# Appendix G – Impact Assessment Methodology

## Impact Identification and Assessment Methodology

The purpose of impact assessment is to assign a qualified significance to impacts which are predicted to occur as a result of the various aspects of an activity.

The following definitions apply:

- Activity: A distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation.
- Environmental aspect: An element of an organisations activities, products and services which can interact with the environment. The interaction of an aspect with the environment may result in an impact.
- Environmental impacts: 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.
- Receptors: 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 aquifers, flora and paleontology.

**Aspects**

Aspects associated with the proposed project are differentiated into construction and operation phases of the project. The nature of the impact is described. Once this has been undertaken the significance of the impact is determined.

**Identifying significant environmental impacts**

The significant environmental impacts are identified using three sources of information:

- The nature of the receiving environment (the environment includes the social, cultural and biophysical environment)
- A review and understanding of the aspects associated with the proposed project.
- All comments received from interested and affected parties during the public participation process. The issues raised will be described giving consideration to the associated activity and the aspect of that activity that is likely to result in an impact.

**Nature of the impact**

Impacts on the environment can lead to changes in existing conditions; the nature of the impact can be direct, indirect or cumulative.

- Direct impacts refer to changes in environmental components that result from direct cause-effect consequences of interactions between the environment and project activities. The direct impact is caused by the action and occurs at the same time and place.
- Indirect (Secondary) impacts result from cause-effect consequences of interactions between the environment and direct impacts. The indirect impact is caused by the action and occurs later in time or is further removed in distance.
- Cumulative impacts refer to the combined effect of changes to the environment caused by multiple human activities over space and time. Cumulative impact is the sum of existing conditions and the direct / indirect impacts resulting from the project. Example: A single cut in the forest is unlikely to have a detectable change, however increasing multiple cuts in the forest caused by a number of human activities is likely to decrease fauna and flora and increase soil erosion. Cumulative effects can thus be additive or synergistic. A synergistic effect refers to when the combined effect is greater than the sum of individual effects.

**Method for assessing the overall significance of impacts**

The overall significance of the impact is critical for defining mitigation and monitoring strategies. The qualified significance of predicted impacts assists to determine the manner in which aspects should be managed in order to avoid or minimise the predicted impacts.

Overall significance of the impacts is determined through systematically rating the following criteria of the impacts:

- The status of the impact
- The spatial extent of the impact
- The severity of negativity or degree of positivity of the impact
    - The duration of the impact
    - The frequency of the impact
    - The intensity of the impact
- The consequence of the impact
- The probability of the impact occurring

**Impact Status**

A qualitative rating of positive or negative is assigned to impact status. Refer to Table 1 (methodology).

**Spatial Extent**

The spatial extent for each aspect, receptor and impact is defined. The geographical coverage (spatial extent) description will take account of the following factors:

- The physical extent / distribution of the aspect
- The physical extent / distribution of the receptor
- The proposed impact as a result of the aspect
- The nature of the baseline environment within the area of impact

For example, the impacts of noise are likely to be confined to a smaller geographical area than the impacts of atmospheric emissions, which may be experienced at some distance. The significance of impacts also varies spatially; noise may be significant in the immediate vicinity. A qualitative description is assigned to the rating. A quantitative value ranging from 1 – 6 is assigned to the rating. Refer to Table 1 (methodology).

**Duration**

The duration refers to the length of time that an aspect of a proposed project may cause change on the receiving environment. The receiving environment could refer to either the social or cultural or biophysical environment. The change caused may be a positive or negative change. A qualitative description is assigned to the rating. A quantitative value ranging from 1 – 6 is assigned to the rating.

**Frequency**

The frequency of the impact occurring refers to how often the aspect results in a given impact on the receiving environment. The receiving environment could refer to either the social or cultural or biophysical environment. The impact may be positive or negative. A qualitative description is assigned to the rating. A quantitative value ranging from 1 – 6 is assigned to the rating.

**Intensity**

The intensity refers to the magnitude of the impact experienced by the receiving environment. The environment could refer to either the social or cultural or biophysical environment. The impact experienced may be a positive or negative impact. A qualitative description is assigned to the rating. A quantitative value ranging from 1 – 6 is assigned to the rating.

**Severity / Degree**

The severity is the sum of the intensity, duration and frequency of the impact and therefore a quantitative value ranging from 3 – 18 is assigned to the rating. If the impact is positive, the degree of positivity is determined. A qualitative description is assigned to the rating.

**Consequence**

A qualitative description is assigned to the rating. The consequence is the sum of the Severity (Intensity + Duration + Frequency) and Spatial Extent. Therefore, a quantitative value ranging from 4 – 24 is assigned to the rating.

