

# Impact assessment methodology

## 1.1 Introduction

The proposed rehabilitation of the Bergvlam Stream will have negative biophysical impacts during construction phase but with mitigation measures the environmental conditions in the stream will improve and will have positive biodiversity and socio-economic impacts. The positive impacts on the environment identified will be used to enhance the environment. The negative biophysical impacts identified will be mitigated with measures suggested. Mitigation measures to reverse, avoid or manage anticipated negative impacts are summarised in Table 1. The mitigation measures will enhance the receiving environment by improving already impacted areas such as the eroded areas, areas cleared of vegetation and to prevent future erosion and negative biodiversity impacts. These mitigation measures will also be included in the Maintenance Plan.

## 1.2 Key Issues Identified

Key issues identified within the proposed project were:

- Environment
- Social issues - walkways,
- Bulk services in the stream –storm water outlets, sewerage & water pipe lines and electrical cables.

## 1.3 Identification of Anticipated Impacts and Recommendations

Site visits were undertaken on 26 January 2010 and 30 June 2015 (before the clearing of vegetation) and after clearing on 31 August 2015. Potential impacts identified during site visits/inspections and potential impacts anticipated by specialists are summarised in Table 1. Also in Table 1 is recommendations that were suggested to reverse, avoid or manage anticipated impacts.

Table 1: Anticipated impacts and mitigations recommended

	POTENTIAL IMPACT	RECOMMENDATIONS TO REVERSE, AVOID AND MANAGE AN IMPACT
Environment		
Topography	The slope of the stream channel is fairly steep, with gradual to very steep banks. The stream mainly consist of sand and pockets of sand silted up on level areas, especially after a storm. The area is highly eroded and erosion possibility is high during the construction phase if areas to be constructed are cleared and left bare for more than 7 days.	Areas cleared for construction may not be left bare for more than 7 days without erosion control measures. Sensitive areas such as the valleys and the riverine areas should be protected and no activities or development are allowed in these areas. Only the planned construction areas may be cleared from vegetation.
Geology and soils	Intensive utilisation of service and access roads by construction and maintenance vehicles may cause loss of stability of road surfaces which will result in soil erosion through wind and surface water run-off. Erosion potential is high.	It is imperative that movement of equipment and machinery be limited during construction phase and restricted to designated roads for access to environmental education site or for maintenance purposes. Re-vegetation with indigenous plants can prevent erosion impacts.
Flora (Vegetation)	Indigenous vegetation: Vegetation removal will also be required for the purpose of construction. . Alien invaders have a negative impact on indigenous vegetation as well as the biodiversity of indigenous vegetation.	Tree surveys and assessments were done by Johan Louw, the conservationist from MLM and were used for this project. Re-vegetation of indigenous vegetation are important – reeds, grasses and forbs. See attached list of MLM conservation department. <i>Ficus</i> spp have big root systems that can prevent erosion of the banks of the stream. Yearly assessment to investigate the impact of alien plants and implementation of maintenance plan to remove alien vegetation.
	Protected plant species: Identification of protected plant species	No protected trees or other plant species were recorded. <i>Breonadia salicina</i> (a riparian tree) can be planted to increase biodiversity.
	Declared invader species: (CARA, Act no 43 of 1983). A high percentage of vegetation in the stream is exotic plants or alien invaders. Invader species could increase in disturbed areas. Dumping of garden refuse (including alien plants) by neighbouring landowners.	A management program to control invader plant spp will be part of the planning and management of the site. Neighbouring landowners needs to be informed about the negative impact of dumping garden refuse and general waste in the stream.
	Thickets: Important habitat for bird species to nest and forage.	Protect thickets in specific areas but prevent it from invading the stream in totality. Yearly assessments to evaluate the condition and size of thickets.
Fauna	The impacts on large and small terrestrial fauna, including mammals, reptiles and amphibians is considered to be of high significance during construction phase.	Protect a variety of habitats to increase Fauna activities and improve the biodiversity of the area. Attenuation ponds can create habitats for different fauna spp.

