

Rehabilitation of the Boksburg Lake: Draft Basic Assessment Report (Draft BAR)

Report Prepared for

Ekurhuleni Metropolitan Municipality (EMM)



Ekurhuleni
METROPOLITAN MUNICIPALITY

Report Number 498275/Draft BAR



Report Prepared by

 **srk** consulting

September 2018

Rehabilitation of the Boksburg Lake: Draft Basic Assessment Report (Draft BAR)

Ekurhuleni Metropolitan Municipality (EMM)

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SRK Project Number 498275/Draft BAR

September 2018

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Basic Assessment Report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014 (Version 1)

Kindly note that:

1. This **Basic Assessment Report** is the standard report required by GDARD in terms of the EIA Regulations, 2014.
2. This application form is current as of 8 December 2014. It is the responsibility of the EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.
3. **A draft Basic Assessment Report must be submitted, for purposes of comments within a period of thirty (30) days, to all State Departments administering a law relating to a matter likely to be affected by the activity to be undertaken.**
4. **A draft Basic Assessment Report (1 hard copy and two CD's) must be submitted, for purposes of comments within a period of thirty (30) days, to a Competent Authority empowered in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended to consider and decide on the application.**
5. Five (5) copies (3 hard copies and 2 CDs-PDF) of the final report and attachments must be handed in at offices of the relevant competent authority, as detailed below.
6. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.
7. Selected boxes must be indicated by a cross and, when the form is completed electronically, must also be highlighted.
8. An incomplete report may lead to an application for environmental authorisation being refused.
9. **Any report that does not contain a titled and dated full colour large scale layout plan of the proposed activities including a coherent legend, overlain with the sensitivities found on site may lead to an application for environmental authorisation being refused.**
10. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the application for environmental authorisation being refused.
11. No faxed or e-mailed reports will be accepted. Only hand delivered or posted applications will be accepted.
12. Unless protected by law, and clearly indicated as such, all information filled in on this application will become public information on receipt by the competent authority. The applicant/EAP must provide any interested and affected party with the information contained in this application on request, during any stage of the application process.
13. Although pre-application meeting with the Competent Authority is optional, applicants are advised to have these meetings prior to submission of application to seek guidance from the Competent Authority.

DEPARTMENTAL DETAILS

Gauteng Department of Agriculture and Rural Development
Attention: Administrative Unit of the of the Environmental Affairs Branch
P.O. Box 8769
Johannesburg
2000

Administrative Unit of the of the Environmental Affairs Branch
Ground floor Diamond Building
11 Diagonal Street, Johannesburg

Administrative Unit telephone number: (011) 240 3377
Department central telephone number: (011) 240 2500

(For official use only)

NEAS Reference Number:						
File Reference Number:						
Application Number:						
Date Received:						

If this BAR has not been submitted within 90 days of receipt of the application by the competent authority and permission was not requested to submit within 140 days, please indicate the reasons for not submitting within time frame.

N/A

Is a closure plan applicable for this application and has it been included in this report?

NO

if not, state reasons for not including the closure plan.

The application is for the rehabilitation of the Boksburg Lake. It is not envisaged that the rehabilitation measures will require a closure plan. The accompanying Environmental Management Programme (EMPr) however makes provision for rehabilitation of the construction areas (Refer to Section 6 of the EMPr) which will be conducted in tandem with the construction phase of the project where possible. Should the need for closure arise, the applicant will submit the plan to the GDARD in terms of the Legislation that will be prevailing at that time. The EAP expects that the impacts of decommissioning and closure will be the same as those for construction and therefore the mitigation measures shall apply.

Has a draft report for this application been submitted to a competent authority and all State Departments administering a law relating to a matter likely to be affected as a result of this activity?

YES

Is a list of the State Departments referred to above attached to this report including their full contact details and contact person?

Yes

If no, state reasons for not attaching the list.

N/A

Have State Departments including the competent authority commented?

Yes

If no, why?

N/A

SECTION A: ACTIVITY INFORMATION

1. PROPOSAL OR DEVELOPMENT DESCRIPTION

Project title (must be the same name as per application form):

Application for an Environmental Authorisation for the rehabilitation of the Boksburg Lake

Select the appropriate box

The application is for an upgrade of an existing development

The application is for a new development

Other, specify

Does the activity also require any authorisation other than NEMA EIA authorisation?

YES
X

If yes, describe the legislation and the Competent Authority administering such legislation

The project requires a Section 21 (c) and (i) Water Use Licence (WUL) from the Department of Water and Sanitation (DWS) in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA).

If yes, have you applied for the authorisation(s)?

YES
X

If yes, have you received approval(s)? (attach in appropriate appendix)

NO
X

A pre-application meeting with the DWS was conducted on 3 April 2018, and a Phase 1 application submitted to DWS via the electronic Water Use Licence Application and Authorisation System (e-WULAAS) system on 18 May 2018. Please refer to Appendix F for a copy of the acknowledgement from DWS.

2. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations:

Title of legislation, policy or guideline:	Administering authority:	Promulgation Date:
National Environmental Management Act, 1998 (Act No. 107 of 1998 as amended).	Department of Environmental Affairs (DEA) Gauteng Department of Agriculture and Rural Development (GDARD)	27 November 1998
National Water Act, 1998 (Act No. 36 of 1998)	Department of Water and Sanitation (DWS)	20 August 1998
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	South Africa Heritage Resources Agency (SAHRA)	14 April 1999
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Department of Environmental Affairs (DEA) Gauteng Department of Agriculture and Rural Development (GDARD)	7 June 2004
National Spatial Biodiversity Assessment:	Department of Environmental Affairs (DEA) Gauteng Department of Agriculture and Rural Development (GDARD)	2011
National Veld and Forest Fire Act, 1998 (Act No. 1010 of 1998)	Department of Environmental Affairs (DEA) Gauteng Department of Agriculture and Rural Development (GDARD)	27 November 1998
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)	National Department of Labor	23 June 1993
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996): Chapter 2 Section 24	National, Provincial, and Local Authorities	8 May 1996
The Gauteng Conservation Plan Version 3.3 (2011)	Gauteng Department of Agriculture and Rural Development (GDARD)	October 2011
Conservation of Agricultural Resources (Act 43 of 1983)	National Department of Agriculture	21 April 1983
The Gauteng Agriculture Potential Atlas Version 4.4	Gauteng Department of Agriculture and Rural Development (GDARD)	
Gauteng Planning and Development Act,	Gauteng Department of Agriculture and Rural Development (GDARD)	14 October 2003

Title of legislation, policy or guideline:	Administering authority:	Promulgation Date:
2003 (Act No. 3 of 2003)	Development (GDARD)	
Gauteng Environmental Management Framework	Gauteng Province	2015
Ekurhuleni Metropolitan Municipality Integrated Development Plan	Ekurhuleni Metropolitan Municipality	2017/18 to 2020/21
Ekurhuleni Metropolitan Municipality Spatial Development Framework	Ekurhuleni Metropolitan Municipality	April 2015

Description of compliance with the relevant legislation, policy or guideline:

Legislation, policy or guideline	Description of compliance
National Environmental Management Act, 1998 (Act No. 107 of 1998): Environmental Impact Regulation (2014) (NEMA:EIR)	An application for environmental authorisation for the identified Listed Activities in terms of the Environmental Impact Regulation (2014) has been lodged with the Gauteng Department of Agriculture and Rural Development (GDARD). The application will follow a Basic Assessment approach in terms of Section 19 of Government Notice R982 (as amended in March 2017) of NEMA: BAR.
National Water Act, 1996 (Act No. 36 of 1998) (NWA)	Water Use License Application for Section 21 (c) and (i) water use activities will be lodged with both the Department of Water and Sanitation (DWS) Head Office (Gauteng) and the Gauteng Regional Office.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)	The South Africa Heritage Resources Agency will be consulted, and a heritage case will be created in the SAHRIS program for statutory comment in terms of Section 38(8) of the NHRA (1999).
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (OHSA)	The proposed rehabilitation activities will be subject to OHSA during construction/operational phase of the project.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)	Although it is not anticipated, rare or protected species may be affected during construction works. The NEMBA lists flora and fauna species that are threatened and requiring protection to ensure their survival in the wild, while regulating activities which may have a potential negative impact on their long-term survival.
GNR 983, December 2014 Activity 12	The development of (xii) infrastructure or structures with a physical footprint of 100 square metres or more, where such development occurs (a) within a watercourse. The total foot footprint of the low crest weir will be more than 100 m ² .
GNR 983, December 2014: Activity 19 a	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from a watercourse. The construction activities will require that material be deposited into the lake for the weir. It is expected that the material required will be more than 10 m ³ .
GNR 983, December 2014: Activity 25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres. It is expected that the package plant may be required to treat more than 2 000 m ³ of wastewater.
GNR 985, December 2014: Activity 12	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 plan (c) Gauteng (ii) Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans. The area to be cleared for the proposed package plant will be more than 300 m ² .
GNR 985, December 2014: Activity 14	The development of (v)weirs, (xii) infrastructure or structures, all exceeding 10 square metres or more in size (a) within a watercourse or (c) within 32 metres of a watercourse measured from the edge of a watercourse (b) in Gauteng Province(x) sites zoned for conservation or public open spaces or equivalent zoning. The Boksburg Lake is located within an area classified as an Ecological Support Area (ESA) and the weir and package plant will have a footprint of more than 10m ² .

3. ALTERNATIVES

Describe the proposal and alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The determination of whether the site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment.

The no-go option must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. **Do not include the no go option into the alternative table below.**

Note: After receipt of this report the competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Please describe the process followed to reach (decide on) the list of alternatives below

SRK Consulting (South Africa) (Pty) Ltd (SRK) was appointed by the Environmental Resource Management Department of the Ekurhuleni Metropolitan Municipality (EMM) for the compilation of a rehabilitation plan and to conduct the associated environmental authorisation application processes for the Boksburg Lake Rehabilitation Project. Figure 1 provides the location of the Boksburg Lake Rehabilitation Project.

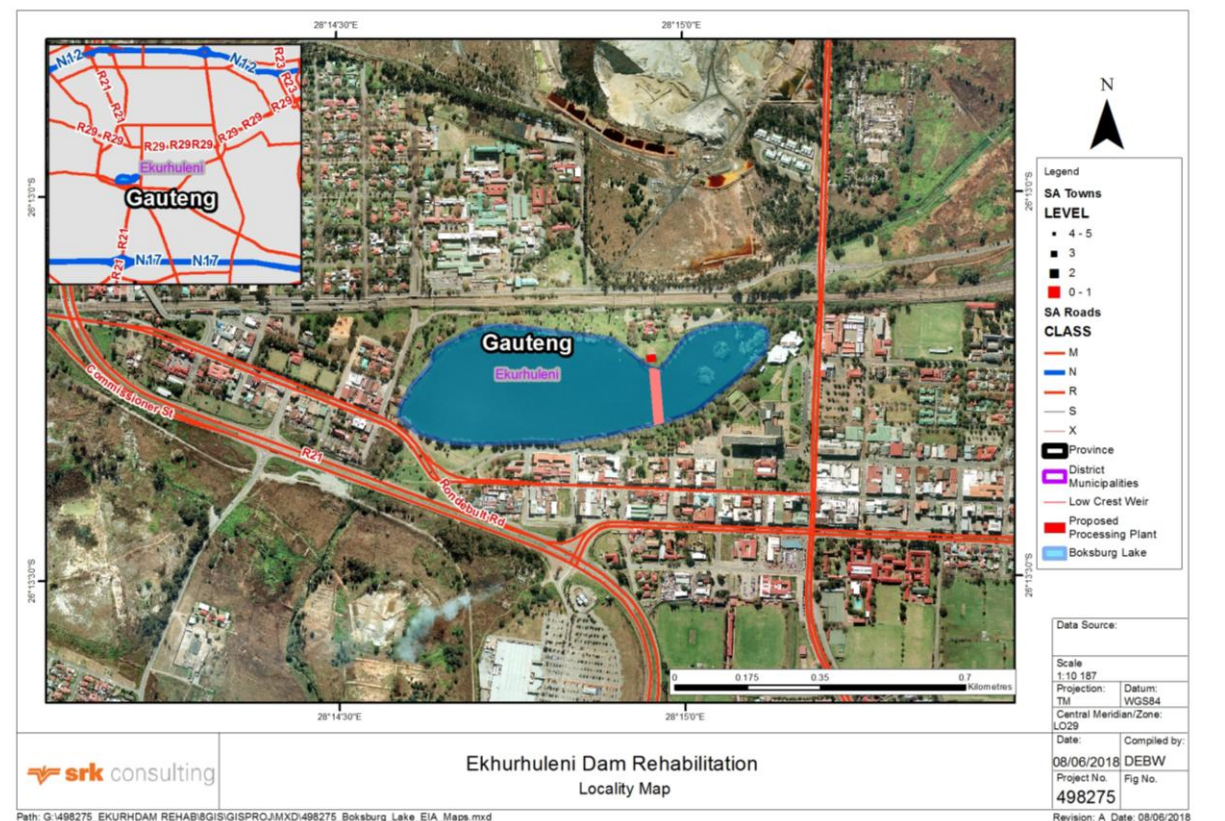


Figure 1: Location of Boksburg Lake

Due to the increased sedimentation as well as the deterioration of the water quality in the Boksburg Lake, it has become necessary to develop a rehabilitation plan for implementation to improve the condition of the lake for use as a public amenity. This process forms part of the Lakes and Dams Flagship programme implemented in the municipality to optimise the use of these amenities by the public.

The siltation and pollution problems of Boksburg Lake are primarily caused by urban sprawls that have affected the lake's original recreational and aesthetic purposes, which are typical of urban impoundments. The water quality study conducted found that the water quality of the lake is impacted upon by the activities in the upstream catchment areas. Therefore, and to meet the EMM Lakes and Dams Flagship programme to optimise the public's use of Boksburg Lake, EMM appointed SRK to undertake studies that would identify the rehabilitation measures that may be implemented to improve the status of the lake. The assessment of the lake was conducted in four phases as follows:

- Site visit and literature review: A site visit was conducted on 6 September 2016 to evaluate the general condition of the Lake and inspect the catchment and major drainage lines flowing into the lake. A review of previous studies conducted on the lake and the catchment area was also conducted.
- Phase 1 -Status Quo Assessment: The status quo assessment included:
 - An assessment of the current sediment size and quality;
 - Sediment and water quality assessment;
 - An assessment of the possible sources of contamination;
 - Hydro-geochemistry conceptual modelling to describe the sequestering (sources and sinks) of the contaminants in the sediments and their interaction with the water column.
 - Soil erosion and sediment transport modelling in the catchment: Sources of silt in the Lake were identified by inspection of the catchment and by using the hydrological model SHETRAN to simulate the rainfall-runoff-

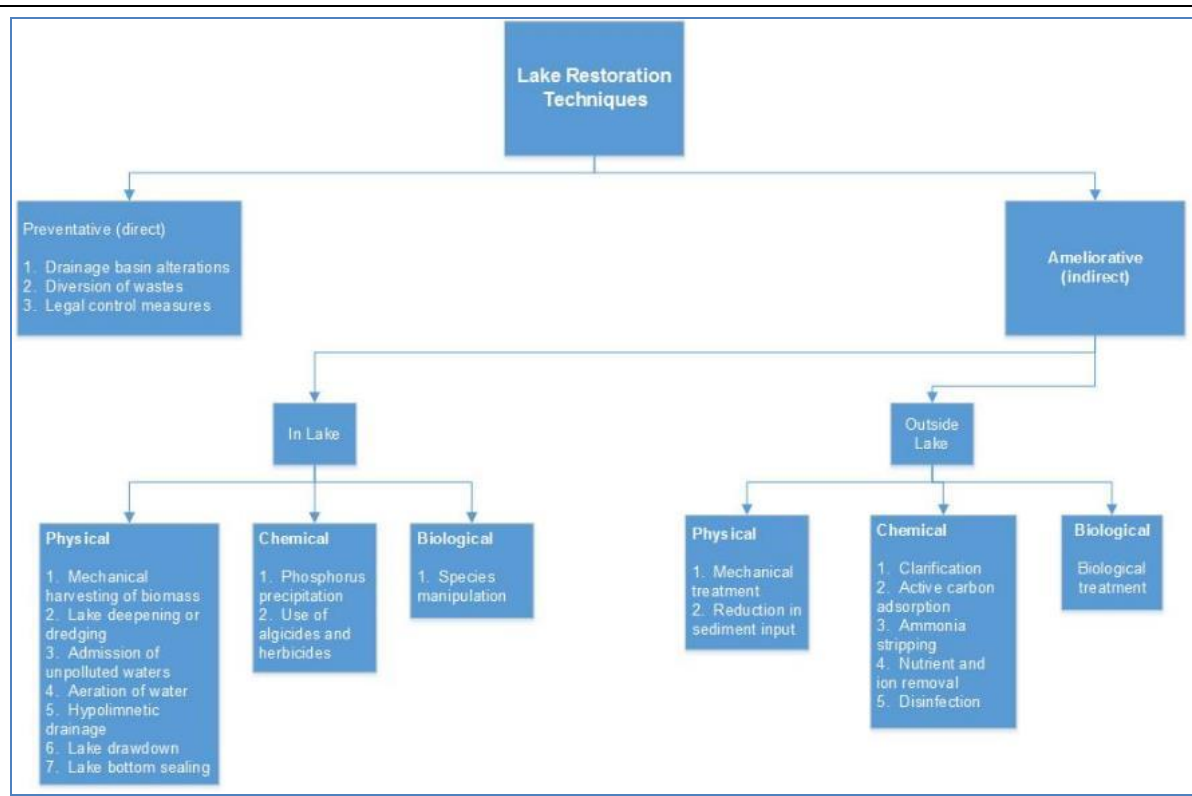
erosion processes. The total sediment yield was validated against a regional sediment yield methodology developed for the SA Water Research Commission (2012).

- Sediment transport modelling: A two-dimensional hydrodynamic model Mike21C of the Danish Hydraulic Institute was used to simulate the sediment transport and deposition processes in the Lake. Cohesive and non-cohesive fractions were also simulated.
- An assessment and description of the aquatic ecology.

The output was a status quo report on the catchment sediment yield and sources of sediment, and on the sediment transport processes in the Lake and physical sediment characteristics in the Lake Sediment analysis and conceptual model as well as a description of the water quality and sources of water pollution and aquatic ecology of the lake.

- Phase 2 - Lake and Catchment Rehabilitation Plan: Remedial measures to limit the sediment yield in the catchment were evaluated. The focus was on the most critical zones in the catchment as identified by SHETRAN during the status quo assessment phase. At the Lake, remedial measures such as dredging of the sediment, sluicing, flushing with water level drawdown, bypassing of sediment and poor water quality through an underwater culvert/conduit along the bank, or a check dam upstream of the Lake were considered. Conceptual hydraulic designs were done for costing of the alternatives. The Lake sediment management scenarios were also evaluated by hydrodynamic modelling of the flow and sediment transport patterns.

An extensive literature research was conducted to gather information on various methods and techniques for lake protection and restoration. The literature contained many discussions on lake water problems and criteria for classifying lakes according to their condition. Lake restoration techniques (Krishan P. Singh, 1982) presented a logical frame work in which to approach Lake restoration which is the approach that has been taken in providing recommendations to EMM.



	Rehabilitation of the Boksburg Lake Lake Restoration Logical Map	Project No. 498275
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Figure 2: Lake Restoration Logical Map

Several in lake ameliorative measures were considered and these were firstly to dredge the sediments, lake drawdown and drainage and then an option which incorporates a process of dilution, aeration hypolimnetic drainage. The output of this phase was a detailed remediation plan/report related to sediment management, which included the cost of each option assessed.

- Phase 3 – Stakeholder Engagement Process: The stakeholder engagement process formed an important and integral part of the project. The stakeholder engagement process was primarily aimed at affording I&APs and stakeholders the opportunity to gain an understanding of the proposed project. In addition, the purpose of consultation with the landowners, key stakeholders, and I&APs was to provide them with the necessary information about the proposed project so that they can make informed decisions as to whether the project will affect them. The stakeholder engagement process included:

Stakeholder identification and database: Relevant stakeholders were identified and a database containing the contact details of each stakeholder or stakeholder representative has been established. The database was updated throughout

the project. The identified stakeholders were as follows:

- o Affected landowners;
- o Adjacent landowners;
- o Affected land occupiers;
- o Provincial Government Departments;
- o Ward Councilors;
- o Greater Boksburg Chamber of Commerce and Industry;
- o Other Organs of State and Parastatals;
- o Media (The Citizen Newspaper); and
- o Community Forums.

Focus Group Meetings: Key stakeholder meetings to discuss the proposed project options and the preferred option were undertaken as summarised in Table 2.

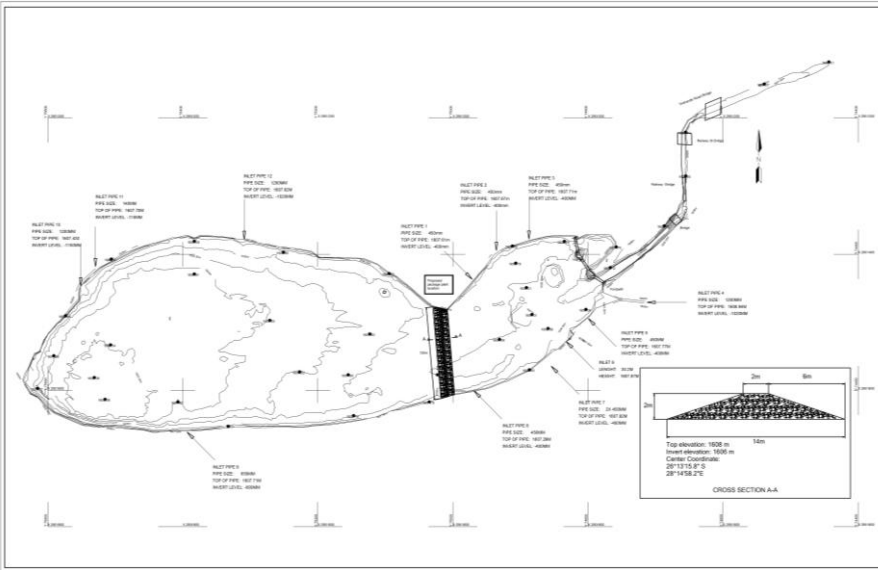
Table 1: Key Stakeholder Meetings conducted

Stakeholder Engagement Phase 2 – Focus Group Discussions		
Stakeholder Group	Sector Attendees/ Invitees	Date
Kliprivier Forum	Department Water Affairs COJ Environmental Sustainability and Resilience Rand Water Department of Agriculture and Rural Development Ekurhuleni Roads and Stormwater Ekurhuleni Parks Department	1 November 2016
	Transnet Ward Councillor	2 August 2017
Representative Adjacent Landowners and Occupiers	Adjacent Landowners and occupiers to the lake	29 June 2017
Business, Commerce and Forums	Boksburg Tourism Association Rotary Club Boksburg Lake Boksburg North CPF DRD Gold	29 June 2017
Ekurhuleni Roads and Stormwater Department	Ekurhuleni Department of Roads and Stormwater	8 September 2017
Ekurhuleni Parks Department	Ekurhuleni Parks Department	19 June 2017
Ward Councillors	Councillor De Vos and Councillor Jill Humphreys	7 August 2017

Public Meeting: A public meeting to discuss the project was organized for 19 June 2018 at the Boksburg Civic Centre. The meeting was however postponed accommodating more people who wanted to be present. The meeting was eventually cancelled due to safety concerns.