**Probability**

In order to determine the significance of the impact, the probability of the impact occurring must first be rated. The probability refers to the likelihood that an impact will result from the aspect in question. A qualitative description is assigned to the rating. A quantitative value ranging from 1 – 6 is assigned to the rating.

**Overall Significance**

A definition of a "significant impact" for the purposes of the study is: "An impact which, either in isolation or in combination with others, could, in the opinion of the specialist, have a material influence on the decision-making process, including the specification of mitigating measures."

A qualitative description is assigned to the rating. The significance is the sum of the Consequence and Probability. Therefore a quantitative value ranging from 5 - 30 is assigned to the rating. A value of 5, 6 or 7 represents a low significance and described as "not harmful". A value of 30 presents a Very High Significance and is described as an "environmental disaster".

**Mitigation**

The Mitigation ratings are described qualitatively according to the success and feasibility of the mitigation option in question. The impacts are further rated before and after mitigation / management options. Negative impacts are assessed with mitigation measures in place in order to give an overall significance rating with mitigation in place. Positive impacts are assessed with management measures in place in order to give an overall significance rating with management in place.

**Confidence**

The confidence of the EAP is assigned a qualitative value.

Table 1: Impact Assessment Rating methodology

| **Impact Status** | | | | | | |
|---|---|---|---|---|---|---|
| **Rating** | **Negative** | | | **Positive** | | |
| **Description** | An impact is rated negative if any degree of negative change will occur in the receiving environment as a result of any aspect of the proposed project.<br>The environment refers to the social environment or the cultural environment or the biophysical environment.<br>Negative impacts are to be avoided, minimised, or mitigated. | | | An impact is rated positive if any degree of positive change will occur in the receiving environment as a result of any aspect of the proposed project.<br>The environment refers to the social environment or the cultural environment or the biophysical environment.<br>Positive impacts are to be enhanced. | | |
| **Scale (Spatial Extent)**<br>Refers to the spatial area the aspect will impact on the environment. The impact may be positive or negative. | | | | | | |
| **Rating** | **Activity specific** | **Site specific** | **Local area Specific** | **Municipal** | **Provincial / National** | **International** |
| **Description** | Impact only experienced on area where | Impact extends to the entire site of the project | Impact extends beyond site into surrounding areas | Impact extends beyond local area into municipal areas | Impact extends beyond municipal area into provincial | Impact extends beyond national area |

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|---|---|---|---|---|---|---|
| | activity is located | | | | and may extend nationally | |
| **Value** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Duration**<br>Refers to the length of time that the aspect may cause a change on the environment. The change may be positive or negative. | | | | | | |
| **Rating** | **Very Short term** | **Short term** | **Short - Medium term** | **Medium term** | **Medium - Long term** | **Long term** |
| **Description** | 1 day to 3 month | 3 months to one year | One year to three years | Three years to ten years | Life of operation | Extends beyond post closure |
| **Value** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Frequency**<br>Refers to how often the aspect may impact on the environment.<br>The impact may be positive or negative. | | | | | | |
| **Rating** | **Rarely** | **Infrequent** | **Seldom** | **Regular** | **Often** | **Continuously** |
| **Description** | Could occur annually | Could occur within 6 months | Monthly | Weekly | Daily | Non stop |
| **Value** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Intensity (Magnitude / Size)**<br>Refers to the intensity of the impact experienced by the receiving environment. The impact may be positive or negative. | | | | | | |
| **Rating** | **Low** | **Low to medium** | **Medium** | **Medium to High** | **High** | **Very High** |
| **Description** | Low intensity experienced only by receiving environment and / or occurs within 100 metres of activity | Low – medium intensity on receiving environment and / or occurs 100 – 500 metres of activity | Medium intensity on receiving environment and / or occurs 500 – 1000 metres of activity | Medium to high intensity on receiving environment and / or occurs within 1000 – 5000 metres of activity | High intensity on receiving environment and / or occurs within 5000 – 10 000 metres of activity | Very high intensity on receiving environment and / or within 10 000 metres or beyond of the activity |
| **Value** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Severity of negative impact**<br>Severity (Intensity + Duration + Frequency)<br>The severity of an environmental aspect is determined by the degree of change to the baseline environment, and considers the following:<br>The reversibility of the negative impact,<br>The sensitivity of the receptor to the stressor,<br>The impact duration, its permanency and whether it increases or decreases with time. | | | | | | |
| **Rating** | **Negligible** | **Low Negative** | **Medium Negative** | **Medium - High Negative** | **High Negative** | **Very High Negative** |
| **Description** | There will be negligible impact as a result of the aspect | There will be a minor impact as a result of the aspect. This is easily reversible. | The aspect will result in a moderate impact. Reversibility of the impact easy but costly. | The aspect will result in a high impact. Reversibility of the impact possible but costly. | The aspect will result in a high impact. Reversibility of the impact difficult and costly. | The aspect will result in a severe impact. Reversibility of the impact not likely. |
| **Value** | 3 | 4-6 | 7-9 | 10-12 | 13-15 | 16-18 |
| **Degree of positive impact**<br>Degree (Intensity + Duration + Frequency)<br>The severity of an environmental aspect is determined by the degree of change to the baseline environment, and considers the following:<br>The enhancement of the positive impact,<br>The sensitivity of the receptor to the opportunity,<br>The impact duration, its permanency and whether it increases or decreases with time. | | | | | | |
| **Rating** | **Negligible** | **Low Positive** | **Medium Positive** | **Medium High Positive** | **High Positive** | **Very High Positive** |
| **Description** | There will be negligible impact | There will be a minor impact as a | The aspect will result in a | The aspect will result in a high impact. | The aspect will result in a high impact. | The aspect will result in a very |