	POTENTIAL IMPACT	RECOMMENDATIONS TO REVERSE, AVOID AND MANAGE AN IMPACT
		Indigenous vegetation will attract a variety of animals.
Surface & Ground water quality	Storm water impact and polluted waste storm water can impact the aquatic life of the river.	Storm water management plan.
Air quality	Dust can be created during the construction phase. No significant impact is anticipated.	Insignificant impact.
Noise pollution	Noise can be created during the construction period.	Insignificant impact.
Visual impact	Bulk services pipelines and electrical cables can impact the natural area in the stream. No significant impact is anticipated.	Indigenous trees can be planted to mitigate any possible negative impact. Insignificant impact.
Social impact		
Socio-economic aspects	The project will have a positive impact, it will create work opportunities, Recreation and Environmental education activities for schools.	Positive impact – no mitigation measures.
Walkways	Environmental friendly design of the walkways is very important.	Low impact and low maintenance structures need to be constructed. No trees may be damaged during construction of walkways. Curves should be planned to avoid impacts on trees or boulders. Stream crossings must be above the flood line to prevent damage During layout and construction of the trail, care must be taken to identify any special or sensitive features such as raptor nests that cannot be identified during planning.
Bulk services		
Sewerage pipe line	Leaking sewer pipelines have a significant negative impact on the stream.	Regular monitoring of sewer pipeline in the stream. Maintenance of the pipeline after storm events. Make use of the public to monitor overflowing manholes.
Water pipe line	Leaking water pipeline does not impact the stream negatively but has an economic negative impact on the residents in the Mbombela (Nelspruit).	Regular monitoring of water pipeline in the stream. Maintenance of the pipeline after storm events.
Electrical cables	Open electrical cables have a potential danger to fauna living in the stream. Open electrical cables can shock residents neighbouring the stream or during environmental education sessions.	Regular monitoring of electrical cables in the stream. Maintenance of the electrical cables after storm events.

## 1.4 Ecological Impact Assessment

The ecological Impact assessment will be done according to the EIA Regulations (R982 of 2014). The following was completed to determine possible impacts on the environment:

- an understanding of the proposed activity in sufficient detail;
- determine the current environmental conditions (i.e. baseline) against which to assess impacts;
- identification of potential impacts ;
- Impact assessment evaluation;
- determine the possible future changes in the receiving environment baseline if the project does not proceed;
- all findings from the Impact Assessment process was taken into account to compile the rehabilitation plan;

## 1.5 Methodology of impact assessment evaluation

The classification of an issue as a 'key issue' during the Impact Assessment phase does not necessarily imply that an impact of high significance will result. The significance of the impact can only be ascertained once a specialist assessment has been conducted. After such an assessment, it is possible that a key issue may turn out to have an impact of low or no significance.

The methodology for assessing impacts and assigning significance to the key issues is as required by the EIA Regulation 982 of 2014, Appendix 1: Basic Assessment process (3)(j). Table 2 summarize the assessment procedures.

Table 2: The methodology for assessing impacts and assigning significance to the key issues

	Description of risk assessment	
Nature of impact	<b>Describes the type of effect that a proposed activity would have on the environment ("what would be affected and how?")</b>	
	Indicates whether the impact is direct, indirect or cumulative;	
	Indicates whether the impact occurs during the construction, operations or decommissioning phases of the project.	
Significance	Based on a synthesis of the above predictions, the significance of the impact shall be evaluated as follows:	
	<b>Low</b>	Where the impact would not have an influence on the decision or require to be significantly accommodated in the project design.
	<b>Medium</b>	Where it could have an influence on the environment which would require modification of the project design or alternative mitigation.
	<b>High</b>	Where it could have a 'no-go' implication for the project unless effective measures are taken to avoid or mitigate the impact.
Consequence	Indicates whether consequences are::	
	<b>Negative</b>	This consequences contribute in <b>damaging</b> the environment
	<b>Neutral</b>	This consequences have no contribution at all. The environment <b>will be in the same condition.</b>
	<b>Positive</b>	This consequences contribute in <b>improving</b> the environment

<b>Extent / location</b>	<b>whether the impact would be site specific and limited to the immediate area of the development site</b>	
	<b>local</b>	limited to within approximately 5km of the site
	<b>regional</b>	Limited to the region
	<b>National/ international</b>	National impact
<b>Duration</b>	<b>the lifetime of the impact, whether the impact is permanent or reversible</b>	
	<b>short-term</b>	short-term
	<b>medium-term</b>	medium-term
	<b>long-term</b>	long-term
<b>Probability</b>	<b>considers the likelihood of the impact occurring</b>	
	<b>improbable</b>	improbable
	<b>probable</b>	probable
	<b>highly probable</b>	highly probable
	<b>definite</b>	definite

The degree of confidence with respect to the assessment of significance in the prediction of the impacts is based on the availability of information. The significance of impacts was evaluated before mitigation was suggested (“as predicted” impacts). Most impacts will be mitigated or will have a low impact after mitigation measures are implemented during the construction and operational phases. The predicted impacts before mitigation were analysed and summarised in Table 3 for the construction phase and for the operational phase in Table 4.