It must be noted that the stakeholder engagement process will continue during the applications for an EA and Water Use Licence as stipulated in Chapter 6 of the NEMA.

Provide a description of the alternatives considered

No	Alternative type, either alternative: site on property, properties, activity, design, technology, energy, operational or other (provide details of "other")	Description
1	Proposal	<p>Low Crest Weir, Wastewater Treatment Package Plant and Aeration</p> <p>The preferred solution to address the immediate need to restore the water quality of the Boksburg Lake so that it can be used by the public, is to facilitate the natural processes. The critical problem with the Boksburg Lake is the constant inflow of Suspended Solids (SS) and nutrients from the sewerage leaking into the municipal storm water system that drains into the lake.</p> <p>Specific strategies to address a lake's nutrient enrichment problems must focus on activities in the watershed and in-lake restoration techniques. However, strategies to address the nutrients emanating from the watershed is a medium to long term process before results will be seen and do not address the immediate EMM Lakes and Dams Flagship programme requirements so in lake interventions are required.</p> <p>Lakes and bodies of water have a certain amount of pollution they can handle without human intervention, however if the pollution inflows into the lake exceed the amount that the natural processes of the lake can handle this then leads to cultural eutrophication and the anaerobic conditions that now prevail in the lake.</p> <p>Due to the dynamic interaction of lake chemistry, plants, microbes and how they will respond to this intervention it is recommended a staggered approach be taken. Once the Dissolved Oxygen (DO) levels are raised and the aerobic conditions are restored and maintained that the natural process will be able to cope with the high SS levels negating any further interventions.</p> <p>The transfer of oxygen from the atmosphere to the top layer of the lake ensures a surface layer of varying depth which keeps nature in equilibrium. Urbanisation drastically increases pollutants into the lakes thus exceeding the capacity the water body can handle on its own and turning the oxidative layer into anaerobic conditions. Aerators have proven that they increase the ability of lakes to survive pollution, increased nutrient levels and eutrophication. By providing sub surface aeration with directional mixing, the water moves in a circular pattern around the entire lake, breaks up stratification and increases in DO levels, the aerators assist nature in returning a healthy state of aerobic equilibrium. The first step in the restoration will be to install four 45 kW aerators into the lake and then to monitor the results. With the aeration of the water and improved DO content, aerobic conditions will return which in turn will enable the digestion of the SS. It is possible that only this intervention could restore the lake, however if the SS levels and nutrient loadings are not resolved with aerators the next step would be to filter out the SS.</p> <p>The removal of the SS will require the construction of a low crest weir and the establishment of a filtration plant as shown in Figure 3.</p>  <p>Figure 3: Low crest rock fall weir and Package Plant</p> <p>The purpose of the low crest weir is to contain the sewage laden inflows from the main storm water pipes into a holding area separate from the main body of the lake without creating impoundment that would cause water during a storm event to back up and exacerbate the flooding that is experienced under the railway bridge on Trichardt's Street.</p>

		<p>The low crest weir will span the “narrows” between Latitude -26.220416°; Longitude 28.249346° and Latitude -26.221608°; Longitude 28.249553°. The depth of the lake at this point is up to 2m deep. The weir is to be constructed from hand sized stone crushed rock of a sound stable lithology. The side slope of the rockfill is to be at an angle of 1v:3h and the crest is to be 2m wide. The rock is to be nominally compacted so that the crest is on the mean average water level of the lake of elevation 1 608m.</p> <p>From this holding area water laden with SS will be processed through a filter plant that will remove the SS and filtered water will run into the main body of the lake. The SS that are filtered out will then be removed to a waste disposal facility. The most suitable filtration plant identified is the Dynadisc plant. This plant has a small footprint and minimal establishment requirements.</p>
2	Alternative 1	<p>Dredging</p> <p>Dredging is always the default solution considered for lake restoration and extensive considerations were given to this option. This intervention is not a preferred solution for the following reasons:</p> <ul style="list-style-type: none"> • Required working area; • Legislative permit requirements; • Disposal of sediments; and • The intervention does not address the cause. <p>The deepening of the lake by dredging is not essential to enhance the public use of Boksburg lake. With its current depths it can be utilised for recreational purposes of paddle boats and fishing.</p> <p>Required working area: The establishment required for a dredging operation is extensive and within a built-up area there are many constraints as in this case where Boksburg Lake is found in the Boksburg CBD. The associated pipelines and pumping station and areas required for dewatering the sediments not only take up space, but the sediments are very fine which will create dusty conditions and when exposed to the atmosphere release unpleasant odours which are not desirable in a built-up area.</p> <p>Legislative permit requirements: Dredging operations and activities within a watercourse and lake basin will trigger activities listed in terms of Listing Notices 1 and 3 of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and will require an Environmental Authorisation from the Gauteng Department of Agriculture and Rural Development (GDARD). According to Section 21 (c) and (i) of the National Water Act, 1998 (Act 36 of 1998) (NWA), any activity that occurs within 100 m of a water course is regarded a water use and will require a water use authorisation from the Department of Water and Sanitation (DWS). In addition, once excavated from the lake, the sediments will be considered hazardous waste and a waste management license would be required.</p> <p>Disposal of sediments: An estimated 60 000m³ of de-watered sediments would be excavated from the lake. Several options were considered for the treatment of the sediments so that they could be used but the cost thereof is prohibitive and rendering them inert is not conclusive. If the sediments were to be disposed of to a licensed hazardous waste facility they would have to be transported in closed contained vehicles and the cost of disposal is prohibitive.</p> <p>The intervention does not address the cause: Dredging the lake does not address the cause of its current condition. If the sediments were to be removed, in several years the process will have to be repeated and it will not improve the water quality. The poor water quality of the lake is because of the high Chemical Oxygen Demand (COD), low Dissolved Oxygen (DO) levels and the high Suspended Solids (SS) which originate from the sewerage that enters the municipal storm water system that drains into the lake.</p>
3	Alternative 2	<p>Lake Drawdown and Drainage</p> <p>One consideration was to draw the lake down and empty it turning the basin into a park area. This option was rejected for several reasons as follows:</p> <ul style="list-style-type: none"> • Boksburg Lake has been in existence since the 1890's and has been iconic landmark in the history of Boksburg and is therefore considered important from a historical and heritage resource point of view. • From the informal discussion with the DWS and Klip River Catchment forum they would not support the option of channelizing the lake from experience with other channelized rivers. • One of the functions of the Boksburg Lake is that it forms a storm water attenuation function during storm events and by draining it this function will be lost causing flooding downstream. • Downstream of the Boksburg Lake is the Cinderella Lake. If Boksburg lake was to be drained all the inflows that currently enter Boksburg lake would go directly into Cinderella Dam and in effect the problems being experienced in Boksburg Lake would just be transferred downstream.
	Etc.	

In the event that no alternative(s) has/have been provided, a motivation must be included in the table below.

N/A

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the total physical size (footprint) of the proposal as well as alternatives. Footprints are to include all new infrastructure (roads, services etc), impermeable surfaces and landscaped areas:

Proposed activity (**Total environmental (landscaping, parking, etc.) and the building footprint**)

Size of the activity:
18.283289 ha (includes Lake area of 17.9671 ha)

Alternatives:

Alternative 1 (if any)
Alternative 2 (if any)

17.9671 ha
17.9671 ha
Ha

or, for linear activities:

Proposed activity

Length of the activity:
N/A

Alternatives:

Alternative 1 (if any)
Alternative 2 (if any)

N/A
N/A
km

Indicate the size of the site(s) or servitudes (within which the above footprints will occur):

Proposed activity

Size of the site/servitude:
29.251991

Alternatives:

Alternative 1 (if any)
Alternative 2 (if any)

29.251991
29.251991
Ha

5. SITE ACCESS

Proposal

Does ready access to the site exist, or is access directly from an existing road?

YES
X
m

If NO, what is the distance over which a new access road will be built

Describe the type of access road planned:

N/A

Include the position of the access road on the site plan (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

Alternative 1

Does ready access to the site exist, or is access directly from an existing road?

YES
X
m

If NO, what is the distance over which a new access road will be built

Describe the type of access road planned:

N/A

Include the position of the access road on the site plan. (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

Alternative 2

Does ready access to the site exist, or is access directly from an existing road?

YES
X
m

If NO, what is the distance over which a new access road will be built

Describe the type of access road planned:

N/A

Include the position of the access road on the site plan. (if the access road is to traverse a sensitive feature the impact thereof must be included in the assessment).

PLEASE NOTE: Points 6 to 8 of Section A must be duplicated where relevant for alternatives

Section A 6-8 has been duplicated

Number of times

(only complete when applicable)

6. LAYOUT OR ROUTE PLAN

A detailed site or route (for linear activities) plan(s) must be prepared for each alternative site or alternative activity. It must be attached to this document. The site or route plans must indicate the following:

- the layout plan is printed in colour and is overlaid with a sensitivity map (if applicable);
- layout plan is of acceptable paper size and scale, e.g.
 - A4 size for activities with development footprint of 10sqm to 5 hectares;

- A3 size for activities with development footprint of > 5 hectares to 20 hectares;
 - A2 size for activities with development footprint of >20 hectares to 50 hectares);
 - A1 size for activities with development footprint of >50 hectares);
- The following should serve as a guide for scale issues on the layout plan:
 - A0 = 1: 500
 - A1 = 1: 1000
 - A2 = 1: 2000
 - A3 = 1: 4000
 - A4 = 1: 8000 (±10 000)
 - shapefiles of the activity must be included in the electronic submission on the CD's;
 - the property boundaries and Surveyor General numbers of all the properties within 50m of the site;
 - the exact position of each element of the activity as well as any other structures on the site;
 - the position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, sewage pipelines, septic tanks, storm water infrastructure;
 - servitudes indicating the purpose of the servitude;
 - sensitive environmental elements on and within 100m of the site or sites (including the relevant buffers as prescribed by the competent authority) including (but not limited thereto):
 - Rivers and wetlands;
 - the 1:100 and 1:50 year flood line;
 - ridges;
 - cultural and historical features;
 - areas with indigenous vegetation (even if it is degraded or infested with alien species);
 - Where a watercourse is located on the site at least one cross section of the water course must be included (to allow the position of the relevant buffer from the bank to be clearly indicated)

FOR LOCALITY MAP (NOTE THIS IS ALSO INCLUDED IN THE APPLICATION FORM REQUIREMENTS)

- the scale of locality map must be at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map;
- the locality map and all other maps must be in colour;
- locality map must show property boundaries and numbers within 100m of the site, and for poultry and/or piggery, locality map must show properties within 500m and prevailing or predominant wind direction;
- for gentle slopes the 1m contour intervals must be indicated on the map and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the map;
- areas with indigenous vegetation (even if it is degraded or infested with alien species);
- locality map must show exact position of development site or sites;
- locality map showing and identifying (if possible) public and access roads; and
- the current land use as well as the land use zoning of each of the properties adjoining the site or sites.

7. SITE PHOTOGRAPHS

Colour photographs from the center of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under the appropriate Appendix. It should be supplemented with additional photographs of relevant features on the site, where applicable.

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of 1:200 for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity to be attached in the appropriate Appendix.

SECTION B: DESCRIPTION OF RECEIVING ENVIRONMENT

Note: Complete Section B for the proposal and alternative(s) (if necessary)

Instructions for completion of Section B for linear activities

- 1) For linear activities (pipelines etc) it may be necessary to complete Section B for each section of the site that has a significantly different environment.
- 2) Indicate on a plan(s) the different environments identified
- 3) Complete Section B for each of the above areas identified
- 4) Attach to this form in a chronological order
- 5) Each copy of Section B must clearly indicate the corresponding sections of the route at the top of the next page.

Section B has been duplicated for sections of the route times

Instructions for completion of Section B for location/route alternatives

- 1) For each location/route alternative identified the entire Section B needs to be completed
- 2) Each alternative location/route needs to be clearly indicated at the top of the next page
- 3) Attach the above documents in a chronological order

Section B has been duplicated for location/route alternatives times (Complete only when appropriate)

Instructions for completion of Section B when both location/route alternatives and linear activities are applicable for the application

Section B is to be completed and attachments order in the following way

- All significantly different environments identified for Alternative 1 is to be completed and attached in a chronological order; then
- All significantly different environments identified for Alternative 2 is to be completed and attached chronological order, etc.

Section B - Section of Route (complete only when appropriate for above)

Section B – Location/route Alternative No. (complete only when appropriate for above)

1. PROPERTY DESCRIPTION

Property description:
(Including Physical Address and Farm name, portion etc.)

Boksburg Lake, Erf 1599, Boksburg

2. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in decimal degrees. The degrees should have at least six decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

Alternative:

Preferred Alternative

Latitude (S):

Longitude (E):

Low Crest Weir: 26.220972°	Low Crest Weir: 28.249348°
Package Plant: 26.220238 °	Package Plant: 28.249218°
Lake: 26.220972°	Lake: 28.246441°
26.220972°	28.246441°
26.220972°	28.246441°

Alternative 1

Alternative 2

In the case of linear activities:

Alternative:

- Starting point of the activity
- Middle point of the activity
- End point of the activity

Latitude (S):

Longitude (E):

N/A	N/A
N/A	N/A
N/A	N/A

For route alternatives that are longer than 500m, please provide co-ordinates taken every 250 meters along the route and attached in the appropriate Appendix

Addendum of route alternatives attached

N/A

The 21 digit Surveyor General code of each cadastral land parcel

PROPOSAL	T	0	I	R	0	0	7	5	0	0	0	1	5	9	9	0	0	0	0	0
ALT. 1	T	0	I	R	0	0	7	5	0	0	0	1	5	9	9	0	0	0	0	0
ALT. 2	T	0	I	R	0	0	7	5	0	0	0	1	5	9	9	0	0	0	0	0
etc.																				

3. GRADIENT OF THE SITE

Indicate the general gradient of the site.

1:50 – 1:20
X

4. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site.

Plain
X

5. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

a) Is the site located on any of the following?

- Shallow water table (less than 1.5m deep)
- Dolomite, sinkhole or doline areas
- Seasonally wet soils (often close to water bodies)
- Unstable rocky slopes or steep slopes with loose soil
- Dispersive soils (soils that dissolve in water)
- Soils with high clay content (clay fraction more than 40%)
- Any other unstable soil or geological feature
- An area sensitive to erosion

	NO X
YES	NO X
YES X	NO
	NO X
	NO X
YES	NO X
YES	NO X
	NO X

(Information in respect of the above will often be available at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by Geological Survey may also be used).

b) are any caves located on the site(s)

NO
X

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S): Longitude (E):

c) are any caves located within a 300m radius of the site(s)

NO
X

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S): Longitude (E):

d) are any sinkholes located within a 300m radius of the site(s)

NO
X

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S): Longitude (E):

If any of the answers to the above are "YES" or "unsure", specialist input may be requested by the Department

6. AGRICULTURE

Does the site have high potential agriculture as contemplated in the Gauteng Agricultural Potential Atlas (GAPA 4)?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

According to the GAPA 4, the areas surrounding the lake have a high agriculture potential. However, it must be noted that the area is mostly built up, with landscaped lawns surrounding the lake (residential) (Figure 4).

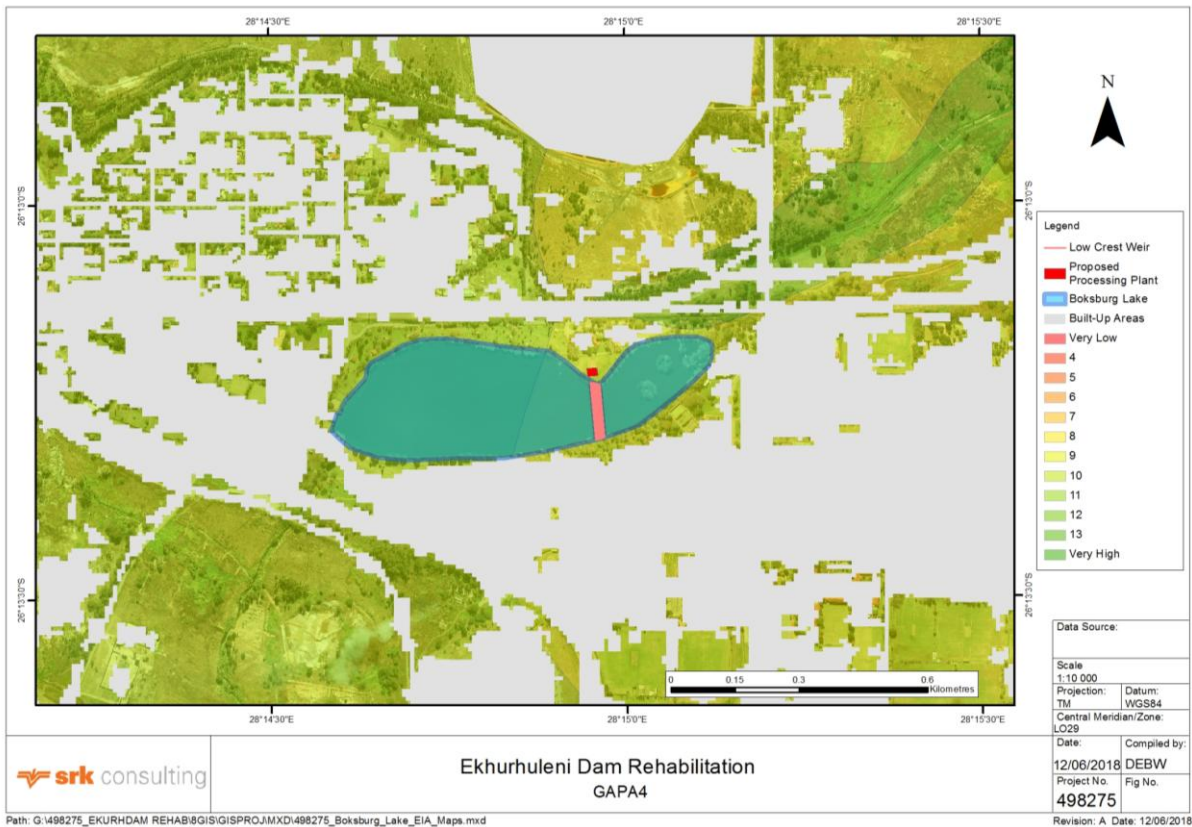


Figure 4: GAPA 4 Map

Please note: The Department may request specialist input/studies in respect of the above.

7. GROUNDCOVER

To be noted that the location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Indicate the types of groundcover present on the site and include the estimated percentage found on site

Natural veld - good condition % = 0	Natural veld with scattered aliens % = 0	Natural veld with heavy alien infestation % = 0	Veld dominated by alien species % = 0	Landscaped (vegetation) % = 79.91
Sport field % = 0	Cultivated land % = 0	Paved surface (hard landscaping) % = 13.45	Building or other structure % = 2.71	Bare soil % = 3.92

Please note: The Department may request specialist input/studies depending on the nature of the groundcover and potential impact(s) of the proposed activity/ies.

Are there any rare or endangered flora or fauna species (including red list species) present on the site

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If YES, specify and explain:

N/A

Are there any rare or endangered flora or fauna species (including red list species) present within a 200m (if within urban area as defined in the Regulations) or within 600m (if outside the urban area as defined in the Regulations) radius of the site.

YES	NO X
-----	---------

If YES, specify and explain:

N/A

Are there any special or sensitive habitats or other natural features present on the site?

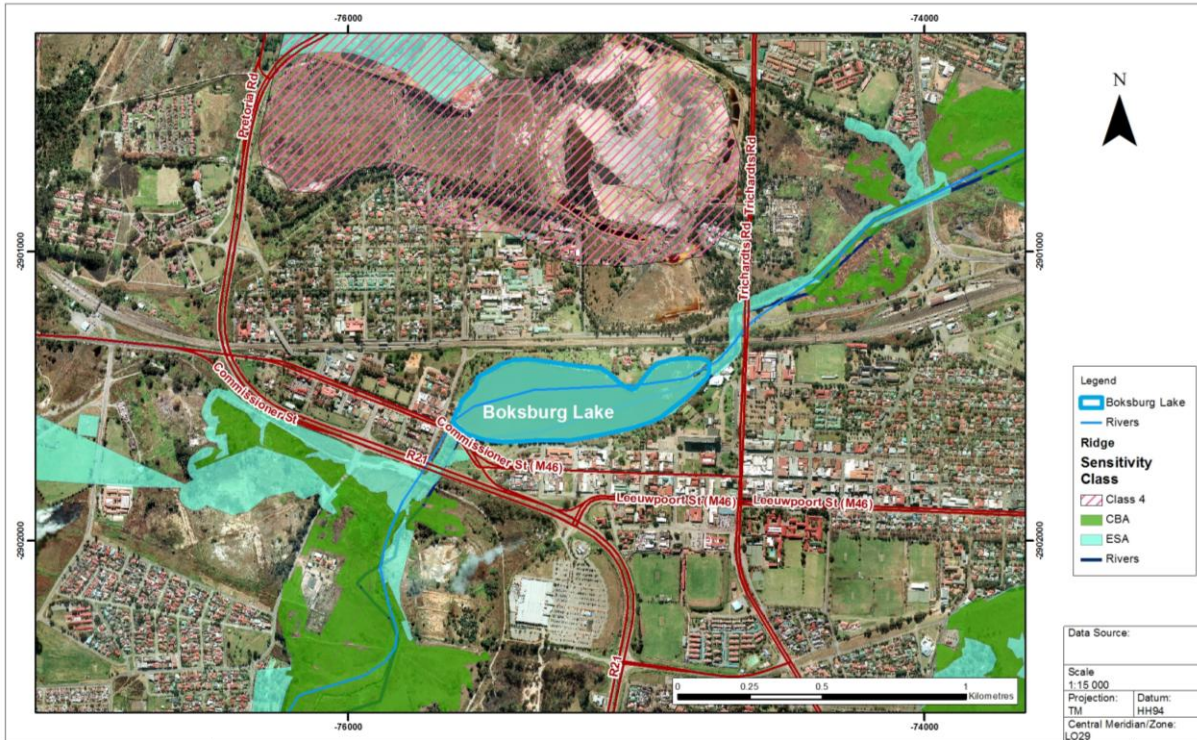
YES X	
----------	--

If YES, specify and explain:

Sensitive Landscapes

According to the Gauteng Conservation Plan (C Plan), the Boksburg Lake is considered an Ecological Support Area (ESA) as shown in (Figure 5). There is also a Class 4 Ridge located to the North of the lake.

Class 4 ridges include ridges of which 65% or more of their surface area has been converted to urban development, quarries and/or alien vegetation.



