that it will temporarily or permanently cease. ***Where appropriate, national and/or international standards are to be used as a measure of the impact.*** *Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.* SOCIO-ECONOMIC ENVIRONMENT: *Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.* **Negligible** – there is no perceptible change to people's livelihood **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. **High** - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.
Impact likelihood (Probability)	
Negligible	The impact does not occur.
Low	The impact may possibly occur.
Medium	Impact is likely to occur under most conditions.

High	Impact will definitely occur.

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance.

Table 7: Example of significance rating matrix

SIGNIFICANCE RATING					
	LIKELIHOOD	**Negligible**	**Low**	**Medium**	**High**
MAGNITUDE	**Negligible**	**Negligible**	**Negligible**	**Low**	**Low**
	Low	**Negligible**	**Negligible**	**Low**	**Low**
	Medium	**Negligible**	**Low**	**Medium**	**Medium**
	High	**Low**	**Medium**	**High**	**High**

In *Table 8*, the various definitions for significance of an impact is given.

Table 8: Significance definitions

Significance definitions	
Negligible significance	An impact of negligible significance (or an insignificant impact) is where a resource or receptor (including people) will not be affected in any way by a particular activity, or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.
Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that 'moderate' impacts have to be reduced to 'minor' impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors such as employment, in coming to a decision on the Project.

Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

1.3 Impact rating methodology: Freshwater Assessment

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand

the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

1. An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
2. An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'[1]. The interaction of an aspect with the environment may result in an impact;
3. **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is;
4. **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems;
5. **Resources** include components of the biophysical environment;
6. **Frequency of activity** refers to how often the proposed activity will take place;
7. **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor;
8. **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards;
9. **Spatial extent** refers to the geographical scale of the impact; and
10. **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity, impact, legal issues and the detection of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[2].

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

[1] The definition has been aligned with that used in the ISO 14001 Standard.

[2] Some risks/impacts that have low significance will however still require mitigation

"RISK ASSESSMENT KEY" (Based on DWS 2015 publication: Section 21 c and i water use Risk Assessment Protocol).

Table 9: Severity (How severe does the aspects impact on the resource quality (flow regime, water quality, geomorphology, biota, habitat).

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland. The score of 5 is only compulsory for the significance rating.	

Table 10: Spatial Scale (How big is the area that the aspect is impacting on).

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Table 11: Duration (How long does the aspect impact on the resource quality).

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5
PES and EIS (sensitivity) must be considered.	

Table 12: Frequency of the activity (How often do you do the specific activity).

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

Table 13: The frequency of the incident or impact (How often does the activity impact on the resource quality).

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Table 14: Legal issues (How is the activity governed by legislation).

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5
Located within the regulated areas	

Table 15: Detection (How quickly or easily can the impacts/risks of the activity be observed on the resource quality, people and resource).

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Table 16: Rating Classes.

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

A low risk class must be obtained for all activities to be considered for a GA

Table 17: Calculations

Consequence = Severity + Spatial Scale + Duration
Likelihood = Frequency of Activity + Frequency of Incident + Legal Issues + Detection
Significance\Risk = Consequence X Likelihood

The following points were considered when undertaking the assessment:

1. Risks and impacts were analysed in the context of the *project's area of influence* encompassing:

    - Primary project site and related facilities that the client and its contractors develops or controls;
    - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
    - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
    - Risks/Impacts were assessed for construction phase and operational phase.

Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.

Control Measure Development

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

1. Mitigation and performance improvement measures and actions that address the risks and impacts are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:

    - Avoidance or prevention of impact;

- Minimisation of impact;
- Rehabilitation; and
- Offsetting.

Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.

Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

Recommendations

Recommendations were developed to address and mitigate potential impacts on the freshwater ecology of the resources in traversed by or in close proximity of the proposed infrastructure.

In diversity there is beauty and there is strength.

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