Table 3: Identified impacts during construction phase

ASPECTS	NATURE OF IMPACT	SIGNIFICANCE	CONSEQUENCE	EXTENT / LOCATION	DIRECT / INDIRECT / CUMULATIVE	DURATION	PROBABILITY
<b>Environment</b>							
Topography	Stream - steep slopes – Erosion. Banks of stream – gentle to Steep slopes – Erosion.	Med	Negative	Local	Direct Cumulative	Long-term	Probable
Geology and soils	Soil type in the stream & banks – Erosion.	Med	Negative	Local	Direct Cumulative	Long-term	Probable
Flora	<b>Indigenous Vegetation</b> Impact on Biodiversity: - removal of indigenous vegetation. - alien invaders take place of indigenous vegetation.	Med	Negative	Local	Direct	Long-term	Definite
	<b>Protected plant spp.</b> Identification of protected plant spp.	Low	Positive	Local	Direct	Long-term	Improbable
	<b>Declared invader species (CARA, Act 43/1984).</b> - Biodiversity of indigenous plant species will be reduced. - Invade disturbed areas. - Garden refuse with alien plants.	High	Negative	Local	Indirect	Long-term	Highly probable
	<b>Thickets</b> Important habitat for birds (nests & forage).	Low	Positive	Local	Direct	Long-term	Probable
Fauna	Biodiversity of indigenous animal species.	Med	Negative	Local	Indirect	Short-term	Improbable
	Declared invader animal spp (Indian myna).	High	Negative	Local	Indirect	Long-term	Highly probable
	Removal of habitats (thickets).	High	Negative	Local	Indirect	Long-term	Highly probable
Surface & Ground water quality	Storm water impact.	Med	Negative	Local	Indirect	Long-term	Probable
	Pollution Sewer leakages.	High	Negative	Local	Indirect	Long-term	Probable
	Pollution Waste management.	High	Negative	Local	Indirect	Long-term	Probable
Air quality	Dust during construction phase.	Low	Negative	Local	Direct	Short-term	Improbable
Noise pollution	Noise created by construction vehicles.	Low	Negative	Local	Direct	Short-term	Improbable

ASPECTS	NATURE OF IMPACT	SIGNIFICANCE	CONSEQUENCE	EXTENT / LOCATION	DIRECT / INDIRECT / CUMULATIVE	DURATION	PROBABILITY
Visual	Visual impact.	Low	Negative	Local	Direct	Short-term	Improbable
Social aspects							
Socio-economic	Job creation. Recreational and environmental education.	High	Positive	Regional	Direct	Long-term	Definite
Walkways	Environmental friendly.	High	Positive	Local	Direct	Long-term	Highly Probable
Sewerage	Leaking sewerage can have a negative impact.	High	Negative	Regional	Direct	Long-term	Probable
Water	Leaking water pipelines – economical.	Low	Negative	Regional	Direct	Long-term	Probable
Electricity supply	Open electrical cables.	Low	Negative	Local	Direct	Long-term	Probable

Table 4: Identified impacts during operational phase after mitigation measures are implemented

ASPECTS	NATURE OF IMPACT	SIGNIFICANCE	CONSEQUENCE	EXTENT / LOCATION	DIRECT / INDIRECT / CUMULATIVE	DURATION	PROBABILITY
<b>Environment</b>							
Topography	Stream - steep slopes – Erosion. Banks of stream – gentle to Steep slopes – Erosion.	Low	Positive	Local	Direct Cumulative	Long-term	Probable
Geology and soils	Soil type in the stream & banks – Erosion.	Low	Positive	Local	Direct Cumulative	Long-term	Probable
Flora	<b>Indigenous Vegetation</b> – Improve biodiversity by - Re-vegetation of indigenous vegetation. - removal of alien invaders.	Med	Positive	Local	Direct	Long-term	Definite
	<b>Protected plant spp:</b> plant protected trees.	Low	Positive	Local	Direct	Long-term	Improbable
	<b>Removal of declared invader species (CARA, 83 of 1983).</b>	High	Positive	Local	Indirect	Long-term	Highly probable