	<p>Ekhurhuleni Dam Rehabilitation CBA , ESA , Protected areas , Ridges</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">Data Source:</td></tr> <tr><td>Scale</td><td>1:15 000</td></tr> <tr><td>Projection:</td><td>TM</td></tr> <tr><td>Datum:</td><td>HH94</td></tr> <tr><td>Central Meridian/Zone:</td><td>LC29</td></tr> <tr><td>Date:</td><td>06/06/2018</td></tr> <tr><td>Compiled by:</td><td>DEBW</td></tr> <tr><td>Project No:</td><td>498275</td></tr> <tr><td>Fig No:</td><td></td></tr> <tr><td>Revision:</td><td>A Date: 06/06/2018</td></tr> </table>	Data Source:		Scale	1:15 000	Projection:	TM	Datum:	HH94	Central Meridian/Zone:	LC29	Date:	06/06/2018	Compiled by:	DEBW	Project No:	498275	Fig No:		Revision:	A Date: 06/06/2018
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Figure 5: Gauteng Conservation Plan

Vegetation

The study site is situated in the Grassland Biome and more specifically within the Dry Highveld Grassland Bioregion as defined by Mucina & Rutherford (2006). The study site comprehends one ecological type, namely the Kliprivier Highveld Grassland. According the SANBI threatened ecosystems report (2009), the Kliprivier Grassland ecosystem contains 25 threatened or endemic plant and animal species and is classified as critical. The ecosystem contains key biodiversity features including Red or Orange Listed plants for example *Cineraria longipes*, *Delosperma purpureum*, *Delosperma leendertziae*, and *Trachyandra erythrorrhiza*; Red or Orange Listed birds for example African Marsh-Harrier, African Grass-Owl, Greater Flamingo, and Melodious Lark; Red or Orange Listed or priority invertebrates for example the Roodepoort Copper Butterfly, Marsh sylph, *Orachrysops mijburghii*, and Golden Starburst Baboon Spider; and six vegetation types including Andesite Mountain Bushveld, Carletonville Dolomite Grassland, Eastern Temperate Freshwater Wetlands, Gauteng Shale Mountain Bushveld, Soweto Highveld Grassland and Tsakane Clay Grassland. Several rivers, wetlands and pans are key features in the ecosystem including the Angelo Pan, Blesboklaagte, Bloubospruit, Elsburgspruit, Hugenote Spruit, Kliprivier, Natalspruit, Rietspruit, Withokspruit, and various other unnamed wetlands and pans.

It must however be noted that the Boksburg Lake is situated in an urban area, where the grassland ecosystem has been severely altered. The area around the lake comprises of landscaped open space and built up areas.

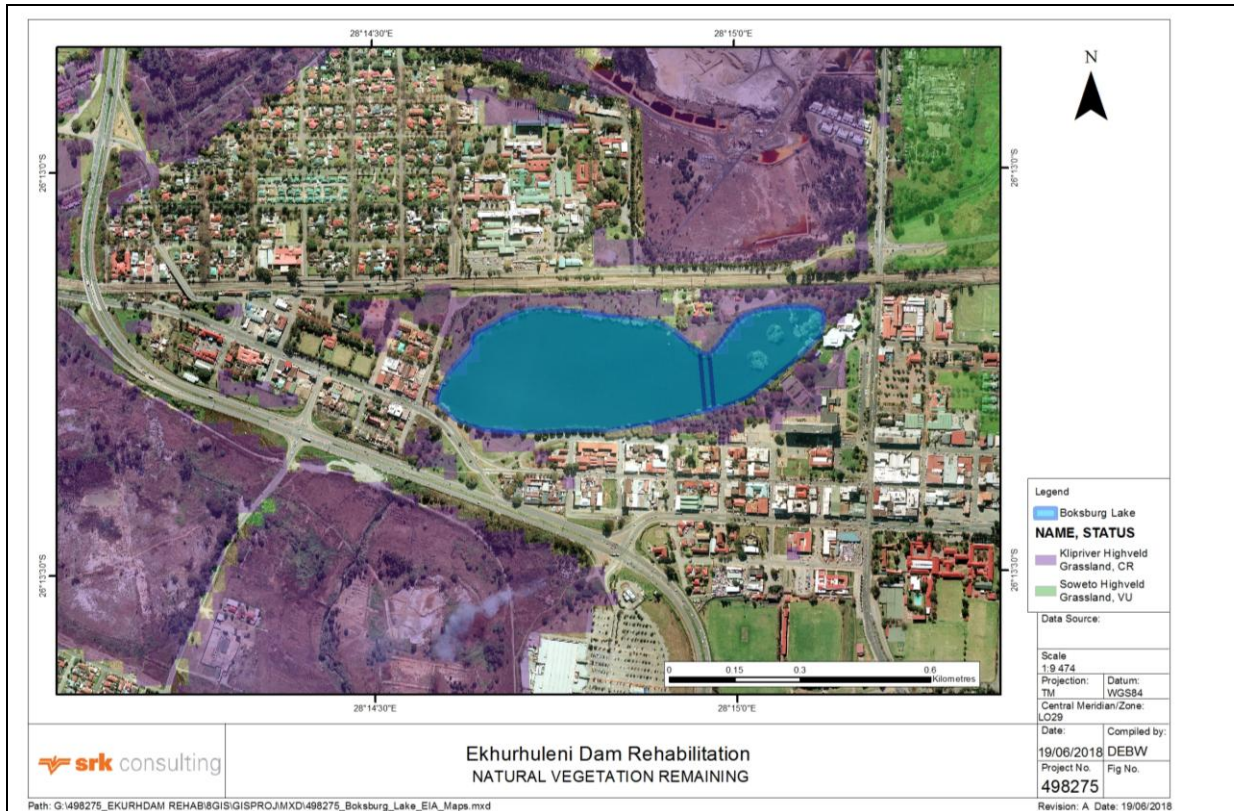


Figure 6: Remaining Natural Vegetation

Wetlands

According to the SANBI National Wetlands database, there is a wetland associated with the Boksburg Lake (Figure 7).

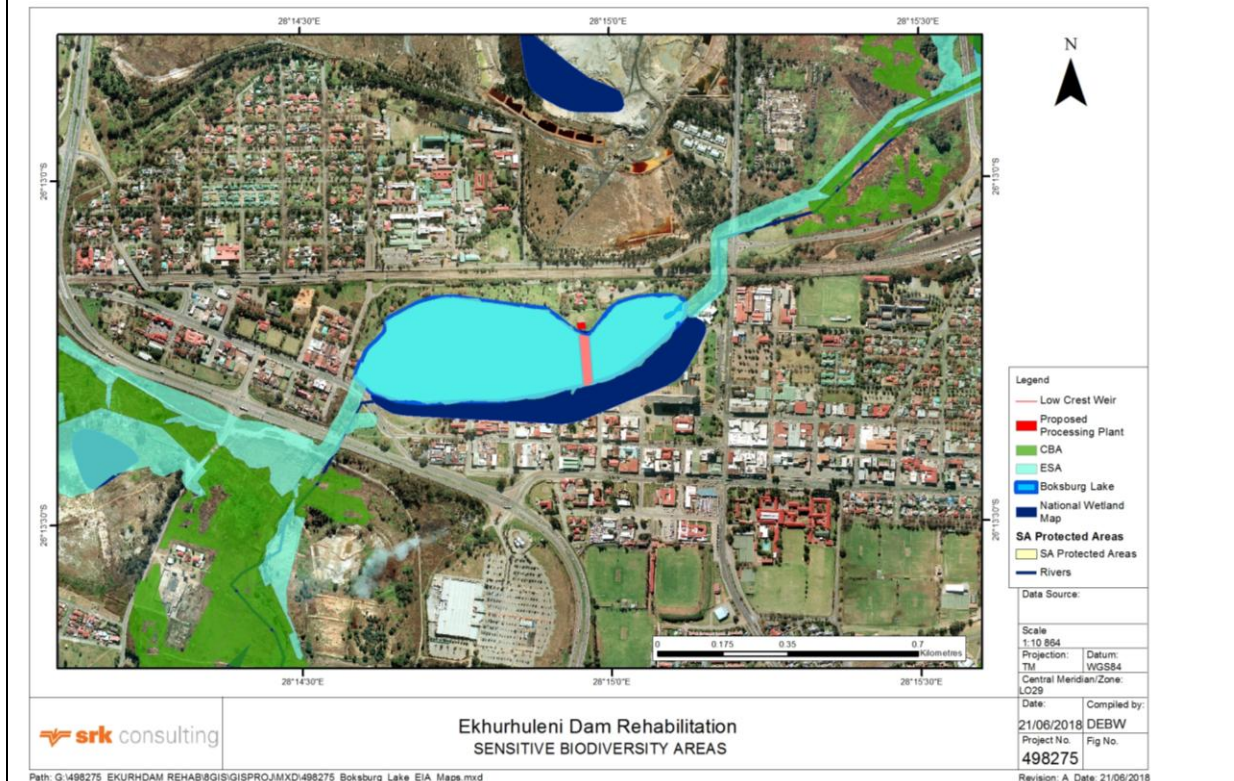


Figure 7: SANBI Wetlands

The Boksburg Lake itself is considered a sensitive habitat. An aquatic ecological assessment was conducted for the project. The assessment confirmed that there is a wetland associated with the Boksburg Lake. According to the study, the Boksburg Lake was created through the impoundment of the original Channeled Valley Bottom Wetland and even though the Boksburg Lake is considered an artificial impoundment, it is still considered to be an ecologically functional watercourse.

The wetland identified is characterised as an Inland System falling within the Moist Cool Highveld Grassland and the Mesic Highveld Grassland Group 3 (Critically Endangered), wetland vegetation type. The results of the wetland system characterisation are summarised in the Table 2

Table 2: Classification of the wetland system located within the study area

Wetland	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit
Channeled Valley Bottom Wetland	Valley floor: The typically gently sloping, lowest surface of a valley	Channeled valley bottom wetland: A valley bottom wetland with a river channel running through it.

The channeled valley bottom freshwater feature stretches from the west to the east over the study area. Water from the freshwater wetland feature (lake) is channeled beneath Commissioner Street and Rondebult road via an artificial culvert and connects to the greater watercourse further downstream.

Of note: is that most of this wetland feature has been artificially altered – with the historical impoundment, and subsequent permanent submergence of the wetland areas associated with the original watercourse (an unnamed tributary of the Elsburgspruit). Additionally, large portions of the wetland have been historically landscaped, e.g., the development of a large public auditorium/entertainment space on the northern boundary of the Boksburg Lake. Further, the spaces surrounding the lake have been modified for public access and use, especially as a recreational area for children, as evidenced by the presence of a number of playground structures. Other modifications include manicured lawns (*Pennisetum clandestinum*) and the presence of large amounts of solid waste/trash originating from the substantial anthropogenic influence of the surrounding landscape. It is also important to note that the urban environment surrounding the wetland feature is expected to have significant impacts on it, given the ease of access from public roads and presence of paths for foot traffic within a few meters of the southern bank of the lake.

The delineated wetland features were classified as follows:

- **Feature HGM Unit Description:** Channeled Valley Bottom
- **Watercourse characteristics:**
 - **Hydraulic regime:** The hydraulic regime of this feature has been severely altered as a result of the impoundment of this feature and the subsequent permanent inundation of the entire wetland. Furthermore, the surrounding area is densely urbanised and has seen significant impacts from high-density residential developments and effluent-based industries, cumulatively affecting the quality and discharge (because of catchment hardening) of stormwater into freshwater resources in the area. Flow within the HGM unit has also increased significantly given the formation of the dammed impoundment. Minor swales are present on the northern side of the lake, which may reduce and redistribute overland flow of water into the wetland (lake). Furthermore, flow of runoff has also been altered given the reduced roughness of the HGM unit.
 - **Water quality:** At the time of the assessment, the water quality was visibly poor, with influxes of sewage and organic debris of anthropogenic origin. Inputs from surrounding industry are likely to have contributed substantially to the toxicant load present within the water body. The waterbody also emits a foul odour, which is likely Sulphur based and not of “natural” origin, i.e., the result of industrial effluent from upstream industry. The electrical conductivity (EC) of the water was highest at the inlet, decreasing by ~50% towards the outlet. This decrease in EC suggests that the lake has a high dilution and settling capacity.
 - **Geomorphology and sediment balance:** Impacts on the geomorphology of the wetland are severe considering the permanent inundation of the system following damming. The inlet of the lake appears to undergo substantial erosion, despite the placement of Loffelstein walls around the bridge which traverses the inlet. Existing Loffelstein walls are currently collapsing as they have become saturated by sediment. This shows that a high degree of sediment is entering via the inlet, prompting appropriate mitigation measures. The lake also appears to receive regular inputs of coarse organic matter in the form of grass trimmings as surrounding banks are highly landscaped. With all the above considerations it is evident that relative to the reference state, the geomorphology and sediment balance of the wetland within the study area has been altered significantly. Consideration must also be given to the fact that because of the alterations, the level of ecoservices provided by the wetland (and flood attenuation specifically) has increased, despite the dramatic change of this unit from its reference state. Thus, the overall sediment balance has significantly increased.
 - **Habitat and biota:** The inundation of the wetland unit from its reference state is by and large the most significant impact to the composition of wetland vegetation, followed by the invasion of alien vegetation and erosion (albeit only to a small degree at the lake inlet). The replacement of natural, with alien vegetation has had a significant impact on faunal communities. The lake is not home to any unique, or red data species, primarily due to the limited diversity of habitats present, where the watercourse is limited primarily to the extent of the lake itself. This suggests a limited ecological integrity. Several bird species were recorded during the site visit; however, these birds are considered resilient to poor ecosystem health and were also only seen in low numbers. Species included; *Alopochen aegyptiaca*, *Fulica cristata*, *Gallinula chloropus*, *Euplectes orix*, *Ardea cinerea*, and *Ploceus velatus*.
- **PES Category: F (Critically Modified)** The degree to which the hydrology, geomorphology and hydraulic regime modules have been critically modified, paired with the location of the wetland in an urban environment and consequent impacts on water quality, have significantly decreased the ecological integrity of this feature. Ecosystem processes have been almost completely modified and is accompanied by an almost complete loss of natural habitat and biota.
- **Ecoservice Provision: Intermediate:** The construction of the lake within the wetland feature has increased the attenuation of flood and stormwater therein, marginally heightening its ability to trap sediment, assimilate phosphates, nitrates and toxicants as well as control erosion. Flood attenuation, followed by toxicant assimilation are considered the primary services of this wetland, albeit at a low degree. Provision of water is low given the quality of the water within the feature. The surrounding vegetation, despite being predominantly alien (>50%) contributes marginally to carbon storage.

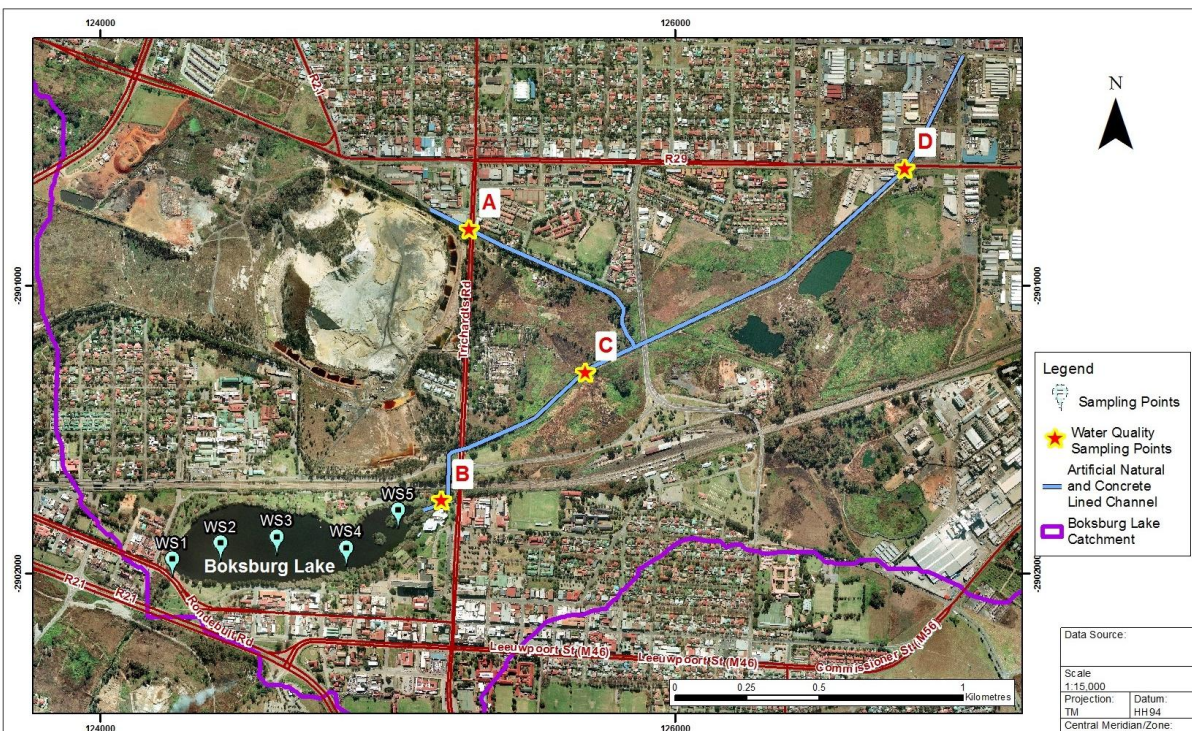
- EIS Category: C: Low/Marginal:** No rare species or species of conservation concern were identified on site, and the biodiversity was low, with a high proportion of alien invasive species. The presence of the lake results in a mentionable hydro-functional importance. Given the location of the wetland, there was a significant presence of direct human impact, which contributes to the critically low score achieved following the assessment. The feature is also not currently receiving a significant degree of protection and is only slightly important from a conservation perspective, given its designation as an Ecological Support Area (ESA) connecting other wetland units across the landscape.
- Recommended Ecological Category: D (Largely Modified)** This freshwater feature has undergone modifications resulting in significantly decreased ecological integrity, and therefore efforts should be made to ensure it does not deteriorate further.

Water Quality Assessment

Samples were collected from the 5 sampling points within the Boksburg lake and 4 additional samples from around the catchment area. The sampling areas were selected based on the potential sources of pollution, with one sample collected from a canal that collects water coming from the industrial areas (sampling point D), one from residential (sampling point A), one where the two canals converge (sampling Point C) and one point at the lake inlet (sampling point B). Two samples were collected at each sampling point in the lake, at near bed (B) and water surface (T). **Error! Reference source not found.** provides a summary and description of the sampling points and Figure 8 provides the locality map of the sampling points.

Table 3: Water quality sampling points around the Boksburg lake catchment

Name	Street Name/Position	Long (DMS)	Lat (DMS)
A	Trichardt street	28°15'12.74"E	26°12'39.18"S
C	Downstream of Campbell Rd bridge	28°15'27.45"E	26°12'55.23"S
B	Montagu White Drive	28°15'9.64"E	26°13'9.88"S
D	Main Reef Road	28°16'7.18"E	26°12'31.84"S
WS 1	Boksburg lake	28°14'36.01"E	26°13'17.45"S
WS 2	Boksburg lake	28°14'42.01"E	26°13'15.58"S
WS 3	Boksburg lake	28°14'49.10"E	26°13'14.80"S
WS 4	Boksburg lake	28°14'57.80"E </td <td>26°13'15.99"S</td>	26°13'15.99"S
WS 5	Boksburg lake	28°15'4.20"E	26°13'11.68"S



Ekhurhuleni Dam Rehabilitation
Water Quality Sampling Points

Data Source:
Scale: 1:15,000
Projection: TM Datum: HH94
Central Meridian/Zone: L029
Date: 10/12/2016 Compiled by: PAUJ
Project No: 498275 Fig No: 4.1
Revision: A Date: 10/12/2016

Figure 8: Water Quality Sampling Points
The water quality assessment found that:

- The water quality in the catchment is generally of good quality when assessed against the Klip River RWQOs with respect to inorganic parameters. The bacteriological parameters, E coli, fecal coliform counts, the Chemical Oxygen Demas (COD) and the Dissolved Oxygen (DO) exceeded the Klip River Water Quality guidelines set by the Department of Water and Sanitation for the Klip River catchment area and are present at unacceptable concentrations, presenting evidence that the water is polluted by sewage releases in the catchment;
- The water quality in the lake is of worse quality than water from around the catchment area. This may be a function of the lake acting as the sink, where all the pollutants from the around the catchment accumulate;
- Alkalinity is generally higher at the surface of the lake and SO₄ levels are generally lower at bottom; and
- The trend analysis demonstrates that between 2005 and 2016, there has been a slight improvement in the water quality of the Boksburg Lake. Although E coli and fecal coliform levels have declined during the assessment period, the levels remain within unacceptable ranges of the KRWQOs, indicating a continuation of sewage contamination within the catchment.

Was a specialist consulted to assist with completing this section

YES
X

If yes complete specialist details

Name of the specialist:

Stephen van Staden

Qualification(s) of the specialist:

MSc (Environmental Management) (University of Johannesburg)
 BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)
 BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)
 SACNASP Pr. Nat. Sci (400134/05)

Postal address:

PO Box 751779, Gardenview

Postal code:

2047

Telephone:

011 616 7893

Cell:

083 415 2356

E-mail:

Stephen@sasenvironmental.co.za

Fax:

086 724 3132

Are any further specialist studies recommended by the specialist?

NO
X

If YES, specify:

If YES, is such a report(s) attached? N/A

YES

NO

If YES list the specialist reports attached below

Signature of specialist:



Date:

2018/09/18

Please note; If more than one specialist was consulted to assist with the filling in of this section then this table must be appropriately duplicated

8. LAND USE CHARACTER OF SURROUNDING AREA

Using the associated number of the relevant current land use or prominent feature from the table below, fill in the position of these land-uses in the vacant blocks below which represent a 500m radius around the site

1. Vacant land	2. River, stream, wetland	3. Nature conservation area	4. Public open space	5. Koppie or ridge
6. Dam or reservoir	7. Agriculture	8. Low density residential	9. Medium to high density residential	10. Informal residential
11. Old age home	12. Retail	13. Offices	14. Commercial & warehousing	15. Light industrial
16. Heavy industrial ^{AN}	17. Hospitality facility	18. Church	19. Education facilities	20. Sport facilities
21. Golf course/polo fields	22. Airport ^N	23. Train station or shunting yard ^N	24. Railway line ^N	25. Major road (4 lanes or more) ^N
26. Sewage treatment plant ^A	27. Landfill or waste treatment site ^A	28. Historical building	29. Graveyard	30. Archeological site
31. Open cast mine	32. Underground mine	33. Spoil heap or slimes dam ^A	34. Small Holdings	
Other land uses (describe):				

NOTE: Each block represents an area of 250m X 250m, if your proposed development is larger than this please use the appropriate number and orientation of hashed blocks

The land use map showing land use character within 250m and 500m of the proposed sites is provided in

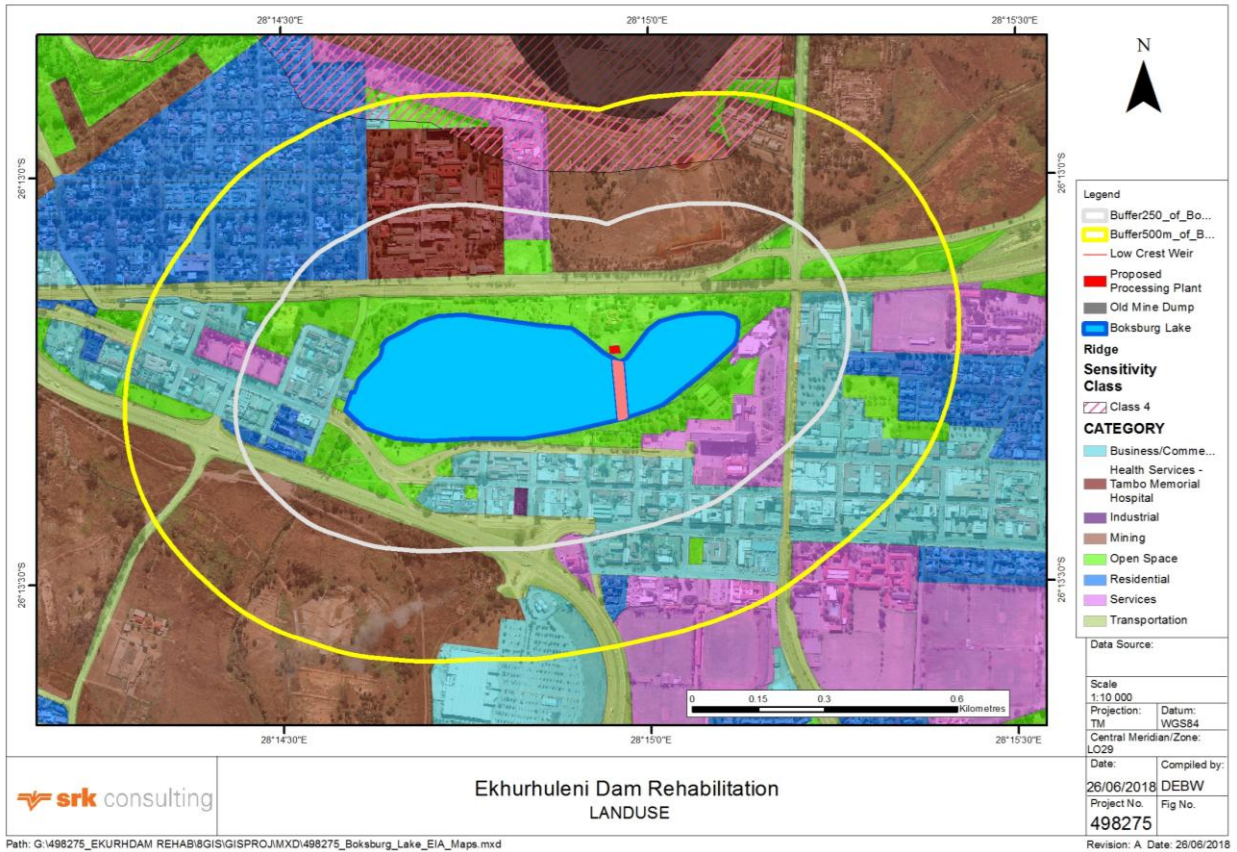
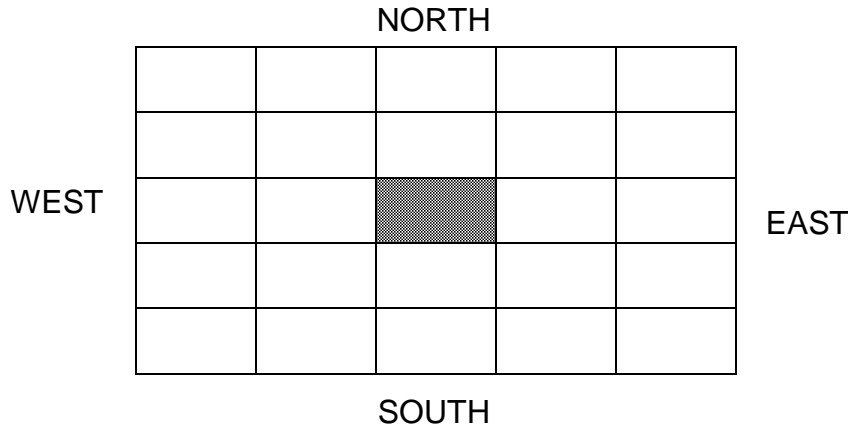


Figure 9.