| | | | | | | |
|---|---|---|---|---|---|---|
| | as a result of the aspect | result of the aspect. | moderate impact. | | | high positive impact. |
| **Value** | 3 | 4-6 | 7-9 | 10-12 | 13-15 | 16-18 |
| **Negative Consequence**<br>Consequence = (Severity + Spatial extent) | | | | | | |
| **Rating** | **Negligible** | **Negative low** | **Negative Medium** | **Negative Medium High** | **Negative High** | **Negative Very High** |
| **Description** | Impact has insignificant consequence on receiving environment. Requires little or no mitigation. | Impact requires in situ mitigation and receptor mitigation. | Impact requires in situ mitigation and receptor mitigation | Impact requires in situ mitigation, receptor mitigation and repair or restoration. | Impact requires in situ mitigation, receptor mitigation and repair or restoration and possible compensation. | Impact is to be avoided |
| **Value** | 4 | 5-8 | 9-12 | 13-16 | 17-20 | 20-24 |
| **Positive Consequence**<br>Consequence = (Degree + Spatial extent) | | | | | | |
| **Rating** | **Negligible** | **Positive low** | **Positive Medium** | **Positive Medium High** | **Positive High** | **Positive Very High** |
| **Description** | Impact has insignificant consequence on receiving environment. | Impact has a positive consequence; management required to enhance positive outcomes. | Impact has a positive consequence; management required to enhance positive outcomes. | Impact has a positive consequence; management required to enhance positive outcomes. | Impact has a positive consequence; management required to maintain positive outcomes. | Widespread / substantial beneficial effect. No alternative ways to achieve same benefits. Management required to maintain positive outcomes. |
| **Value** | 4 | 5-8 | 9-12 | 13-16 | 17-20 | 20-24 |
| **Probability**<br>Refers to the likelihood that an impact will result from the aspect in question. The impact may be positive or negative. | | | | | | |
| **Rating** | **Slim** | **Slight** | **Plausible** | **Probable** | **Expected** | **Anticipated** |
| **Description** | 0 - 9% likelihood | 10 – 25 % likelihood | 26 - 50% likelihood | 51 - 75% likelihood | 76 - 90% likelihood | 91 - 100 % likelihood |
| **Value** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Negative Significance**<br>(Consequence + Probability) | | | | | | |
| **Rating** | **Negligible** | **Low** | **Medium** | **Medium High** | **High** | **Very High** |
| **Description** | Not harmful | Slightly harmful | Harmful | Very Harmful | Considerably Harmful | Disaster |
| **Value** | 5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 |
| **Positive Significance**<br>(Consequence + Probability) | | | | | | |
| **Rating** | **Negligible** | **Low** | **Medium** | **Medium High** | **High** | **Very High** |
| **Description** | Insignificant | Slightly positive | Positive | Positive but not substantial. | Substantial positive impact. | Necessity |
| **Value** | 5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 |
| **Mitigation of negative impact** | | | | | | |
| **Rating** | **None** | **Likely** | **Possible** | **Difficult** | **Unlikely** | **Not possible** |
| **Description** | Mitigation not required. Impact remains the same. | Impact can be avoided with mitigation which has proven results. | Impact can be minimised and managed with mitigation | Difficult or costly to mitigate. | Difficult and costly to mitigate | Impact cannot be mitigated |
| **Management of positive impact** | | | | | | |

| Rating | None | Likely | Possible | Difficult | Unlikely | Not possible |
|---|---|---|---|---|---|---|
| **Description** | Management not required. Impact remains the same. | Impact can be easily enhanced with management which has proven results. | Impact can be enhanced with management | Difficult or costly to enhance but possible | Difficult and costly to enhance | Impact cannot be enhanced |
| **Confidence**<br>Refers to the confidence level the EAP has in predicting the impact. | | | | | | |
| **Rating** | **Low** | **Medium low** | **Medium** | **Medium High** | **High** | **Very High** |