ASPECTS	NATURE OF IMPACT	SIGNIFICANCE	CONSEQUENCE	EXTENT / LOCATION	DIRECT / INDIRECT / CUMULATIVE	DURATION	PROBABILITY
	- Biodiversity of indigenous plant species will increase.						
	<b>Thickets.</b> Important habitat for birds (nests & forage).	Low	Positive	Local	Direct	Long-term	Probable
Fauna	Biodiversity of indigenous animal species.	Low	Positive	Local	Direct	Long-term	Probable
	Declared invader animal spp (Indian myna).	High	Negative	Local	Indirect	Long-term	Highly probable
	Maintenance of habitats (thickets).	High	Positive	Local	Indirect	Long-term	Highly probable
Surface & Ground water quality	Storm water impact.	Med	Negative	Local	Indirect	Long-term	Probable
	Pollution Sewer leakages.	High	Negative	Local	Indirect	Long-term	Probable
	Pollution Waste management.	High	Negative	Local	Indirect	Long-term	Probable
Social aspects							
Socio-economic	Job creation. Recreational and environmental education.	High	Positive	Regional	Direct	Long-term	Definite
	Waste management.	Med	Negative	Local	Direct	Short-term	Probable
Walkways	Environmental friendly.	High	Positive	Local	Direct	Long-term	Highly Probable
Sewerage pipelines	Leaking sewerage can have a negative impact.	High	Negative	Regional	Direct	Long-term	Probable
Water pipelines	Leaking water pipelines – economical.	Low	Negative	Regional	Direct	Long-term	Probable
Electricity cables	Open electrical cables.	Low	Negative	Local	Direct	Long-term	Probable

## 1.6 Impact statement

The ecological Impact assessment was done according to the EIA Regulations (R982 of 2014). The above mentioned steps (paragraph 1.4 and 1.5) assist in the determination of the existing conditions of the stream and possible future changes in the receiving environment. The statement of the environment after the mitigations were applied during the rehabilitation (construction) and operational phase is summarised in Table 5. As the baseline information indicates a severe degraded and neglected environment in the Bergvlam Stream which can be used for recreational activities by residents after the rehabilitation process and it can improve biodiversity in a residential area.

Table 5: Impact statement as a summary of Impact Assessment

IMPACT STATEMENT		
Impact	Statement	
Construction	Soil & Geology - Topography	The possibility of erosion is high, mitigations to prevent erosion and silting of the stream needs to be prevented. Re-vegetate the area to prevent silting.
	Surface & groundwater	Silting due to erosion can disturbed the ecology of stream/existing dam. To prevent deterioration of water quality by preventing leaking sewer pipelines and illegal waste dumping in the stream.
	Flora	Prevent the loss of indigenous and/or protected plant species, enhance the biodiversity by planting trees and other indigenous plant spp.
	Fauna	Control alien invaders and other alien spp. Manage and improve riparian areas.
	Air Quality	Possible dust pollution during construction of attenuation ponds and diverting of the stream – impact is insignificant.
	Noise pollution	Construction phase – Work from 8:00 – 17:00. Insignificant impact.
	Visual Impact	Construction phase. Insignificant impact.
	Construction & general waste	Destruction of vegetation, worsening of biodiversity. Water pollution.
	Bulk services	Regular monitoring and maintenance.
	Operational	Topography: Soil & Geology - Erosion
Ecology: enhancement of Fauna & Flora		Control alien invaders and other alien spp. Manage and improve riparian areas. Regular re-vegetation.
Surface & groundwater		Re-vegetation and construction of gabions will prevent silting due to erosion. Ecology of stream & dam will settle over time. Water quality will improve over time due to managing of sewer pipelines and illegal waste dumps.
Socio-economy		Possible income on tourist activities. Environmental education. Recreational activities in green open space. Permanent work as care taker and gardener in the stream.

## 1.7 No-go possibility

If the rehabilitation project is not approved, the Bergvlam stream will consist of 100% alien vegetation in the near future and the stream channel would be eroded to the bedrock with neighbouring house's foundation that could collapsed because of unstable banks in the stream. The biodiversity will deteriorate and existing indigenous fauna and flora in all the open spaces, including the Bergvlam Stream, will not be available for the use of recreational or environmental education purposes.