Note: More than one (1) Land-use may be indicated in a block

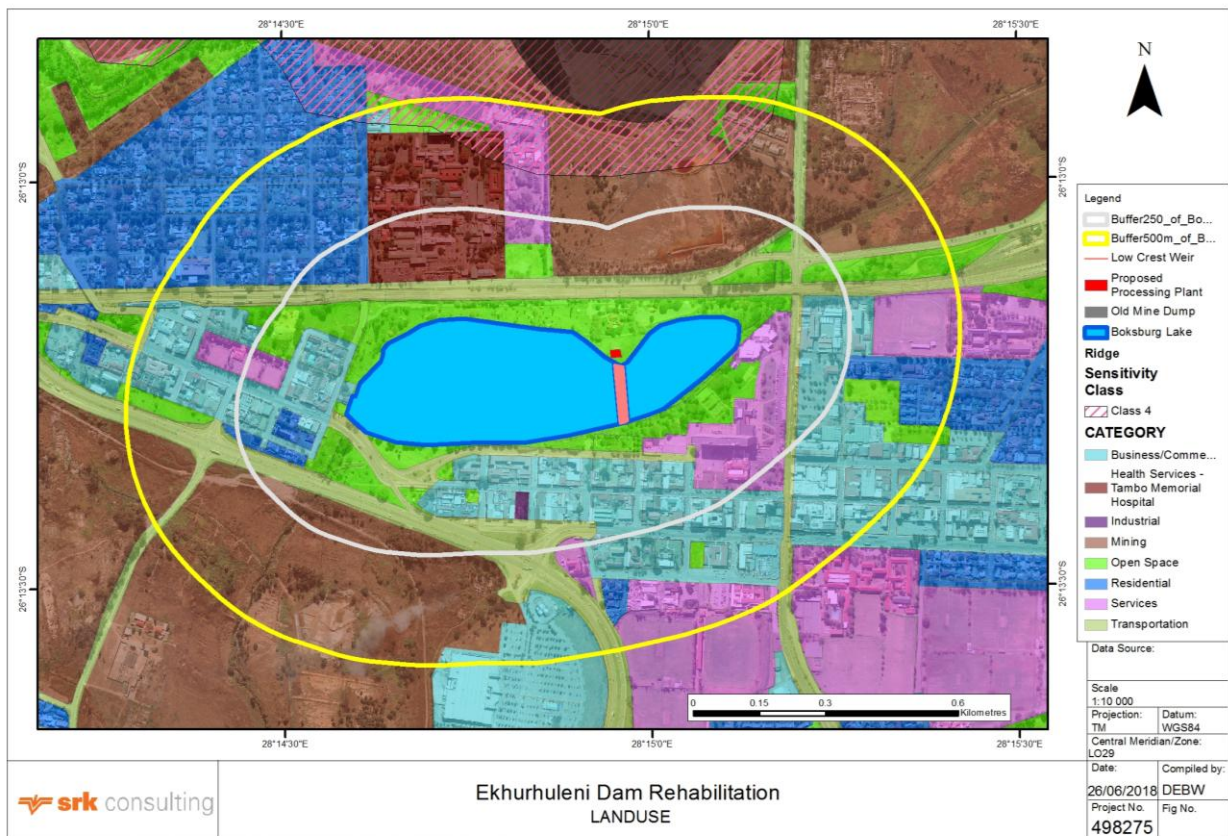


Figure 9: Landuse Characterisation

Please note: The Department may request specialist input/studies depending on the nature of the land use character of the area and potential impact(s) of the proposed activity/ies. Specialist reports that look at health & air quality and noise impacts may be required for any feature above and in particular those features marked with an “A” and with an “N” respectively. There is a road (4 lanes) that are located within 250 m and 500m of some of the Boksburg Lake. The Tambo Memorial Hospital is also located with 250 m of the Boksburg Lake. The lake itself is surrounded by landscaped open space that is used for recreational purposes. It is expected that the project will have the following impacts:

- Increase in traffic on some of the roads that will be used as access roads for the project;
- Construction related noise impacts; and
- Increase in nuisance dust as well as emissions from construction vehicles and machinery.

There is also a small section of an old gold mine dump that is located within 500 m of the Boksburg Lake. It is expected that the rehabilitation of the lake will not have any impact on the mine dump. Runoff from the old dump however, seeps into the lake as shown in Figure 10.



Figure 10: Water from Old Mine Dump seeping into the Boksburg Lake

The water quality assessment conducted however showed that the water quality in terms of heavy metals or acid rain does not indicate contamination as would be expected from mine water contamination. The status quo assessment found that:

The results from the water quality assessment showed that the levels of metals in the lake and the catchment are generally within ideal and acceptable ranges, except for the Iron (Fe) levels that were recorded at point WS 4B, which were more than 1 000 times the recordings from all the other points and were within unacceptable ranges of the KRWQOs. It must be noted that in places in the lake the bed is not well consolidated and sludgier, making it difficult to identify the bed. It is suspected that the samples collected from point WS 4B may have been collected too close to the sediment near the bed.

There is a hospital that is located within 250 m of the Boksburg Lake, and there is potential for the residents of the hospital to experience noise impacts during construction and operation of the project. The impacts are expected to be of low significance and will be short lived. Air quality impacts will be due to nuisance dust during construction. There may be release of odors during the first few weeks of operation. This will however be short lived.

A class 4 ridge is located with 500m to the North of the lake. The GDARD defines a class 4 ridge as, a ridge of which 65% or more of their surface area has been converted to urban development, quarries and/or alien vegetation. (It is expected that the project will not have an impact on the ridge.

The potential impacts identified for the project are included in Section E of this project. Mitigation measures have also been identified and included in Section E and the accompanying Environmental Management Programme (EMPr) (Appendix H).

Have specialist reports been attached NO
X

If yes indicate the type of reports below
N/A

9. SOCIO-ECONOMIC CONTEXT

Describe the existing social and economic characteristics of the area and the community condition as baseline information to assess the potential social, economic and community impacts.

The City of Ekurhuleni Metropolitan Municipality is a Category A municipality that covers an extensive area from Germiston in the west to Springs and Nigel in the east. The former administrations of the nine towns in the former East Rand were amalgamated into the metropolitan municipality, along with the Khayalami Metropolitan Council and the Eastern Gauteng Services Council. It is one of the most densely populated areas in the Gauteng Province, and the country (<https://municipalities.co.za/overview/4/city-of-ekurhuleni-metropolitan-municipality>).

Demographics

According to the 2016 Community Survey, the City of Ekurhuleni has an estimated population of 3 379 1042, up 200 634 people from 3 178 470 in the 2011 census. The population growth rate has slowed from as high as 4% in the period between 1996 and 2001 to 2.47% between 2001 and 2011. This represents over 6% of the population of South Africa. An important feature of the growth in the Ekurhuleni population is the net migration into the City as together with Tshwane and Johannesburg are the largest recipients of in-migration in the country. Table 4 shows other key population attributes from the 2011 census such as the dependency ratio, sex ratio, number of households and household size. Major shifts seem to have occurred in the population composition by broad age groups between 2011 and 2016, for example the promotion of the young, the 0-14-year age group increasing from 24% to 35% and that of elderly, the 65+ population more than doubling from 4% to 9%.

Table 4: Demographics for Ekurhuleni Metropolitan Municipality

Population Attribute	2011 Census Statistic	2016 Community Survey Statistic
Total Population	3 178 470	3 379 104
Young (0-14)	24.3 %	34.7%
Working Age (15-64)	71.7 %	56.2%
Elderly (65+)	4%	9.1%
Dependency Ratio	39.4	
Sex Ratio	105	
Growth Rate	2.47 %(2001-2011)	
Population Density	1609 persons/km ²	
Number of Households	1 015 46	
Household Size	2.9%	
Female headed household	31.3 %	

Age Distribution and Population

An assessment of the 2005 with the 2015 population pyramid for the City of Ekurhuleni shows that:

- In 2005, there were a larger share (albeit marginal) of young working age people – aged 20 to 34 (30.7%) – compared to 2015 (29.6%).
- Fertility in 2005 was slightly lower compared to that of 2015.
- The share of children between the ages of 0 to 14 years is slightly smaller in 2005 (25.4%) compared to 2015 (26.0%).
- Life expectancy appears to be increasing. This is broadly in line with national trends as revealed in the latest mortality rates and causes of death report, 2015 (released in February 2017). In terms of this report South Africa is experiencing fewer deaths in an increasing population and that life expectancy is also increasing in the country.

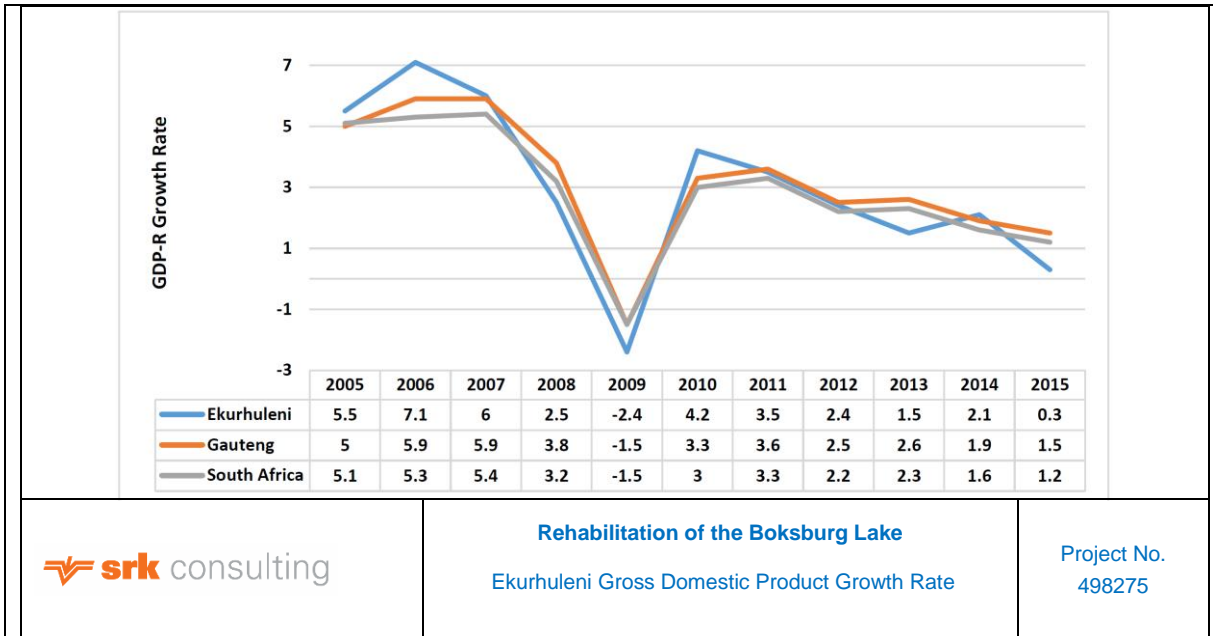
In 2015, the female population for the 20 to 34 years' age group amounted to 14.6% of the total female population while the male population group for the same age amounted to 16.0% of the total male population. In 2005 the male working age population at 15.4% still exceeds that of the female population working age population at 14.2%.

Socio-Economic Development

Ekurhuleni's contribution to the national economy has increased from 8.2% in 1995 to 8.8% in 2016, overtaking eThekweni as the fourth largest city in the country. Between 1995 and 2013, four of the cities increased their share of South Africa's GVA: Johannesburg (11.7% to 13.9%), Cape Town (10.3% to 10.9%), Tshwane (8.9% to 9.2%) and Ekurhuleni (8.2% to 8.8%), but the shares of eThekweni and all the three smaller metros declined.

The structure of the City of Ekurhuleni's economy is dominated by four sectors: manufacturing, finance and business services, community services and general government and to a lesser extent the trade and hospitality sector. Over the past 15 years, major structural shifts have occurred in the structure of the economy principally involving the decline of the dominance of the manufacturing sector which dropped from 30.3% in 2000 to 22.7% in 2015 and a comparable increase of the contribution of the finance and business services sector which increased its share from 14.8% in 2011 to 21.3% in 2015. The continuing decline of the manufacturing sector is a big challenge for the municipality and for that reason the revitalization of the manufacturing sector is a key strategic focus area for the municipality.

The City of Ekurhuleni had a total GDP of R 301 billion and in terms of total contribution towards the Gauteng Province, Ekurhuleni ranked third relative to all the regional economies to total Gauteng GDP. In 2020, Ekurhuleni's GDP is forecasted at an estimate of R 251 billion (constant 2010 prices) or 21.2% of the total GDP of Gauteng. The above figure illustrates the GDP growth rates for Ekurhuleni, Gauteng and South Africa 2005-2015, 2010 Constant Prices.



Rehabilitation of the Boksburg Lake
Ekurhuleni Gross Domestic Product Growth Rate

Project No.
498275

Figure 11: Goss Domestic Product Growth Rate

EMPLOYMENT

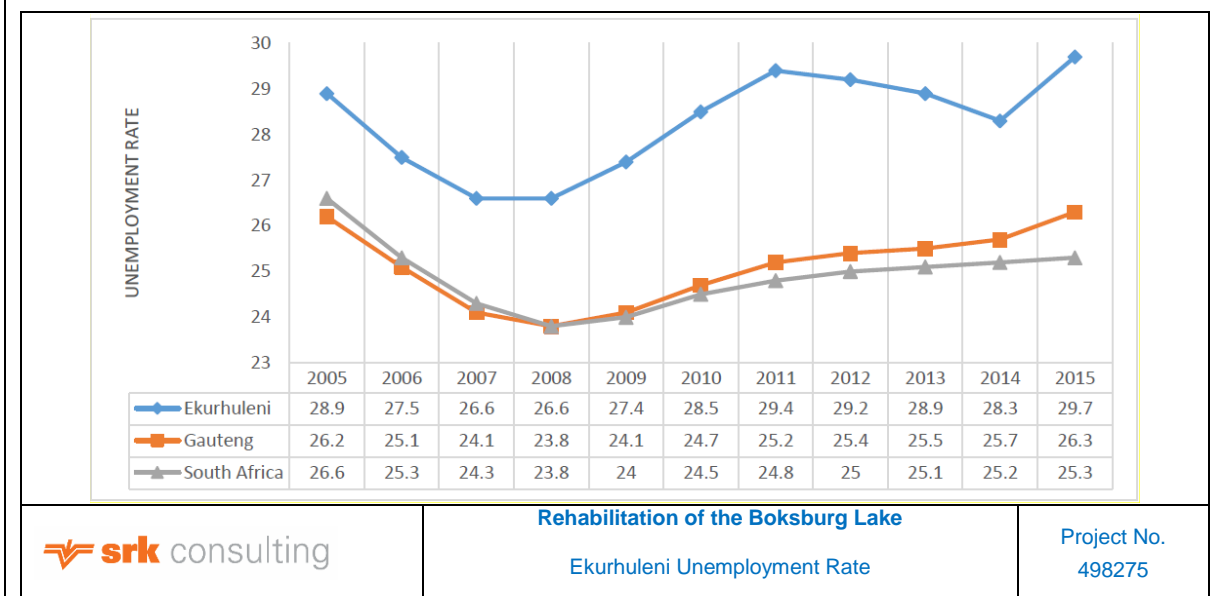
Economically Active Population: The City of Ekurhuleni’s EAP was 1.64 million in 2015, which is 48.47% of its total population of 3.38 million, and roughly 25.32% of the total EAP of the Gauteng Province. From 2005 to 2015, the average annual increase in the EAP in Ekurhuleni was 2.33%, which is 0.464 percentage points lower than the growth in the EAP of Gauteng’s for the same period.

Total Employment: In 2015, Ekurhuleni employed 1.19 million people which is 23.92% of the total employment in Gauteng (4.96 million), 7.71% of total employment in South Africa (15.4 million). Employment within Ekurhuleni increased annually at an average rate of 2.54% from 2005 to 2015. The City of Ekurhuleni’s average annual employment growth rate of 2.54% exceeds the average annual labor force growth rate of 2.33%.

Unemployment: In 2015, the unemployment rate in Ekurhuleni (based on the official definition of unemployment) was 29.72%, which is an increase of 0.868 percentage points. The unemployment rate in Ekurhuleni is higher than that of Gauteng as can be seen in the figure below. The unemployment rate for South Africa was 25.28% in 2015, which is a decrease of 1.27 percentage points from 26.55% in 2005.

In terms of unemployment, Ekurhuleni as with both Gauteng and South Africa have witnessed a steady increase in the unemployment rate from 2009. From a low of 26.6% in 2006, unemployment rose to 29.7% in 2015 for Ekurhuleni. The number of people employed in the City of Ekurhuleni declined from 1 190 000 in the second quarter of 2015 to 1 161 000 in the second quarter of 2016.

For the period under review, unemployment in Ekurhuleni has consistently been higher than the provincial and national figures as demonstrated in Figure 12.



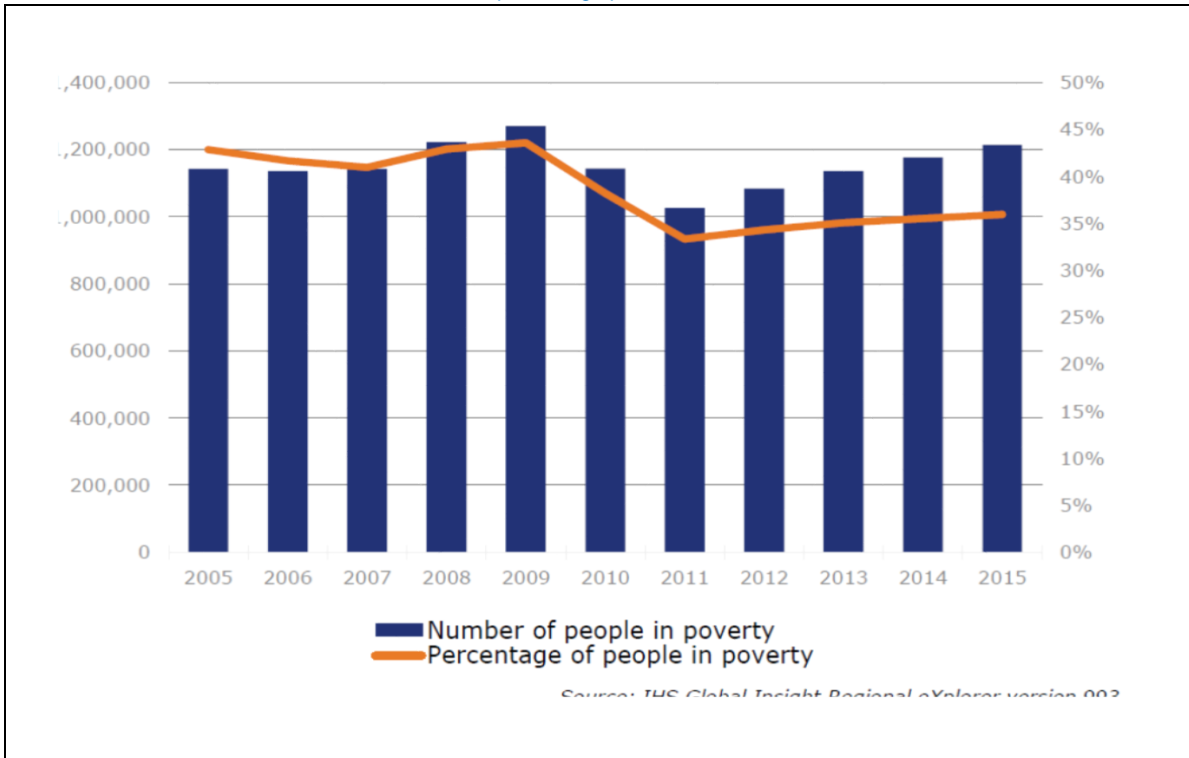
Rehabilitation of the Boksburg Lake
Ekurhuleni Unemployment Rate

Project No.
498275

Figure 12: Unemployment Rate – Ekurhuleni, Gauteng And South Africa

Poverty

In 2015, there were 1.21 million people living in poverty, using the upper poverty line definition, across Ekurhuleni - this is 6.27% higher than the 1.14 million in 2005. The percentage of people living in poverty has decreased from 42.83% in 2005 to 35.94% in 2015, which indicates a decrease of 6.89 percentage points.

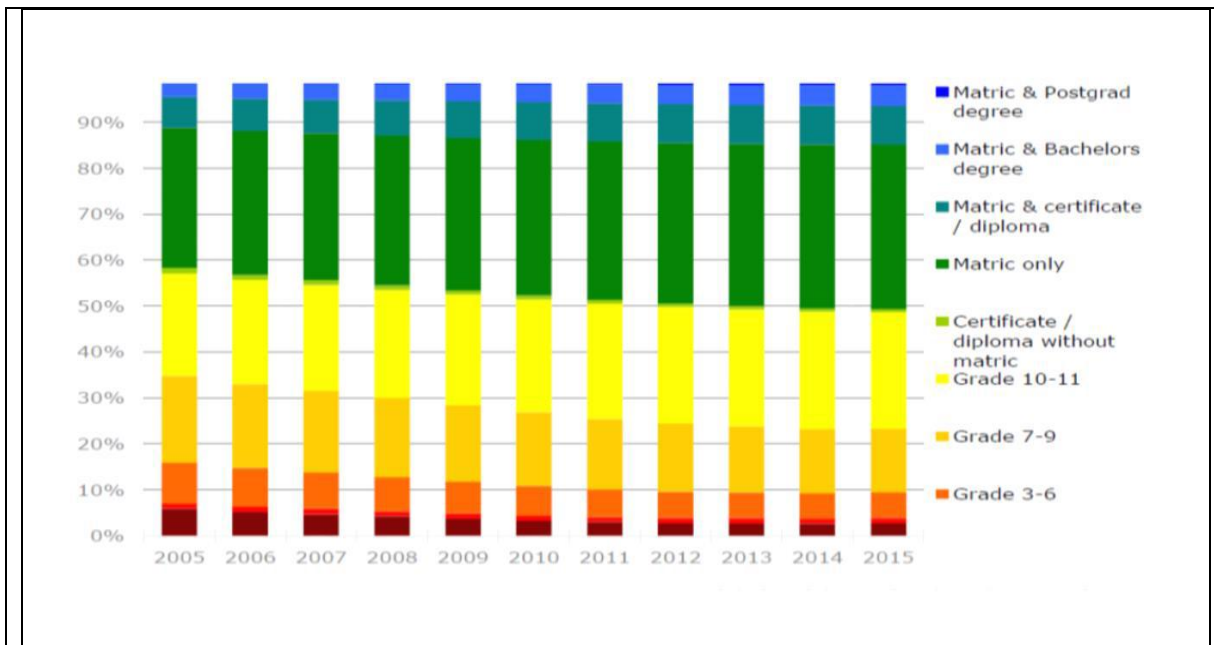


	<p>Rehabilitation of the Boksburg Lake</p> <p>Number and Percentage of People in Poverty</p>	<p>Project No. 498275</p>
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Figure 13: Number and percentage of people in poverty

Education

Within the City of Ekurhuleni, the number of people without any schooling decreased from 2005 to 2015 with an average annual rate of -4.83%, while the number of people within the 'matric only' category, increased from 538,000 to 818,000. The number of people with 'matric and a certificate/diploma' increased with an average annual rate of 4.82%, with the number of people with a 'matric and a Bachelor's' degree increasing with an average annual rate of 6.33%. Overall improvement in the level of education is visible with an increase in the number of people with 'matric' or higher education.



	Rehabilitation of the Boksburg Lake Ekurhuleni Municipality Levels of Education	Project No. 498275
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Figure 14: Level of Education in Ekurhuleni Metropolitan Municipality

Statistics show that (<https://youthexplorer.org.za/profiles/municipality-EKU-ekurhuleni/#education>)

- Approximately 63% of youth aged 20-24 have completed matric/matric equivalent or higher;
- 87.2% of youth aged 16-17 have completed grade 9 or higher; and
- 48.4% of youth aged 15-24 attend an educational institution.

Table 5: Level of Education in Ekurhuleni Metropolitan Municipality (Source for table <https://municipalities.co.za/metropolitans/view/2/city-of-johannesburg-metropolitan-municipality#demographic>)

Education Level	2016	2011
No schooling	4.1 %	3.6 %
Matric	38.5 %	35.4 %
Higher Education	11.9 %	14.6 %

10. CULTURAL/HISTORICAL FEATURES

Please be advised that if section 38 of the National Heritage Resources Act 25 of 1999 is applicable to your proposal or alternatives, then you are requested to furnish this Department with written comment from the South African Heritage Resource Agency (SAHRA) – Attach comment in appropriate annexure

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

- the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- the construction of a bridge or similar structure exceeding 50m in length;
- any development or other activity which will change the character of a site-
 - exceeding 5 000 m2 in extent; or
 - involving three or more existing erven or subdivisions thereof; or
 - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- the re-zoning of a site exceeding 10 000 m2 in extent; or
- any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Are there any signs of culturally (aesthetic, social, spiritual, environmental) or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including archaeological or palaeontological sites, on or close

	NO X
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(within 20m) to the site?



If YES, explain:

N/A

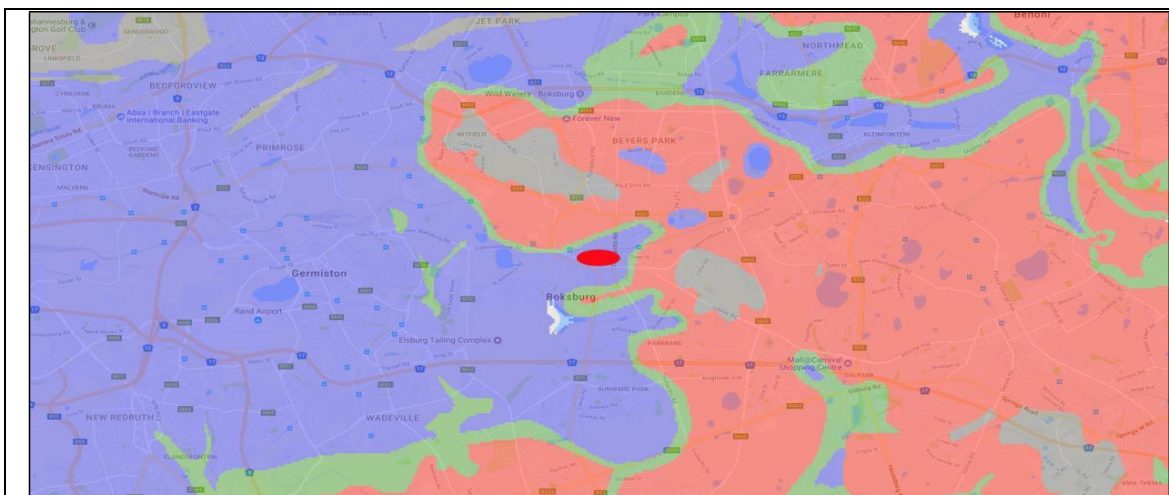
If uncertain, the Department may request that specialist input be provided to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist if one was already appointed:

The heritage resources assessment was conducted by Archaetos Culture & Cultural Resource Consultants. The study found that the project will not have an impact on any heritage and/or cultural resources. The findings from the study were as follows:

Palaeontology

The palaeontological sensitivity map was extracted from the South African Heritage Resources Information System (SAHRIS) database and clearly shows Blue (Low) sensitivity. As a result, a desktop palaeontological study will not be required for the survey footprint.




	<p>Rehabilitation of the Boksburg Lake</p> <p>Palaeontological sensitivity zones</p>	<p>Project No. 498275</p>
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Figure 15: Palaeontological sensitivity map extracted from the SAHRIS Database

Table 6: Palaeontological Sensitivity Classification a Required Action

Colour	Sensitivity	Required Action
Red	Very High	Field assessment and protocol for finds is required
Orange/Yellow	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
Green	Moderate	Desktop study is required
Blue	Low	No palaeontological studies are required however a protocol for finds is required
Grey	Insignificant/Zero	No paleontological studies are required
White/Clear	Unknown	Will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Heritage and Cultural Resources

The study found that although the Boksburg Lake and surrounds can be regarded as historical (older than 60 years as per Section 34 of the NHRA, the area is a living, dynamic and changing entity which has been constantly reshaped during the last 100 years. Within this context no (isolated) historical or archaeological structures, features, assemblages or artefacts were recorded during the survey. However, several pagoda-style picnic structures (age unknown) have recently been repainted and restored by contractors.

The specialist concluded that the proposed dynamic restoration initiatives to re-establish water quality at the Boksburg Lake may proceed as there is no objection from a heritage perspective.

Will any building or structure older than 60 years be affected in any way?

[REDACTED]	NO
	X
[REDACTED]	NO
	X

Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?

If yes, please attached the comments from SAHRA in the appropriate Appendix

SECTION C: PUBLIC PARTICIPATION (SECTION 41)

1. The Environmental Assessment Practitioner must conduct public participation process in accordance with the requirement of the EIA Regulations, 2014.

The Public Participation Process (PPP) was conducted in terms of Chapter 6 of GNR 982 of the NEMA and entailed the following:

- Newspaper advertisement during the project announcement phase in The Citizen on 14 June 2018. Some stakeholder indicated that they did not have access to The Citizen, therefore a second newspaper advertisement was placed in a local paper, Ekurhuleni News on 27 September 2018;
- Announcement letters notifying stakeholders of the project and application were distributed to registered Interested and Affected Parties on 12 June 2018. In addition to the notification letters, bulk SMSes were also sent to stakeholders on 12 June 2018;
- Drafting and posting on-site notices around the project site. On site notices were put up around the Boksburg Lake on 18 and 19 June 2018(see **Error! Reference source not found.**);
- Identification of stakeholders;
- Creation and maintenance of the stakeholder database, including correspondence with the stakeholders;
- Compilation and distribution of the notification letters (project announcement phase, notification of the availability of the draft BAR for review and comment, announcement of the GDARD decision and appeal process);
- A 30-day public comment period on the Draft BAR; and
- Drafting of the Comments and Responses Report (CRR).

In addition to Chapter 6 requirements, the stakeholder engagement process also included key stakeholder meetings to discuss the proposed project options and the preferred option were undertaken as follows:

Stakeholder Engagement Phase 2 – Focus Group Discussions		
Stakeholder Group	Sector Attendees/ Invitees	Date
Klipriver Forum	Department Water Affairs COJ Environmental Sustainability and Resilience Rand Water Department of Agriculture and Rural Development Ekurhuleni Roads and Stormwater Ekurhuleni Parks Department	1 November 2016
	Transnet Ward Councillor	2 August 2017
Community	Eco tabs Old Boksburg Lake Forum	4 November 2016
Representative Adjacent Landowners and Occupiers	Adjacent Landowners and occupiers to the lake	29 June 2017
Business, Commerce and Forums	Boksburg Tourism Association Rotary Club Boksburg Lake Boksburg North CPF DRD Gold	29 June 2017
Ekurhuleni Roads and Stormwater Department	Ekurhuleni Department of Roads and Stormwater	8 September 2017
Ekurhuleni Parks Department	Ekurhuleni Parks Department	19 June 2017
Ward Councillors	Councillor De Vos and Councillor Jill Humphreys	7 August 2017

All the issues and comments received during the announcement phase of the process were collated into a Comments and Responses Register (CRR) which will form part of the Draft Basic Assessment Report (Draft BAR). Once the Draft BAR has been finalised, the registered stakeholders will be notified of the availability of the report for review and comment. The stakeholders will be provided with a 30-day public review and comment period on the Draft BAR. The CRR will be updated once the 30-day public review and comment period lapses. The CRR will be submitted to GDARD as part of the Final BAR.

The final notification letter will be sent to the stakeholders once GDARD has decided on the application. The notification will inform the stakeholder of the decision by GDARD and will provide details on the appeal process that may be followed, should it be necessary.

All the PPP documentation is provided in Appendix E.

2. LOCAL AUTHORITY PARTICIPATION

Local authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input. The planning and the environmental sections of the local authority must be informed of the application at least thirty (30) calendar days before the submission of the application to the competent authority.

Was the draft report submitted to the local authority for comment?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

If yes, has any comments been received from the local authority?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If "YES", briefly describe the comment below (also attach any correspondence to and from the local authority to this application):

To be included after the 30-day public comment period

If "NO" briefly explain why no comments have been received or why the report was not submitted if that is the case.

3. CONSULTATION WITH OTHER STAKEHOLDERS

Any stakeholder that has a direct interest in the activity, site or property, such as servitude holders and service providers, should be informed of the application at least **thirty (30) calendar days** before the submission of the application and be provided with the opportunity to comment.

Has any comment been received from stakeholders?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

To be included after the 30-day public comment period

If "NO" briefly explain why no comments have been received

4. GENERAL PUBLIC PARTICIPATION REQUIREMENTS

The Environmental Assessment Practitioner must ensure that the public participation process is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees and ratepayers associations. Please note that public concerns that emerge at a later stage that should have been addressed may cause the competent authority to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was flawed.

The EAP must record all comments and respond to each comment of the public / interested and affected party before the application report is submitted. The comments and responses must be captured in a Comments and Responses Report as prescribed in the regulations and be attached to this application.

5. APPENDICES FOR PUBLIC PARTICIPATION

All public participation information is to be attached in the appropriate Appendix. The information in this Appendix is to be ordered as detailed below

[Appendix 1 – Proof of site notice](#)

[Appendix 2 – Written notices issued as required in terms of the regulations](#)

[Appendix 3 – Proof of newspaper advertisements](#)

[Appendix 4 – Communications to and from interested and affected parties](#)

[Appendix 5 – Minutes of any public and/or stakeholder meetings](#)

[Appendix 6 - Comments and Responses Report](#)

[Appendix 7 –Comments from I&APs on Basic Assessment \(BA\) Report](#)

[Appendix 8 –Comments from I&APs on amendments to the BA Report](#)

[Appendix 9 – Copy of the register of I&APs](#)

SECTION D: RESOURCE USE AND PROCESS DETAILS

Note: Section D is to be completed for the proposal and alternative(s) (if necessary)

Instructions for completion of Section D for alternatives

- 1) For each alternative under investigation, where such alternatives will have different resource and process details (e.g. technology alternative), the entire Section D needs to be completed
- 4) Each alternative needs to be clearly indicated in the box below
- 5) Attach the above documents in a chronological order

Section D has been duplicated for alternatives times (complete only when appropriate)

Section D Alternative No. (complete only when appropriate for above)

1. WASTE, EFFLUENT, AND EMISSION MANAGEMENT

Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

If yes, what estimated quantity will be produced per month?

<input type="text"/>	m ³
----------------------	----------------

How will the construction solid waste be disposed of (describe)?
 Any construction waste produced will be disposed of in dedicated containers on site and removed by approved service providers to permitted landfill sites as specified in the accompanying Environmental Management Programme (EMPr). The landfill site servicing the Boksburg area is Rooikraal Landfill site.

Where will the construction solid waste be disposed of (describe)?
 Construction waste will be disposed of to the nearest permitted landfill site (Rooikraal) which can receive this type of waste.

Will the activity produce solid waste during its operational phase?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

If yes, what estimated quantity will be produced per month?

<input type="text" value="Unknown"/>	m ³
--------------------------------------	----------------

How will the solid waste be disposed of (describe)?
 During the operational phase of the project, the low crest rockfill weir will be used to contain the sewage laden inflows from the main storm water pipes into a holding area separate from the main body of the lake to create a "holding area". From this holding area water laden with SS will be processed through a filter plant that will remove the SS and filtered water will run into the main body of the lake. The SS solids that are filtered out will then be stored in dedicated skips and removed by a registered service provider to a registered municipal waste disposal facility.

Has the municipality or relevant service provider confirmed that sufficient air space exists for treating/disposing of the solid waste to be generated by this activity?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?
 N/A

Note: If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

If yes, inform the competent authority and request a change to an application for scoping and EIA. Is the activity that is being applied for a solid waste handling or treatment facility?

<input type="checkbox"/>	NO
<input checked="" type="checkbox"/>	X

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
 It is expected that the SS to be disposed of will contain some metals and other material that will render the solid waste to be disposed of hazardous. Waste classification will be required to determine whether the waste produced will be hazardous. It must however be noted that the waste produced will be taken off site to a registered facility that can handle hazardous waste. It is therefore not necessary to change the application to an application for scoping and EIA. Describe the measures, if any, that will be taken to ensure the optimal reuse or recycling of materials:
 N/A

Liquid effluent (other than domestic sewage)

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?

	NO
	X

If yes, what estimated quantity will be produced per month?

	m ³
--	----------------

If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the liquid effluent to be generated by this activity(ies)?

	NO
	X

Will the activity produce any effluent that will be treated and/or disposed of on site?

Yes	
X	

If yes, what estimated quantity will be produced per month?

Unknown. The amount of wastewater to be treated by the package plant will vary.	
---	--

If yes describe the nature of the effluent and how it will be disposed.

The wastewater will be processed by the package filter plant that will remove the Suspended Solids (SS). The filtered water will run into the main body of the lake.

Note that if effluent is to be treated or disposed on site the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA

The proposed package plant is expected to handle less than 15 000 m³ per day, and therefore triggers activities listed in terms of Listing Notice 1 of the NEMA, which requires that a Basic Assessment be conducted.

Will the activity produce effluent that will be treated and/or disposed of at another facility?

	NO
	X

If yes, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		Cell:	
E-mail:		Fax:	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

Waste Separation and Handling

General domestic wastes at the selected sites will be disposed of through a colour coded bin system for different types of waste material. Domestic waste and scrap metals will be collected in rubbish bins.

Recycling

Provision for recycling of waste will be considered and all recyclable waste material will be disposed of at municipal facilities that recycle plastics, glasses, papers, scrap metals, cardboard boxes, tins and cans.

Liquid effluent (domestic sewage)

Will the activity produce domestic effluent that will be disposed of in a municipal sewage system?

	NO
	X

During the construction phase sewage will be generated on site. An approved service provider such as Sanitech will collect the domestic sewage on a regular basis and dispose of it to an approved WWTW such as Vlakplaats WWTW which services the Boksburg area.

If yes, what estimated quantity will be produced per month?

	m ³
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It is not yet known how many people will be working on site, but each person could potentially generate 250 l of sewage per day which will result in a total of 7.5 m³ per month. This volume is small compared to the volume that is received by the Vlakplaats WWTW per day.

If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the domestic effluent to be generated by this activity(ies)?

	NO
	X

The estimated volume of domestic sewage to be produced is small compared to the volume that is received by the Vlakplaats WWTW per day.

Will the activity produce any effluent that will be treated and/or disposed of on site?

	NO
	X

If yes describe how it will be treated and disposed of.

N/A

Emissions into the atmosphere

Will the activity release emissions into the atmosphere?

YES	
X	

If yes, is it controlled by any legislation of any sphere of government?

	NO
	X

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If no, describe the emissions in terms of type and concentration:

During construction, there will be particulate emissions (dust) related to debris handling; truck transport; materials storage, handling and transfer; open areas (windblown emissions). Gas emissions are also expected to occur due to vehicle and construction equipment activity (exhaust fumes). These impacts can be mitigated and managed to acceptable levels, with a post mitigation impact that is of low significance.

2. WATER USE

Indicate the source(s) of water that will be used for the activity

Municipal <input checked="" type="checkbox"/>	Directly from water board	groundwater	river, stream, dam or lake	other	the activity will not use water
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If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:

If Yes, please attach proof of assurance of water supply, e.g. yield of borehole, in the appropriate Appendix Does the activity require a water use permit from the Department of Water Affairs?

If yes, list the permits required

The rehabilitation of the lake entails working within the 1:100-year floodline (Figure XX) as well as within the water body and as such requires water use authorisation in terms of Section 40 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) for Section 21 (c) and (i) water uses.

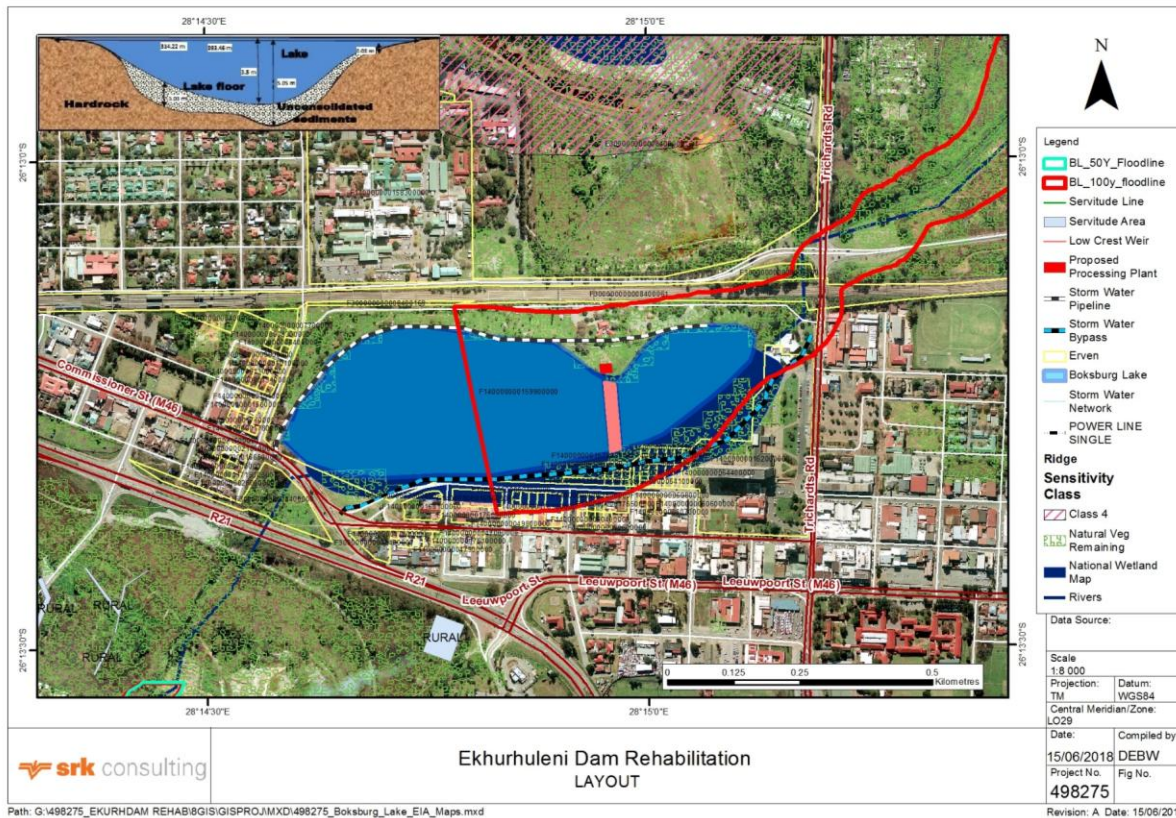


Figure 16: Floodlines

A Water Use Licence pre-application meeting was held with the Department of Water and Sanitation (DWS) regional office on 3 April 2018 and a Phase 1 application submitted to the DWS on 18 May 2018. The EWULAAs application confirmation is attached as Appendix F.

If yes, have you applied for the water use permit(s)?

If yes, have you received approval(s)? (attached in appropriate appendix)

3. POWER SUPPLY

Please indicate the source of power supply eg. Municipality / Eskom / Renewable energy source

Diesel generators will be used during the construction or operational phase of the project. All open spaces will be provided with lighting for the safety of people near the construction sites. The lights will be powered with electricity sourced from Eskom or Municipality.

If power supply is not available, where will power be sourced from?

4. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

Where required, low energy LED lighting will be used in the open spaces and servitudes such as pedestrian pathways.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

Not applicable

SECTION E: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts as well as the impacts of not implementing the activity (Section 24(4)(b)(i)).

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summarise the issues raised by interested and affected parties.

To be included after the public comment period

Summary of response from the practitioner to the issues raised by the interested and affected parties (including the manner in which the public comments are incorporated or why they were not included)

(A full response must be provided in the Comments and Response Report that must be attached to this report):

To be included after the public comment period

2. IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION AND OPERATIONAL PHASE

Briefly describe the methodology utilised in the rating of significance of impacts

All specialists were required to assess each identified potential impact according to the Impact Assessment Methodology as described below. This methodology has been utilised for the assessment of environmental impacts where the consequence (severity of impact, spatial scope of impact and duration of impact) and likelihood (frequency of activity and frequency of impact) have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact.

The first stage of any impact assessment is the identification of potential environmental activities¹, aspects² and impacts, which may occur during the commencement and implementation of a project. This is supported by the identification of receptors³ and resources⁴, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Environmental impacts⁵ (social and biophysical) are then identified based on the potential interaction between the aspects and the receptors/resources.

The significance of the impact is then assessed by rating each variable numerically according to defined criteria as outlined in Table 7. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity⁶, spatial scope⁷ and duration⁸ of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity⁹ and the frequency of the impact¹⁰ together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix table as shown in

Table 8.

This matrix thus provides a rating on a scale of 1 to 150 (low, medium low, medium high or high) based on the consequence and likelihood of an environmental impact occurring.

Natural and existing mitigation measures, including built-in engineering designs, are included in the pre-mitigation assessment of significance. Measures such as demolishing of infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

Table 7: Criteria for Assessing Significance of Impacts

¹An **activity** is 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.

²An **environmental aspect** is 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.

³**Receptors** comprise, but are not limited to people or man-made structures.

⁴**Resources** include components of the biophysical environment.

⁵**Environmental 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. 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 aquifers, flora and paleontology. In the case where the impact is on human health or well-being, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.

⁶**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.

⁷**Spatial scope** refers to the geographical scale of the impact.

⁸**Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

⁹**Frequency of activity** refers to how often the proposed activity will take place.

¹⁰**Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.

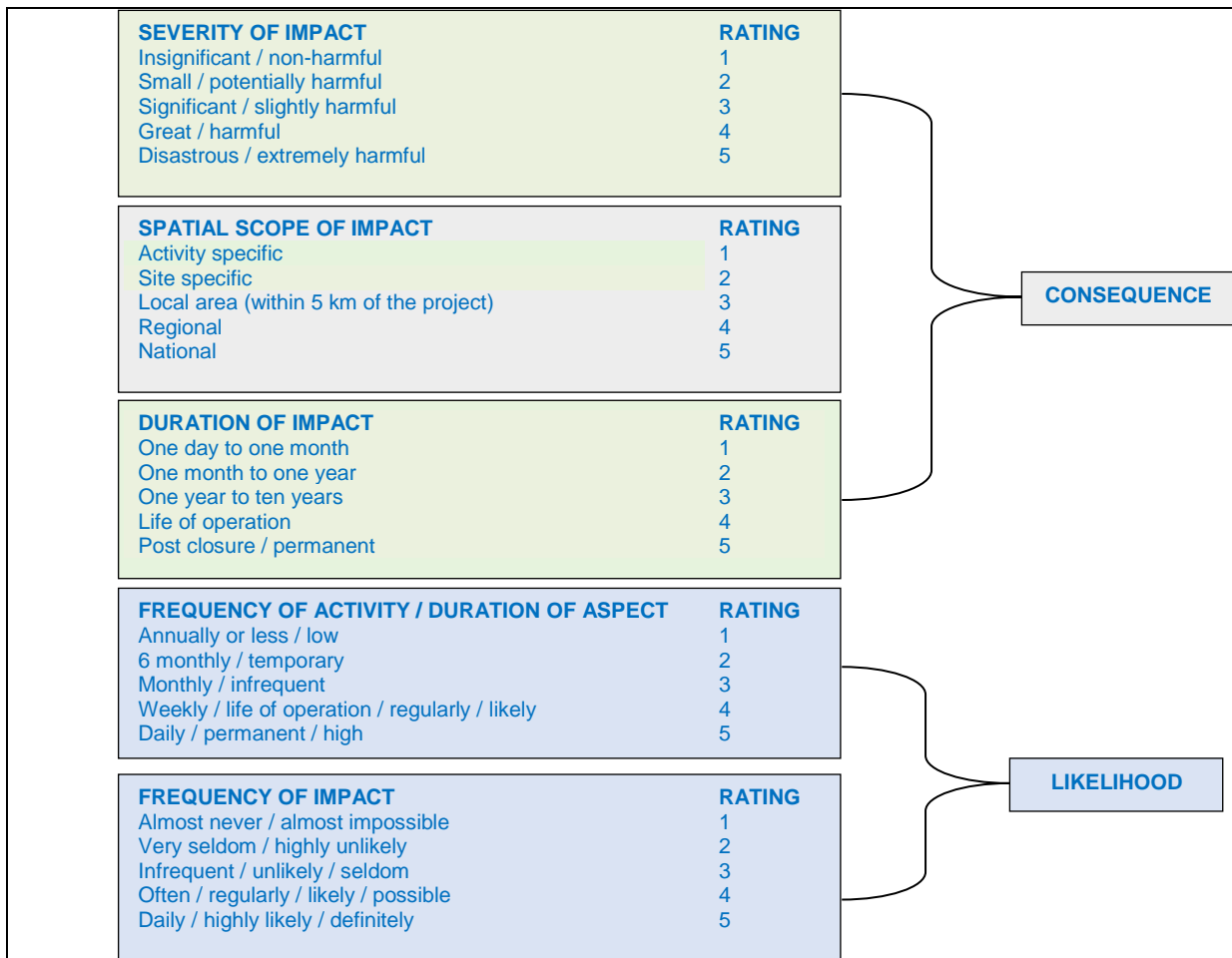


Table 8: Interpretation of Impact Rating

		Consequence														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Likelihood	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	2	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	3	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	4	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	5	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	6	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	7	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	8	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	9	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
	10															

High	76 to 150	Improve current management
Medium High	40 to 75	Maintain current management
Medium Low	26 to 39	
Low	1 to 25	No management required

SIGNIFICANCE = CONSEQUENCE x LIKELIHOOD

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the construction phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

CONSTRUCTION PHASE

Three options were considered as follows:

- Preferred Option: Aerators, low crest weir and package filter plant;
- Option 1: Dredging; and
- Option 2: Lake Drawdown.

Site Establishment

The construction sites will be located on previously disturbed areas near the amphitheatre that is in a securely fenced area on the northern shore of the Lake. These areas will make provision for closed civil systems such as water tanks and conservancy tanks for sewerage containment. All waste products will be removed from the construction sites to an approved and licensed disposal site. Rehabilitation of the construction sites will be to the same level as to prior establishment. The construction site camps will be located above the 1:100-year flood line with hazard free accessibility from the main roads for delivery and access to the construction areas. Access to the respective construction site would be possible via pre-existing roads. All additives to be used are to be non-poisonous and environmentally sound. Batching of concrete for all purposes is to be done at the construction site camps in a regulated environmentally friendly way. No batching will be allowed to happen inside 1:100-year flood line. All construction equipment and material also to be stored at the site camps and above the 1:100-year flood line where required. All material will be imported thus no quarries will be established in the vicinity.

Preferred Option

The preferred option entails the construction, installation and establishment of aerators, Low Crest Weir and Package Filter Plant.

• Aerators:

- 2 X 4 KW aerators will be installed at the Boksburg Lake inlet to oxygenate water as it enters the dam and to eliminate the possibility of stagnation. This will also create a beneficial flow path towards larger aerators and outlet.
- 2 X 45 KW aerators will also be installed at the outlet, the deepest part of the dam. The aerators will reduce ammonia through nitrification, ejecting 162 kg of oxygen per hour, reducing Chemical Oxygen Demand (COD) and increasing the Dissolved Oxygen (DO) levels in the lake.

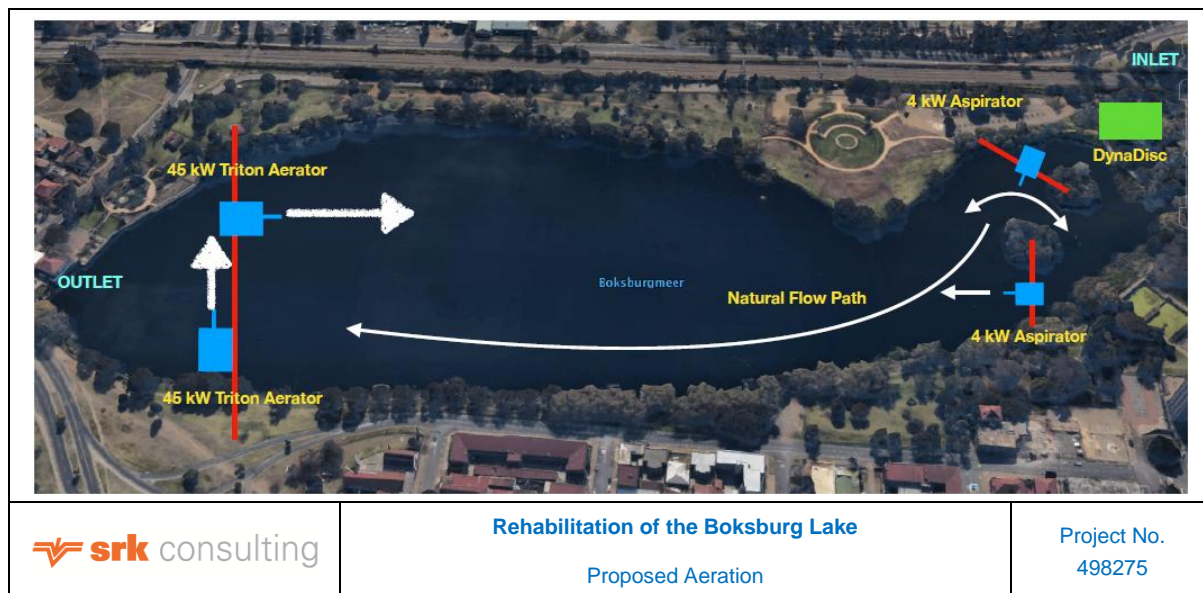


Figure 17: Proposed Aeration Process

• Low crest weir

- Site Clearance and establishment.
- All necessary traffic accommodation and construction warning signage will be erected as necessary.
- Surveying and setting out.
- Importing and placement of rock fill material. This will be end tipped from the truck starting on the northern shore and the rock will be positioned and profiled with a 20t excavator.
- The weir will then be advanced towards the southern shore in this manner.
- Landscaping, shaping of ground and planting of vegetation where required.
- Rehabilitation and site de-establishment including the removal of all debris and waste products off the site to an approved and licensed disposal site.
- Maintenance of the rehabilitated areas should be carried out to ensure that the newly planted vegetation does not die.

• Package Plant:

- Excavation into river bank.
- Erect formwork and steel fixing.
- Concrete to be cast.
- Curing.

- Stripping of shutters.
- Backfill and compact.
- Landscaping, shaping of ground and planting of vegetation where required.
- Rehabilitation and site de-establishment including the removal of all debris and waste products off the site to an approved and licensed disposal site.

Alternative 1: Suction Dredging

This option entails the use of a dredging machine to take out the sediments at the bottom of the lake, removing any toxic sediments, and reducing nuisance aquatic macrophyte growth. The sediments from the lake will be collected by a registered service provider and disposed of at a registered landfill site (registered to handle hazardous waste).

Alternative 2: Lake Drawdown

For this option EMM will draw down the lake, empty it and landscape the area and form a park.

The results from the quantification of the identified potential impacts associated with the construction of flood remedial measures are summarised in Table 9.

Table 9: Summary of the potential impacts that can be expected during the construction phase

Proposal: Aerators, Low crest weir and package filter plant

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
Ineffective communication with affected property owners and property occupiers leading to conflict	Low	<ul style="list-style-type: none"> Random and regular alcohol and drug testing shall be conducted on all personnel responsible for operating machinery and driving construction vehicles to ensure the safety of the public. Security and safety should be emphasized. Liaise with the SAPD and existing forums to implement effective crime prevention strategies. No construction workers shall be allowed to access private properties without the owner's knowledge and consent. A register of complaints from the affected residents shall be kept on site and made available for inspection on request. Where possible, a community liaison officer shall be appointed to deal with complaints from the affected residents. Sufficient ablution facilities shall be provided to service the construction site (this must not exceed 20 users per toilet). The maximum walking distance from a work site to a toilet shall not exceed 50 metres, Ablution facilities shall not be placed within 100 m of the Boksburg Lake. Ablution facilities shall be serviced on a regular basis by an approved service provider to keep them in good, functional working order and in an acceptable state of hygiene. Designated eating areas shall be provided for employees. Ablution facilities shall be serviced on a regular basis by an approved service provider to keep them in good, functional working order and in an acceptable state of hygiene. Contents from the chemical toilets shall not be discharged into the environment but shall be removed by an approved service provider to the nearest waste water treatment works (Vlakplaats WWTW). 	Low	Low
Construction activities may result in an increase in petty crimes in the area	Medium High		Low	Low
Unauthorised access to private property may result in conflict with the property owners and occupiers	Low		Low	Low
Poor housekeeping will result in the deterioration of water quality, increase in <i>E coli</i> resulting in potential health effects	Medium Low		Low	Low
Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in <i>E coli</i> resulting in potential health effects	Medium Low		Low	Low
Lack of or poor sanitation will result in the contamination of surface runoff	Medium Low		Low	Low
Local spillages of oils from vehicles and machinery leaching to groundwater contamination.	Medium Low	<ul style="list-style-type: none"> Ensure that no heavy machinery or vehicles are permitted within the freshwater resource, unless essential. Infrastructure layouts should be carefully planned and optimised to minimise encroaching on freshwater resource, thus negating the need for any machinery, vehicles or personnel to enter the lake. All vehicles used to import rock must be inspected for leaks prior to entering the construction site. Any vehicles found to be leaking oils/hydrocarbons may not be allowed access; No washing of vehicles shall be allowed outside demarcated areas. Washing bays for vehicles and other equipment shall be provided with appropriate soakaways, will be clearly demarcated and will not be allowed to contaminate any surface runoff. Sufficient areas shall be provided for the maintenance and washing of vehicles. Refueling of vehicles will only be allowed in designated areas. All construction equipment shall be parked in a demarcated area Drip trays shall be used when equipment is used for some time. On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100-year flood lines. Runoff from this area shall be contained. Spill kits shall be made available and all personnel shall be trained, and training records shall be made available on request. 	Low	Low
Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Medium High		Medium Low	Low
Disturbance of the area may release suspended solids into the lake during the construction of the temporary earth berm	Medium High		Medium Low	Low
Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from construction vehicles and machinery.	Medium High		Medium Low	Low
Deterioration of water quality due to the disposal of water that accumulated in the cofferdam.	Medium High		Medium Low	Low
Poor stormwater management leading to runoff from stockpiled material resulting in the erosion of the stockpiles causing sedimentation of the Boksburg Lake.	Medium High		Medium Low	Low
Diversion of the lake resulting in the change in flow and an increase in sedimentation	Medium High		Medium Low	Low
Construction of temporary earth berms may result in changes to instream biota	Medium High		Medium Low	Low
Construction of temporary earth berms may result in changes to instream habitat	Medium High		Medium Low	Low
Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	Medium High		Medium Low	Low
Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality	Medium High		Medium Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	Medium High	<ul style="list-style-type: none"> difference upstream and/or downstream of the installation site. The duration of impacts on the riparian areas must be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised (construction period must be kept as short as is possible). 	Medium Low	Low
Localised changes to the riparian areas because of vegetation clearing.	Medium High	<ul style="list-style-type: none"> All construction activities within the lake should be take place in the low flow period of winter. 	Medium Low	Low
Possible incision near the water diversion structures because of the temporary formation of a concentrated flow path	Medium High	<ul style="list-style-type: none"> Stream diversion must be kept as small as possible and extreme caution must be taken to prevent sedimentation of the downstream resources and where possible construction must be undertaken during the low flow period. 	Medium Low	Low
Temporary water diversion may result in altered flow regime leading to possible loss of recharge downstream, affecting downstream biota.	Medium High	<ul style="list-style-type: none"> The construction of piles within the coffer dams must be done as quickly as possible to reduce the duration of construction activities within the active channel. Construction areas must be reseeded with indigenous species as soon as construction has been completed. 	Medium Low	Low
Impact on the hydrological functioning of the riparian systems	Medium High	<ul style="list-style-type: none"> Sediment and erosion control measures must be maintained throughout the construction phase to minimise sedimentation downstream of the work areas. 	Medium Low	Low
Loss of habitat and riparian zone ecological structure because of site clearance activities and uncontrolled riparian zone degradation	Medium High		Medium Low	Low
Impact on the riparian systems because of changes to the sociocultural service provisions	Medium High		Medium Low	Low
Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of riparian resources	Medium High		Medium Low	Low
Soil compaction and levelling because of construction activities and vehicle movement leading to loss of riparian habitat	Medium High		Medium Low	Low
Excavation into banks of dam and surrounding areas for concrete-works necessary for the construction of the Dynadisc filtration plant. This will result in soil exposure, with a subsequent increased risk of soil erosion and sedimentation of the lake and may also result in soil and water contamination by oils/hydrocarbons.	Medium High	<ul style="list-style-type: none"> Excavated area must be limited as far as possible; The area to be excavated should be of as shallow a gradient as possible; and Exposed soils must be protected for the duration of construction 	Medium Low	
Laying of concrete for the Dynadisc filtration plant, potentially resulting in a spillage of concrete within the receiving environment, and the contamination of water and soils with oils/hydrocarbons.	Medium Low	<ul style="list-style-type: none"> Concrete must be mixed outside of the lake and banks. If any mixing is required within the lake area, batter boards should be utilised. 	Low	
Although the heritage study found no resources of cultural and/or heritage importance that will be affected by the project, a possibility remains that, there may be some resources that may be affected.	Low	<ul style="list-style-type: none"> If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. 	Low	Low
Site clearance in the lake for the low crest weir has potential to impact on palaeontological resources	Low	<ul style="list-style-type: none"> If fossils are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. 	Low	Low
Loss of localised riparian biodiversity habitats within sensitive areas due to site clearance.	Medium Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. Where possible, rehabilitation cleared areas shall be undertaken in tandem with construction. 	Low	Low
Sedimentation of riparian resources leading to smothering of flora	Medium Low	<ul style="list-style-type: none"> Ensure that sedimentation control devices are in place prior to commencement of construction. Ensure that adequate stormwater control and management is incorporated into the detailed designs Movement of construction vehicles, personnel and machinery in the riparian zones shall be kept to a minimum. Adequate stormwater management must be incorporated into the design of the proposed remedial measures to prevent erosion and the associated sedimentation of the river system. Only essential construction personnel shall be permitted within the floodlines. All demarcated sensitive zones outside of the construction area shall be kept off limits during the construction phase. Edge effects during construction and operation need to be strictly controlled. The footprint area of the construction activities shall be limited to what is essential to minimise environmental damage. 	Low	Low
Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. Where possible, rehabilitation cleared areas shall be undertaken in tandem with construction. 	Low	Low
Potential spreading of alien invasive species as indigenous vegetation is removed, and pioneer alien species are provided with a chance to flourish.	Medium High	<ul style="list-style-type: none"> Edge effects of activities including erosion and alien/ weed control will be strictly managed in the riparian area; All sites disturbed by construction activities shall be monitored for colonisation by exotic or invasive plants; Exotic or invasive plants shall be controlled as they emerge; An alien vegetation control program must be developed and implemented within the riparian and all disturbed areas. After removal of alien vegetation, the affected areas must be re-assessed to determine the success of the program and any follow up measures that may be required.; The eradicated plant material must be disposed of at an approved solid waste disposal site; During post-construction, an alien vegetation removal and monitoring plan must be compiled for those areas which were not effectively rehabilitated; The extent of invasion must be established through investigation to identify priority areas; 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
		<ul style="list-style-type: none"> Priority species shall be identified to control and develop protocols for the removal of all alien species e.g. mechanical removal, herbicidal treatment etc. Mechanical methods must be favored to chemical methods where possible for the removal of alien invasive species. Chemical removal shall only be undertaken by a suitably qualified and approved person; All disturbed areas shall be re-vegetated with indigenous riparian species; and As much vegetation growth as possible must be promoted to protect soils. In this regard, special mention is made of the need to use indigenous vegetation species where hydro seeding, rehabilitation planting (where applicable) are to be implemented. 		
Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Medium Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. No trapping or hunting of fauna is shall be permitted. 	Low	Low
Habitat fragmentation because of construction activities of the access roads leading to loss of floral diversity.	Medium Low	<ul style="list-style-type: none"> Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed. 	Low	Low
Loss of faunal diversity and ecological integrity because of construction activities, erosion, poaching and faunal species trapping	Medium Low	<ul style="list-style-type: none"> Should any SCC be encountered within the study area, these species will be relocated to similar habitat within or near the study area with the assistance of a suitably qualified specialist. No informal fires near construction areas shall be permitted. 	Low	Low
Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Low	<ul style="list-style-type: none"> An alien vegetation control plan must be developed and implemented to manage alien plant species occurring within the study area, and to prevent further faunal habitat loss. 	Low	Low
Possible increase in dust generation, PM ₁₀ and PM _{2.5} because of bulk earthworks, operation of heavy machinery, and material movement.	Medium Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All construction equipment must be scheduled for preventative maintenance to limit air pollution. 	Low	Low
Increase in carbon emissions and ambient air pollutants (NO ₂ and SO ₂) because of movement of vehicles and operation of machinery/equipment.	Medium Low	<ul style="list-style-type: none"> The number of construction vehicles and trips shall be kept to a minimum All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency and minimise emissions. 	Low	Low
Visual intrusion because of the movement of machinery and the establishment of the required infrastructure.	Low	<ul style="list-style-type: none"> The number of construction vehicles and machinery to be used shall be kept to a minimum. Movement of vehicles shall be kept to outside busy hours to minimise the visual impacts on the residents. Where possible, rehabilitation of the work areas shall be undertaken in tandem with construction to ensure that areas stripped of vegetation are kept to a minimum. The landscaping and green engineering solutions shall be utilised for rehabilitation and to minimise visual impacts. 	Low	Low
Indirect visual impact due to dust generation because of the movement of vehicles and materials, to and from the site area.	Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All construction equipment must be scheduled for preventative maintenance to limit air pollution. 	Low	Low
The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity	Low	<ul style="list-style-type: none"> All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise. Equipment must be operated within specifications and capacity (e.g. no overloading of machines). Regular maintenance of equipment must be undertaken, particularly about lubrication, Equipment must be operated with appropriate noise abatement accessories such as silencers and sound hoods, which must be correctly maintained. Equipment must be operated in such a way that the equipment is operated throughout the working periods instead of operating several items simultaneously. Equipment shall be switched off when not in operation. Appropriate directional and intensity settings must be maintained on all hooters and sirens. The contractor must ensure that the employees conduct themselves in an appropriate manner while on site. Adjacent landowners shall be notified in writing if work needs to be carried out after hours or if any blasting will be required. Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 16H00 and Saturday 07H00 -14H00). The contractor (s) shall comply with the traffic regulations 	Low	Low
Localised chemical pollution of soils because of vehicle hydrocarbon spillages and compaction.	Medium Low	<ul style="list-style-type: none"> On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100-year flood lines. Runoff from this area shall be contained. Spill kits shall be made available and all personnel shall be trained, and training records shall be made available on request. 	Low	Low
Localised clearing of vegetation and	Low	<ul style="list-style-type: none"> Vegetation removal to be kept to a minimum and preferably only alien floral species 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.		to be removed. Retain as much indigenous vegetation as possible. <ul style="list-style-type: none"> Exposed soils to be protected by means of a suitable geotextile covering such as hessian sheeting. Where possible, the rehabilitation of the work areas shall be undertaken in tandem with construction to minimize the amount of time soils are left exposed to weather elements. 		
Increase in traffic volumes because of pre-construction activities which may lead to an increase in traffic congestion on roads around the project area.	Medium Low	<ul style="list-style-type: none"> Local speed limits and traffic laws shall apply always to minimise the occurrences of accidents on public roads; Where possible the transportation of construction materials and rubbish shall be undertaken outside traffic peak hours to minimise inconveniencing residents; Materials transported on public roads must be covered. 	Low	Low
Emissions of Green House Gases because of the use of construction vehicles and machinery.	Low	<ul style="list-style-type: none"> The number of construction vehicles and trips shall be kept to a minimum All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency. 	Low	Low
Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Medium Low	<p>Separation of waste</p> <ul style="list-style-type: none"> Waste shall be stored in demarcated areas according to type of waste. Hazardous waste shall not be mixed with general waste and in doing so increase the quantities of hazardous waste to be managed. Runoff from any area demarcated for waste will be contained, treated and reused. Hazardous waste will be removed and managed by an approved service provider. A safe disposal certificate must be provided by the approved service provider as proof of responsible disposal of hazardous waste and kept on record. All waste management facilities will be maintained in good working order. No littering shall be allowed in and around the site, a sufficient number of bins shall be provided for the disposal of waste. Flammable substances must be kept away from sources of ignition and from oxidizing agents, The maximum retention time for temporary storage of waste generated shall not exceed 30 days, provided the waste does not present a health hazard or risk of odour. <p>Disposal of waste.</p> <ul style="list-style-type: none"> General waste will be collected in adequate number of litter bins located throughout the construction site. Bins must be provided with lids to keep rain water out. Bins shall be cleaned regularly to prevent the bins from overflowing. All work areas shall be kept clean and tidy always. All general waste shall be disposed of to the nearest licensed landfill site, Where necessary dedicate a storage area on site for collection of construction waste. No construction rubble shall be disposed of to the riparian area. If construction rubble is not removed immediately it shall be stockpiled outside the 1:50 year flood line and outside the sensitive riparian areas. All construction rubble shall be disposed of to an appropriate licensed landfill site. Concrete shall only be mixed in a dedicated area and surplus concrete shall be dispose of responsibly. Waste shall not be buried or burned on site. 	Low	Low
Disposal and storage of hazardous waste including hydrocarbon contaminated soils, rags etc will result in the contamination of surface runoff resulting in the deterioration of water quality of the lake	Medium Low	<p>Storage of hazardous substances</p> <ul style="list-style-type: none"> All bunding areas of hazardous substances will comply with the SANS standards. On surface bulk storage of hydrocarbons must be stored in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substances. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. The relevant safety signage must be provided to warn employees of the hazards in the area, The necessary fire-fighting facilities will be provided. All hazardous substances shall be stored in a secure, safe and weatherproof facility. The facility shall have an impermeable floor to prevent. All containers must be labelled according to the substance stored, substances are not allowed to be decanted into another container without the correct labelling displayed on the container, No combustible materials shall be stored near flammable substances; flammable substances shall be stored in a secured area. A register of all the hazardous substances shall be kept on site. The relevant Material Safety Data Sheets (MSDS) for all the hazardous substances shall be made available on request. <p>Handling of hazardous substances</p> <ul style="list-style-type: none"> All personnel responsible for handling hazardous substances shall be trained on how to store, handling and dispose of the material. Personnel shall be provided with the necessary personnel protective equipment to handle the hazardous substances. The MSDS will be made available at the point of use. <p>Disposal of hazardous substances</p> <ul style="list-style-type: none"> All empty hazardous substance containers shall be considered and shall be handled in accordance with the waste EMPPr. 	Low	Low
Potential indiscriminate disposal of hazardous and non-hazardous materials wastes within freshwater resources, leading to altered water quality, possible changes to flow patterns because of blockages caused by solid wastes/rubble	Medium Low	<ul style="list-style-type: none"> No wastes are permitted to be disposed of within Boksburg Lake or surrounding areas, and ensure that all wastes are removed to an appropriate disposal facility; Boksburg Lake to be designated a "No Go" area and off-limits to all personnel and vehicles, unless entry is unavoidable due to essential placement of infrastructure; and Where entry into Boksburg Lake is essential, such as for the construction of the rock-fill weir, designated entry/exit points to the lake must be demarcated to avoid indiscriminate movement through the lake. 	Low	
Stockpiling material resulting in secondary pollution and contamination of the Lake	Medium Low	<ul style="list-style-type: none"> No material removed from the river shall be disposed of to the 1:100-year floodline. Material removed from the Boksburg Lake shall be removed immediately to an 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented	
		appropriate licensed landfill site.			
Alternative 1: Dredging					
Potential impacts:	Significance rating of impacts(positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented	
Ineffective communication with affected property owners and property occupiers leading to conflict	Low	<ul style="list-style-type: none"> Random and regular alcohol and drug testing shall be conducted on all personnel responsible for operating machinery and driving construction vehicles to ensure the safety of the public. Security and safety should be emphasized. Liaise with the SAPD and existing forums in order to implement effective crime prevention strategies. No construction workers shall be allowed to access private properties without the owner's knowledge and consent. A register of complaints from the affected residents shall be kept on site and made available for inspection on request. Where possible, a community liaison officer shall be appointed to deal with complaints from the affected residents. 	Low	Low	
Construction activities may result in an increase in petty crimes in the area	Medium High		Low	Low	
Unauthorised access to private property may result in conflict with the property owners and occupiers	Low		Low	Low	
Poor housekeeping will result in the deterioration of water quality, increase in <i>E coli</i> resulting in potential health effects	Medium Low		<ul style="list-style-type: none"> Sufficient ablution facilities shall be provided to service the construction site (this must not exceed 20 users per toilet). The maximum walking distance from a work site to a toilet shall not exceed 50 metres, 	Low	Low
Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in <i>E coli</i> resulting in potential health effects	Medium Low		<ul style="list-style-type: none"> Ablution facilities shall not be placed within 100 m of the Boksburg Lake. Ablution facilities shall be serviced on a regular basis by an approved service provider to keep them in good, functional working order and in an acceptable state of hygiene. 	Low	Low
Lack of or poor sanitation will result in the contamination of surface runoff	Medium Low		<ul style="list-style-type: none"> Designated eating areas shall be provided for employees. Ablution facilities shall be serviced on a regular basis by an approved service provider to keep them in good, functional working order and in an acceptable state of hygiene. Contents from the chemical toilets shall not be discharged to into the environment but shall be removed by an approved service provider to the nearest waste water treatment works (Vlakplaats WWTW). 	Low	Low
Local spillages of oils from the dredger and vehicles leaching to groundwater contamination.	Medium Low		<ul style="list-style-type: none"> Ensure that no heavy machinery or vehicles are permitted within the freshwater resource, unless absolutely essential. Infrastructure layouts should be carefully planned and optimised in order to minimise encroaching on freshwater resource, thus negating the need for any machinery, vehicles or personnel to enter the lake. All vehicles used to import rock must be inspected for leaks prior to entering the construction site. Any vehicles found to be leaking oils/hydrocarbons may not be allowed access; No washing of vehicles shall be allowed outside demarcated areas. Washing bays for vehicles and other equipment shall be provided with appropriate soakaways, will be clearly demarcated and will not be allowed to contaminate any surface runoff. Sufficient areas shall be provided for the maintenance and washing of vehicles. Refuelling of vehicles will only be allowed in designated areas. All construction equipment shall be parked in a demarcated area Drip trays shall be used when equipment is used for some time. On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100 year flood lines. Runoff from this area shall be contained. Spill kits shall be made available and all personnel shall be trained and training records shall be made available on request. 	Low	Low
Dredging will lead to resuspension of suspended solids into the lake, which will be washed downstream of the lake.	Medium High		<ul style="list-style-type: none"> Adequate stormwater management must be incorporated into the design of the proposed remedial measures in order to prevent erosion and the associated sedimentation of the lake. 	Medium Low	Low
Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the construction footprint area.	Medium High		<ul style="list-style-type: none"> Only essential construction personnel shall be permitted within the 1:100 year floodlines. All vehicles used to import rock must be inspected for leaks prior to entering the construction site. Any vehicles found to be leaking oils/hydrocarbons may not be allowed access; 	Medium Low	Low
Potential deterioration in water quality due to the potential accidental spillages of hazardous substances such as hydrocarbons from dredging machine and vehicles.	Medium High		<ul style="list-style-type: none"> Entry to Boksburg Lake must be by designated routes only (preferably at a stable, gently-sloping area of bank), and no indiscriminate movement within the lake and/or banks should be allowed All demarcated sensitive zones outside of the construction area shall be kept off limits during the construction phase. 	Medium Low	Low
Poor stormwater management leading to runoff from stockpiled dredged material removed from the lake resulting in the erosion of the stockpiles causing sedimentation of the Boksburg Lake.	Medium High	<ul style="list-style-type: none"> Edge effects during construction and operation need to be strictly controlled. The footprint area of the construction activities shall be limited to what is absolutely essential in order to minimise environmental damage. 	Medium Low	Low	
Impact on the hydrological functioning of the riparian systems due to dredging	Medium High	<ul style="list-style-type: none"> During construction, erosion protection berms shall be installed where the track has a slope of less than 2%, every 25 m where the track slopes between 2% and 10%, every 20 m where the track slopes between 10% and 15% and every 10 m where the track slope is greater than 15%. 	Medium Low	Low	
Loss of habitat and riparian zone ecological structure as a result of uncontrolled movement of the dredging machine on the banks of the lake	Medium High	<ul style="list-style-type: none"> Riparian areas shall be rehabilitated upon completion of the construction phase to ensure that the river system functions are re-instated, 	Medium Low	Low	
Impact on the hydrological functioning of the riparian systems as a result of changes to the wetland sociocultural service provisions	Medium High	<ul style="list-style-type: none"> Disturbed areas must be reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist). Where possible, construction activities shall be restricted to the drier winter months, if possible, to avoid sedimentation of the river system. 	Medium Low	Low	
Soil compaction and levelling as a result of vehicle movement leading to loss of	Medium High	<ul style="list-style-type: none"> Reprofiling of the banks of disturbed drainage areas to a maximum gradient of 1:3 to 	Medium Low	Low	

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
riparian habitat		<p>ensure bank stability must be conducted.</p> <ul style="list-style-type: none"> Sediment control measures must be put in place prior to commencement of construction activities. Ensure that the creation of the river diversion does not result in significant water level difference upstream and/or downstream of the installation site. The duration of impacts on the riparian areas must be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised (construction period must be kept as short as is possible). All construction activities within the lake should be take place in the low flow period of winter. Stream diversion must be kept as small as possible and extreme caution must be taken to prevent sedimentation of the downstream resources and where possible construction must be undertaken during the low flow period. The construction of piles within the coffer dams must be done as quickly as possible to reduce the duration of construction activities within the active channel. Construction areas must be reseeded with indigenous species as soon as construction has been completed. Sediment and erosion control measures must be maintained throughout the construction phase to minimise sedimentation downstream of the work areas. 		
Dredging operations may lead to possible release of toxic substances, and destruction of the bottom benthic community.	High	The impact cannot be mitigated	High	
Although the heritage study found no resources of cultural and/or heritage importance that will be affected by the project, a possibility remains that, there may be some resources that may be affected.	Low	<ul style="list-style-type: none"> If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. 	Low	Low
Site clearance in the river has potential to impact on palaeontological resources	Low	<ul style="list-style-type: none"> If fossils are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. 	Low	Low
Sedimentation of riparian resources leading to smothering of flora	Medium Low	<ul style="list-style-type: none"> Ensure that sedimentation control devices are in place prior to commencement of construction. Ensure that adequate stormwater control and management is incorporated into the detailed designs Movement of construction vehicles, personnel and machinery in the riparian zones shall be kept to a minimum. Adequate stormwater management must be incorporated into the design of the proposed remedial measures in order to prevent erosion and the associated sedimentation of the river system. Only essential construction personnel shall be permitted within the floodlines. All demarcated sensitive zones outside of the construction area shall be kept off limits during the construction phase. Edge effects during construction and operation need to be strictly controlled. The footprint area of the construction activities shall be limited to what is essential in order to minimise environmental damage. 	Low	Low
Loss of localised riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to uncontrolled movement of the dredging machine	Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. Where possible, rehabilitation cleared areas shall be undertaken in tandem with construction. 	Low	Low
Potential spreading of alien invasive species as indigenous vegetation is removed and pioneer alien species are provided with a chance to flourish.	Medium High	<ul style="list-style-type: none"> Edge effects of activities including erosion and alien/ weed control will be strictly managed in the riparian area; All sites disturbed by construction activities shall be monitored for colonization by exotic or invasive plants; Exotic or invasive plants shall be controlled as they emerge; An alien vegetation control program must be developed and implemented within the riparian and all disturbed areas. After removal of alien vegetation, the affected areas must be re-assessed to determine the success of the program and any follow up measures that may be required.; The eradicated plant material must be disposed of at an approved solid waste disposal site; During post-construction, an alien vegetation removal and monitoring plan must be compiled for those areas which were not effectively rehabilitated; The extent of invasion must be established through investigation to identify priority areas; Priority species shall be identified to control and develop protocols for the removal of all alien species e.g. mechanical removal, herbicidal treatment etc. Mechanical methods must be favored to chemical methods where possible for the removal of alien invasive species. Chemical removal shall only be undertaken by a suitably qualified and approved person; All disturbed areas shall be re-vegetated with indigenous riparian species; and As much vegetation growth as possible must be promoted in order to protect soils. In this regard, special mention is made of the need to use indigenous vegetation species where hydro seeding, rehabilitation planting (where applicable) are to be implemented. 	Low	Low
Movement of construction and dredging machinery may result in collision with fauna, resulting in loss of fauna.	Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. No trapping or hunting of fauna is shall be permitted. Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed. Should any SCC be encountered within the study area, these species will be relocated to similar habitat within or in the vicinity of the study area with the assistance of a suitably qualified specialist. No informal fires in the vicinity of construction areas shall be permitted. An alien vegetation control plan must be developed and implemented in order to manage alien plant species occurring within the study area, and to prevent further faunal habitat loss. 	Low	Low
Possible increase in dust generation, PM ₁₀	Medium Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
and PM _{2.5} as a result of bulk earthworks, operation of heavy machinery, and material movement.		<ul style="list-style-type: none"> of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All construction equipment must be scheduled for preventative maintenance to limit air pollution. 		
Increase in carbon emissions and ambient air pollutants (NO ₂ and SO ₂) as a result of movement of vehicles and operation of machinery/equipment.	Medium Low	<ul style="list-style-type: none"> The number of construction vehicles and trips shall be kept to a minimum All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency and minimise emissions. 	Low	Low
Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	Low	<ul style="list-style-type: none"> The number of construction vehicles and machinery to be used shall be kept to a minimum. Movement of vehicles shall be kept to outside busy hours to minimise the visual impacts on the residents. Where possible, rehabilitation of the work areas shall be undertaken in tandem with construction to ensure that areas stripped of vegetation are kept to a minimum. The landscaping and green engineering solutions shall be utilised for rehabilitation and to minimise visual impacts. 	Low	Low
Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All construction equipment must be scheduled for preventative maintenance to limit air pollution. 	Low	Low
The use of the dredging machine may generate noise in the immediate vicinity	Low	<ul style="list-style-type: none"> All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise. Equipment must be operated within specifications and capacity (e.g. no overloading of machines). Regular maintenance of equipment must be undertaken, particularly with regard to lubrication, Equipment must be operated with appropriate noise abatement accessories such as silencers and sound hoods, which must be correctly maintained. Equipment must be operated in such a way that the equipment is operated throughout the working periods instead of operating several items simultaneously. Equipment shall be switched off when not in operation. Appropriate directional and intensity settings must be maintained on all hooters and sirens. The contractor must ensure that the employees conduct themselves in an appropriate manner while on site. Adjacent landowners shall be notified in writing if work needs to be carried out after hours or if any blasting will be required. Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 16H00 and Saturday 07H00 -14H00). The contractor (s) shall comply with the traffic regulations 	Low	Low
Localised chemical pollution of soils as a result of hydrocarbon spillages and compaction.	Medium Low	<ul style="list-style-type: none"> On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100 year flood lines. Runoff from this area shall be contained. Spill kits shall be made available and all personnel shall be trained and training records shall be made available on request. 	Low	Low
Poor waste management will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Medium Low	<p>Separation of waste</p> <ul style="list-style-type: none"> Waste shall be stored in demarcated areas according to type of waste. Hazardous waste shall not be mixed with general waste and in doing so increase the quantities of hazardous waste to be managed. Runoff from any area demarcated for waste will be contained, treated and reused. Hazardous waste will be removed and managed by an approved service provider. A safe disposal certificate must be provided by the approved service provider as proof of responsible disposal of hazardous waste and kept on record. All waste management facilities will be maintained in good working order. No littering shall be allowed in and around the site, a sufficient number of bins shall be provided for the disposal of waste. Flammable substances must be kept away from sources of ignition and from oxidizing agents, The maximum retention time for temporary storage of waste generated shall not exceed 30 days, provided the waste does not present a health hazard or risk of odour. <p>Disposal of waste.</p> <ul style="list-style-type: none"> General waste will be collected in adequate number of litter bins located throughout the construction site. Bins must be provided with lids in order to keep rain water out. Bins shall be cleaned regularly to prevent the bins from overflowing. All work areas shall be kept clean and tidy at all times. All general waste shall be disposed of to the nearest licensed landfill site, Where necessary dedicate a storage area on site for collection of construction waste. No construction rubble shall be disposed of to the riparian area. 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
		<ul style="list-style-type: none"> If construction rubble is not removed immediately it shall be stockpiled outside the 1:50 year flood line and outside the sensitive riparian areas. All construction rubble shall be disposed of to an appropriate licensed landfill site. Concrete shall only be mixed in a dedicated area and surplus concrete shall be disposed of responsibly. Waste shall not be buried or burned on site. 		
Disposal and storage of hazardous waste including hydrocarbon contaminated soils, rags etc will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Medium Low	<p>Storage of hazardous substances</p> <ul style="list-style-type: none"> All bunding areas of hazardous substances will comply with the SANS standards. On surface bulk storage of hydrocarbons must be stored in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substances. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. The relevant safety signage must be provided to warn employees of the hazards in the area, The necessary fire-fighting facilities will be provided. All hazardous substances shall be stored in a secure, safe and weatherproof facility. The facility shall have an impermeable floor to prevent. All containers must be labelled according to the substance stored, substances are not allowed to be decanted into another container without the correct labelling displayed on the container, No combustible materials shall be stored in the vicinity of flammable substances; flammable substances shall be stored in a secured area. A register of all the hazardous substances shall be kept on site. The relevant Material Safety Data Sheets (MSDS) for all the hazardous substances shall be made available on request. <p>Handling of hazardous substances</p> <ul style="list-style-type: none"> All personnel responsible for handling hazardous substances shall be trained on how to store, handling and dispose of the material. Personnel shall be provided with the necessary personnel protective equipment to handle the hazardous substances. The MSDS will be made available at the point of use. <p>Disposal of hazardous substances</p> <ul style="list-style-type: none"> All empty hazardous substance containers shall be considered and shall be handled in accordance with the waste EMPR. 	Low	Low
Potential indiscriminate disposal of hazardous and non-hazardous materials wastes within freshwater resources, leading to altered water quality, possible changes to flow patterns as a result of blockages caused by solid wastes/rubble	Medium Low	<ul style="list-style-type: none"> No wastes are permitted to be disposed of within Boksburg Lake or surrounding areas, and ensure that all wastes are removed to an appropriate disposal facility; Boksburg Lake to be designated a "No Go" area and off-limits to all personnel and vehicles, unless entry is unavoidable due to essential placement of infrastructure; and Where entry into Boksburg Lake is essential, such as for the construction of the rock-fill weir, designated entry/exit points to the lake must be demarcated to avoid indiscriminate movement through the lake. 	Low	
Stockpiling of the dredged material resulting in secondary pollution and contamination of the Lake	Medium Low	<ul style="list-style-type: none"> No material removed from the river shall be disposed of to the 1:100 year floodline. Material removed from the Boksburg Lake shall be removed immediately to an appropriate licensed landfill site. 	Low	Low
Alternative 2: Lake Drawdown				
Potential impacts:	Significance rating of impacts(positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Ineffective communication with affected property owners and property occupiers leading to conflict	Low	<ul style="list-style-type: none"> Random and regular alcohol and drug testing shall be conducted on all personnel responsible for operating machinery and driving construction vehicles to ensure the safety of the public. 	Low	Low
Unauthorised access to private property may result in conflict with the property owners and occupiers	Low	<ul style="list-style-type: none"> Security and safety should be emphasized. Liaise with the SAPD and existing forums in order to implement effective crime prevention strategies. No construction workers shall be allowed to access private properties without the owner's knowledge and consent. A register of complaints from the affected residents shall be kept on site and made available for inspection on request. Where possible, a community liaison officer shall be appointed to deal with complaints from the affected residents. 	Low	Low
Poor housekeeping will result in the deterioration of water quality, increase in E coli resulting in potential health effects	Medium Low	<ul style="list-style-type: none"> Sufficient ablution facilities shall be provided to service the construction site (this must not exceed 20 users per toilet). The maximum walking distance from a work site to a toilet shall not exceed 50 metres, 	Low	Low
Irresponsible disposal of contents of chemical toilets may cause the deterioration of surface water quality, increase in E coli resulting in potential health effects	Medium Low	<ul style="list-style-type: none"> Ablution facilities shall not be placed within 100 m of the Boksburg Lake. Ablution facilities shall be serviced on a regular basis by an approved service provider to keep them in good, functional working order and in an acceptable state of hygiene. 	Low	Low
Lack of or poor sanitation will result in the contamination of surface runoff	Medium Low	<ul style="list-style-type: none"> Designated eating areas shall be provided for employees. Ablution facilities shall be serviced on a regular basis by an approved service provider to keep them in good, functional working order and in an acceptable state of hygiene. Contents from the chemical toilets shall not be discharged to into the environment but shall be removed by an approved service provider to the nearest waste water treatment works (Viakplaats WWTW). 	Low	Low
Local spillages of oils from vehicles and machinery leaching to groundwater contamination.	Medium Low	<ul style="list-style-type: none"> Ensure that no heavy machinery or vehicles are permitted within the freshwater resource, unless absolutely essential. Infrastructure layouts should be carefully planned and optimized in order to minimise encroaching on freshwater resource, thus negating the need for any machinery, vehicles or personnel to enter the lake. All vehicles used to import rock must be inspected for leaks prior to entering the construction site. Any vehicles found to be leaking oils/hydrocarbons may not be 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
		<p>allowed access;</p> <ul style="list-style-type: none"> No washing of vehicles shall be allowed outside demarcated areas. Washing bays for vehicles and other equipment shall be provided with appropriate soakaways, will be clearly demarcated and will not be allowed to contaminate any surface runoff. Sufficient areas shall be provided for the maintenance and washing of vehicles. Refueling of vehicles will only be allowed in designated areas. All construction equipment shall be parked in a demarcated area Drip trays shall be used when equipment is used for some time. On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100 year flood lines. Runoff from this area shall be contained. Spill kits shall be made available and all personnel shall be trained and training records shall be made available on request. 		
Although the heritage study found no resources of cultural and/or heritage importance that will be affected by the project, a possibility remains that, there may be some resources that may be affected. It must be noted that the Lake itself has a historical cultural value as it has been used by the community since its inception.	High	<ul style="list-style-type: none"> If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. 	High	Low
Site clearance in the river has potential to impact on palaeontological resources	Low	<ul style="list-style-type: none"> If fossils are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. 	Low	Low
Loss of localised riparian and aquatic biodiversity habitats due to drawdown and changing lake to a park.	Medium Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. Where possible, rehabilitation cleared areas shall be undertaken in tandem with construction. 	Low	Low
Sedimentation of downstream riparian resources leading to smothering of flora	Medium Low	<ul style="list-style-type: none"> Ensure that sedimentation control devices are in place prior to commencement of construction. Ensure that adequate stormwater control and management is incorporated into the detailed designs Movement of construction vehicles, personnel and machinery in the riparian zones shall be kept to a minimum. Adequate stormwater management must be incorporated into the design of the proposed remedial measures in order to prevent erosion and the associated sedimentation of the river system. Only essential construction personnel shall be permitted within the floodlines. All demarcated sensitive zones outside of the construction area shall be kept off limits during the construction phase. Edge effects during construction and operation need to be strictly controlled. The footprint area of the construction activities shall be limited to what is essential in order to minimise environmental damage. 	Low	Low
Loss of riparian floral species diversity including Species of Conservation Concern (SCC) and medicinal protected species due to site clearance	Low	<ul style="list-style-type: none"> Loss of aquatic habitat due to lake drawdown and filling cannot be mitigated 	Low	Low
Aquatic habitat loss as a result of construction activities of the access roads leading to loss of floral diversity.	High		High	High
Loss of ecological function and structure of the lake due to drawdown and infilling of the lake	High		High	
Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Low	<ul style="list-style-type: none"> Removal of riparian and instream vegetation shall be kept to a minimum, and where possible, only alien invasive floral species shall be removed. Indigenous vegetation shall be retained as much as is possible. No trapping or hunting of fauna is shall be permitted. Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed. Should any SCC be encountered within the study area, these species will be relocated to similar habitat within or in the vicinity of the study area with the assistance of a suitably qualified specialist. No informal fires in the vicinity of construction areas shall be permitted. An alien vegetation control plan must be developed and implemented in order to manage alien plant species occurring within the study area, and to prevent further faunal habitat loss. 	Low	Low
Possible increase in dust generation, PM10 and PM2.5 as a result of bulk earthworks, operation of heavy machinery, and material movement.	Medium Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All construction equipment must be scheduled for preventative maintenance to limit air pollution. 	Low	Low
Increase in carbon emissions and ambient air pollutants (NO ₂ and SO ₂) as a result of movement of vehicles and operation of machinery/equipment.	Medium Low	<ul style="list-style-type: none"> The number of construction vehicles and trips shall be kept to a minimum All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency and minimise emissions. 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	Low	<ul style="list-style-type: none"> The number of construction vehicles and machinery to be used shall be kept to a minimum. Movement of vehicles shall be kept to outside busy hours to minimise the visual impacts on the residents. Where possible, rehabilitation of the work areas shall be undertaken in tandem with construction to ensure that areas stripped of vegetation are kept to a minimum. The landscaping and green engineering solutions shall be utilised for rehabilitation and to minimise visual impacts. 	Low	Low
Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All construction equipment must be scheduled for preventative maintenance to limit air pollution. 	Low	Low
The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity	Low	<ul style="list-style-type: none"> All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise. Equipment must be operated within specifications and capacity (e.g. no overloading of machines). Regular maintenance of equipment must be undertaken, particularly with regard to lubrication, Equipment must be operated with appropriate noise abatement accessories such as silencers and sound hoods, which must be correctly maintained. Equipment must be operated in such a way that the equipment is operated throughout the working periods instead of operating several items simultaneously. Equipment shall be switched off when not in operation. Appropriate directional and intensity settings must be maintained on all hooters and sirens. The contractor must ensure that the employees conduct themselves in an appropriate manner while on site. Adjacent landowners shall be notified in writing if work needs to be carried out after hours or if any blasting will be required. Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 16H00 and Saturday 07H00 -14H00). The contractor (s) shall comply with the traffic regulations 	Low	Low
Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	Medium Low	<ul style="list-style-type: none"> On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substance. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. All preventative servicing of earth moving equipment and construction vehicles shall be serviced off site. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be situated outside the 1:100 year flood lines. Runoff from this area shall be contained. Spill kits shall be made available and all personnel shall be trained and training records shall be made available on request. 	Low	Low
Emissions of Green House Gases as a result of the use of construction vehicles and machinery.	Low	<ul style="list-style-type: none"> The number of construction vehicles and trips shall be kept to a minimum All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency. 	Low	Low
Disposal and storage of hazardous waste including hydrocarbon contaminated soils, rags etc will result in the contamination of surface runoff resulting in the deterioration of water quality of the watercourse	Medium Low	<p>Storage of hazardous substances</p> <ul style="list-style-type: none"> All bunding areas of hazardous substances will comply with the SANS standards. On surface bulk storage of hydrocarbons must be stored in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substances. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. The relevant safety signage must be provided to warn employees of the hazards in the area, The necessary fire-fighting facilities will be provided. All hazardous substances shall be stored in a secure, safe and weatherproof facility. The facility shall have an impermeable floor to prevent. All containers must be labelled according to the substance stored, substances are not allowed to be decanted into another container without the correct labelling displayed on the container, No combustible materials shall be stored in the vicinity of flammable substances; flammable substances shall be stored in a secured area. A register of all the hazardous substances shall be kept on site. The relevant Material Safety Data Sheets (MSDS) for all the hazardous substances shall be made available on request. <p>Handling of hazardous substances</p> <ul style="list-style-type: none"> All personnel responsible for handling hazardous substances shall be trained on how to store, handling and dispose of the material. Personnel shall be provided with the necessary personnel protective equipment to handle the hazardous substances. The MSDS will be made available at the point of use. <p>Disposal of hazardous substances</p>	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
		<ul style="list-style-type: none"> All empty hazardous substance containers shall be considered and shall be handled in accordance with the waste EMPr. 		
Potential indiscriminate disposal of hazardous and non-hazardous materials wastes within freshwater resources, leading to altered water quality, possible changes to flow patterns as a result of blockages caused by solid wastes/rubble	Medium Low	<ul style="list-style-type: none"> No wastes are permitted to be disposed of within Boksburg Lake or surrounding areas, and ensure that all wastes are removed to an appropriate disposal facility; Boksburg Lake to be designated a "No Go" area and off-limits to all personnel and vehicles, unless entry is unavoidable due to essential placement of infrastructure; and Where entry into Boksburg Lake is essential, such as for the construction of the rock-fill weir, designated entry/exit points to the lake must be demarcated to avoid indiscriminate movement through the lake. 	Low	
Stockpiling material resulting in secondary pollution and contamination of the Lake	Medium Low	<ul style="list-style-type: none"> No material removed from the river shall be disposed of to the 1:100 year floodline. Material removed from the Boksburg Lake shall be removed immediately to an appropriate licensed landfill site. 	Low	Low

OPERATIONAL PHASE

The impacts that may result as a result of activities during the operation phase are summarised in Table 10.

Table 10: Summary of the potential impacts that can be expected during the operation phase**Proposal: Aerators, Low crest weir and package filter plant**

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
Local spillages of oils from vehicles collecting waste from the package plant leading to soil and groundwater contamination.	Medium Low	<ul style="list-style-type: none"> All vehicles shall be parked in a demarcated area, situated outside the 1:100 year flood lines. Emergency areas shall be demarcated and protected with an impermeable surface. The emergency area shall be Runoff from the designated parking area shall be contained. Spill kits shall be made available and all personnel shall be trained and training records shall be made available on request. No indiscriminate movement through the resource and surrounding area shall be allowed. 	Low	Low
Routine maintenance and repair of rehabilitated areas and infrastructure, involving gaining access to the rock- fill weir and Dynadisc filtration plant. This may result in soil compaction, flattening of vegetation and soil and water contamination by hydrocarbons/oils. Furthermore, access to the lake may result in disturbances to the banks and the introduction of contaminants to the lake.	Medium Low	<ul style="list-style-type: none"> Access via designated routes only (no indiscriminate movement through the resource and surrounding area); Ensure there are no leakages from vehicles or equipment before entering Boksburg Lake; Only trained personnel may carry out maintenance activities; Material used to repair the rock-fill weir should be pre- washed and all contaminants removed where possible; and Any damaged vegetation should be rehabilitated where possible post-maintenance. 	Low	Low
Regular removal of solid wastes from the Boksburg Lake, which may result in the potential indiscriminate disposal of wastes, spillage of wastes into the main waterbody and disturbances to the banks	Medium High	<ul style="list-style-type: none"> Only trained personnel may remove solid wastes from the impounded portion of the lake; Adequate facilities for the disposal of wastes must be provided and maintained; Removal of wastes must take place via designated routes to limit indiscriminate movement within, and subsequent disturbance to, Boksburg Lake and surrounding areas; and Vegetation growth within the impounded portion of the lake must be limited, so as not to inhibit waste removal 	Low	Low
Possible increase in traffic due to vehicles transporting SS from the filter plant to a municipal landfill site	Medium Low	<ul style="list-style-type: none"> Local speed limits and traffic laws shall apply at all times to minimise the occurrences of accidents on public roads; Where possible the transportation of SS and other waste shall be undertaken outside traffic peak hours to minimise inconveniencing residents; Materials transported on public roads must be covered. 	Low	Low
Possible increase in dust generation, PM ₁₀ and PM _{2.5} as a result of bulk earthworks, operation of heavy machinery, and material movement.	Medium Low	<ul style="list-style-type: none"> Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities. Appropriate dust suppression measures may include spraying with water. Where practical possibly rehabilitation should be undertaken progressively. 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
		<ul style="list-style-type: none"> Dust from the construction activities shall not disturb the landowners in the area. A speed limit of 20 km/h shall apply to limit vehicle entrained dust from the unpaved roads. All equipment must be scheduled for preventative maintenance to limit air pollution. 		
Increase in carbon emissions and ambient air pollutants (NO ₂ and SO ₂) as a result of movement of vehicles and operation of machinery/equipment.	Medium Low	<ul style="list-style-type: none"> The number of construction vehicles and trips shall be kept to a minimum All the vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency and minimise emissions. 	Low	Low
Waste Management	Medium Low	<p>Storage of hazardous substances (Suspended Solids)</p> <ul style="list-style-type: none"> All bunding areas of hazardous substances will comply with the SANS standards. On surface bulk storage of hydrocarbons must be stored in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the substances. Bunded areas shall contain 110% of the stored volume. Bund areas must be impermeable. Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider. Regular inspections shall be carried out to ensure the integrity of the bundwalls. The relevant safety signage must be provided to warn employees of the hazards in the area, The necessary fire-fighting facilities will be provided. All hazardous substances shall be stored in a secure, safe and weatherproof facility. The facility shall have an impermeable floor to prevent. All containers must be labelled according to the substance stored, substances are not allowed to be decanted into another container without the correct labelling displayed on the container, No combustible materials shall be stored in the vicinity of flammable substances; flammable substances shall be stored in a secured area. A register of all the hazardous substances shall be kept on site. The relevant Material Safety Data Sheets (MSDS) for all the hazardous substances shall be made available on request. <p>Handling of hazardous substances</p> <ul style="list-style-type: none"> All personnel responsible for handling hazardous substances shall be trained on how to store, handling and dispose of the material. 	Low	Low

Nature of potential impact/risk	Significance Rating	Impact Management Actions (Proposed Mitigation Measures)	Significance Rating	Risk of the impact and mitigation not being implemented
		<ul style="list-style-type: none"> Personnel shall be provided with the necessary personnel protective equipment to handle the hazardous substances. The MSDS will be made available at the point of use. <p>Disposal of hazardous substances</p> <ul style="list-style-type: none"> All empty hazardous substance containers shall be considered and shall be handled in accordance with the waste EMPr. 		
Uncontrolled stormwater runoff from the Suspended Solids Storage Area resulting in contamination of the lake	Medium-High	<ul style="list-style-type: none"> The suspended solids from the lake will be treated as hazardous waste and the mitigation measures on the storage and handling of hazardous material will apply; The Suspended Solid storage areas shall be bunded; No runoff from the storage area shall be permitted to flow into the lake; A stormwater management plan shall be developed and sufficient stormwater management structures that separate clean and dirty water shall be installed on site; No suspended solids may be stored on site for more than 3 days; Personnel shall be provided with the necessary personnel protective equipment to handle the suspended solids; The MSDS will be made available at the point of use 	Low	Low
Alternative 1: Dredging				
Potential impacts:	Significance rating of impacts(positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
No impacts are envisaged once the lake has been dredged				
Alternative 2: Lake Drawdown				
Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
No impacts are envisaged once the lake has been emptied and filled up to create a park				

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

- Wetlands Delineation and Riparian Zone Impact Assessment;
- Heritage Resources Assessment;
- Status Quo Assessment Report; and
- Rehabilitation Plan Report.

Describe any gaps in knowledge or assumptions made in the assessment of the environment and the impacts associated with the proposed development.

The following assumptions are applicable to the aquatic ecological assessment impact assessment of the project:

- With ecology being dynamic and complex (i.e., seasonally variable), certain aspects (some of which may be important) may have been overlooked. It is, however, expected that the study area has been accurately assessed and considered, based on the field observations undertaken and the consideration of existing studies and monitoring data in terms of the wetland ecology;
- The wetland assessment and groundtruthed delineation were confined to the study area and did not include an assessment of the freshwater resources within surrounding properties. The surrounding area was however considered as part of the desktop assessment;
- The site visit for the aquatic assessment was undertaken on the 14th of November 2016. The effects of natural seasonal and long-term variation in the ecological conditions are therefore unknown, as aquatic and terrestrial ecosystems are dynamic and complex; and
- Data presented in the aquatic specialist studies report is the result of in-situ field assessments undertaken on the aforementioned date via a thorough site inspection, however, the presence of aquatic macrophytes may have been overlooked as a result of a lack of direct access to the entire extent of the water body.

3. IMPACTS THAT MAY RESULT FROM THE DECOMMISSIONING AND CLOSURE PHASE

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the decommissioning and closure phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

It is not foreseen that the aerators, low crest weir and the package plant will be removed. It is likely that the aerators may be switched off when not in use and be switched on when it becomes necessary to aerate the lake, and the package plant will be required until the sewage issues in the catchment area have been resolved. Should the decommissioning and closure of the aerators, low crest weir and the package plant happen for some or other reason the potential impacts will be like that during construction of the measures.

Alternative 1				
Potential impacts:	Significance rating of impacts(positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented
Alternative 2				
Potential impacts:	Significance rating of impacts (positive or negative):	Proposed mitigation:	Significance rating of impacts after mitigation:	Risk of the impact and mitigation not being implemented

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

- Wetlands Delineation and Riparian Zone Impact Assessment;
- Heritage Resources Assessment;
- Status Quo Assessment Report; and
- Rehabilitation Plan Report.

Where applicable indicate the detailed financial provisions for rehabilitation, closure and ongoing post decommissioning management for the negative environmental impacts.

None.

4. CUMULATIVE IMPACTS

Describe potential impacts that, on their own may not be significant, but is significant when added to the impact of other activities or existing impacts in the environment. Substantiate response:

- **Vegetation:** The project is located in an area located in Klip River Grassland, which according to the SANBI is classified as threatened, with only 62% of the original area of the ecosystem remaining. Only 1 % of the original area of the ecosystem is protected. The grasslands are associated with key biodiversity including some red and orange listed flora and fauna. Vegetation associated with the Boksburg Lake area has been significantly transformed and is no longer considered a true representative of the Klip River Grassland vegetation type. Areas surrounding the Boksburg area consist mainly of landscaped grass. It is expected that the vegetation in this area is not likely to add to the conservation target of this vegetation type in the region in its present state and its loss from the study area is therefore not considered to contribute to any cumulative impacts. The development footprint of the project is also considered small in relation to the surrounding areas. The cumulative impact associated with the construction of the protection measures is therefore considered to be low (-).
- **Groundwater and Surface:** Currently the river is affected by water quality problems as result of contamination from sewer systems, industry, residential areas and sedimentation. It is expected that during construction the project may result in erosion of the banks and bed, as well as contamination of the water in the river. This will lead to an increased contamination and impact on the aquatic ecology. The potential groundwater and surface water quality impact associated with the project also relates to the potential contamination as a result of mismanagement of materials stored and leakages from vehicles and machinery. There is a lot of vehicle movement associated with the location of the lake, and it is likely that there is groundwater and surface water contamination emanating from the current movement of vehicles around the lake. Mismanagement of materials stored on site and leakage of hydrocarbons may lead to an increase in the cumulative effect of potential contamination of groundwater and surface water quality downstream of the development area. It must however be noted that the impacts will be of short duration (during the construction phase). Mitigation measures have been proposed for the impacts on ground water and surface water contamination. It is expected that with the implementation of the mitigation measures this impact will be reduced to an acceptable level.
- **Air Quality:** The potential air quality impacts associated with the project relate to the potential generation of PM2.5, PM10 and fugitive dust emissions as a result of site clearance, vehicular movements as well as carbon emissions and ambient air pollutants (NO₂ and SO₂) as a result of movement of vehicles and operation of machinery/equipment. The majority of the land use in the vicinity of the Boksburg Lake is mostly business/commercial and residential in nature, associated with a lot of vehicular movement in the vicinity of the lake contributing air quality impacts. The movement of construction vehicles associated with the rehabilitation of the Boksburg Lake will lead to additional air quality impacts. The impacts are expected to be of low significance and can be mitigated to be of very low significance.
- **Noise:** The potential noise nuisance associated with the project relates to the movement of vehicles and operation of machinery on site. Mitigation measures have been proposed to avoid and /or reduce the nuisance noise impacts. It is expected that with the implementation of the mitigation measures this impact will be reduced to an acceptable level.
- The majority of the land use in the vicinity of the Boksburg Lake is mostly business/commercial and residential in nature. There is a lot of vehicle movement associated with the location of the lake, contributing to nuisance noise levels. Mismanagement of sources of noise at the lake may lead to an increase in the cumulative effect of nuisance noise in the vicinity of the lake.

It must be also be noted that the implementation of the project itself is considered to be a form of mitigation in terms of addressing the issues such as sedimentation and water contamination that is currently posing a threat to the health of the residents of EMM, the aquatic fauna and flora. Although the lake is not necessarily especially sensitive to further negative impacts, the ecology thereof may respond positively to intervention measures thus leading to an overall improvement of the system. For this reason, further degradation to the system should not be permitted, whether it be through direct impacts arising from the implementation of rehabilitation/intervention measures, or indirect impacts associated with the edge effects of increasing urbanisation. Therefore, whilst rehabilitation/intervention is deemed essential in order to prevent further degradation of the system, it is equally essential that such activities do not impact negatively on the lake and

surrounding areas

5. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that sums up the impact that the proposal and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Proposal: Aerators, Low Crest Weir and Package Filter Plant

It is expected that the impacts of all the alternatives during the construction phase will be similar and will include:

- Changes to instream habitat and biota,
- Deterioration of surface water quality due to sedimentation,
- Contamination of soils and groundwater,
- Loss of sensitive aquatic taxa;
- Loss of terrestrial biodiversity;
- Proliferation of alien invasive species;
- Deterioration in air quality, and
- Increase in ambient noise levels.

Movement of earth moving equipment within the project area will be required for the removal of any existing infrastructure and establishment of foundations. The removal of any existing infrastructure from the lakebed will potentially result in the loss of and/or changes to the instream habitat and instream biota. The construction of the weir through rock-fill placement, positioning and profiling will involve the use of trucks and 20T excavators, and may result in the compaction of soils and flattening of vegetation by vehicles, damage to the banks, and exposure of soils and subsequent increased risk of sedimentation to the lake

Excavation into banks of the dam and surrounding areas for concrete-works necessary for the construction of the Dynadisc filtration plant will result in soil exposure, with a subsequent increased risk of soil erosion and sedimentation of the lake.

It is expected that construction activities will be conducted during the dry months and this will likely result in an increase in nuisance dust. The impact will occur for the duration of the construction phase but will be localised and have a medium severity. The impact will thus have a *medium* significance but will be mitigated with the implementation of dust suppression measures to an impact with *low* significance.

Earth moving equipment and construction vehicles may potentially increase ambient noise levels. The duration of the impact will be throughout the construction phase while construction activities are underway. Once the construction activities stop the ambient noise, levels will return to what it was prior to the construction activities. The impact will have an overall *medium* significance.

Due to the nature of construction activities hydrocarbon spillages is likely to occur. This will result in the deterioration of the water quality and contamination of soils and changes to the instream biota. The impact may occur throughout the construction phase but will be of local importance since the water may not be contained to the immediate site. The impact will reduce the functionality of the receiving environment but it will still continue to function in a modified way. Thus the impact will have a *medium* significance prior to the implementation of any mitigation measures. The implementation of mitigation measures will reduce the probability that an incident may occur and should the necessary materials be available the impact will be contained to the immediate site thus reducing the significance of the impact to *low*.

The movement of construction vehicles and personnel will result in the disturbance of the soil, which may result in the erosion of the lakebed and banks. The erosion will result in an increase in suspended solids and the loss of soil. This impact will be localised, but will have a high severity due to the loss of soils, which cannot be recovered without difficulty. The impact will have a *medium* significance prior to the implementation of mitigation measures. With the implementation of mitigation measures, the impact will be mitigated to a *low* significance.

Material removed from the lake will be stockpiled outside the 1:100 year floodlines. Uncontrolled runoff from the stockpiles will result in erosion of the stockpiles and the sedimentation of the Boksburg Lake. It is expected that the impact will have a *medium* significance prior to the implementation of any mitigation measures, which will be reduced to a *low* significance with the implementation of mitigation measures.

The construction of the low crest weir require temporary earth berms to be constructed on both sides of the construction areas to divert the flow of water through the area and create a dry area for the construction equipment to operate in. The water will be transferred through a pipe from the one side to the other. The cofferdams will result in the change in flow of the river. These cofferdams will be in place for the duration of the construction phase and will have a medium severity, but

the receiving environment will continue to function in a modified way. The impact will be of a *medium* significance without the implementation of the mitigation measures set out in this document. The significance of the impact will be reduced to a *low* with the implementation of mitigation measures.

The construction of the cofferdams can also result in the loss of habitat and aquatic integrity. The impact will have a short duration during the construction phase and will be contained locally. The impact will be of a *medium* significance without the implementation of the mitigation measures as detailed in the accompanying EMPr. The significance of the impact will be reduced to a *low* with the implementation of mitigation measures.

Water accumulating in the cofferdam or between the two earth berms needs to be removed to ensure that construction can continue and the concrete foundations can be constructed to the necessary standards. It is expected that the water will be high in suspended solids and will result in the deterioration of the receiving water environment if this water is discharged to the Boksburg Lake. This will have a medium severity and the impact will be contained to the local area. Water will likely be disposed of for the duration of the construction period and therefore will have an impact with a *medium* significance prior to the implementation of mitigation measures. This significance can be reduced to *low* when construction takes place during the dry season or when sedimentation ponds are used to settle out the suspended solids.

The storing and placing of construction materials and stockpiles, including the rock to be used for the low crest weir in the riparian area or within the 1:100 year floodline will result in the destruction of instream habitat and biota and increase in the silt load into the Boksburg Lake. This impact will be of short duration, as the dump rock will be used during the construction phase. The probability of the impact occurring is most likely and will have an impact with a *medium* significance without the implementation of mitigation measures. The impact will be mitigated to a *low* significance through the implementation of mitigation measures.

The lack of proper waste management will result in the deterioration of surface water, loss of instream habitat and an increase in general and hazardous waste to be managed. This will have a high severity should it occur but will have a short duration. Without the implementation of mitigation measures, the impact will have a *medium* significance. The implementation of mitigation measures set out in the EMPr will reduce the significance of the impact to a *low*.

Laydown areas will be provided for the construction equipment in agreement with the landowners. Surface water can be contaminated due to insufficient bunding of hydrocarbon fuels or provision of maintenance areas for the construction equipment. This impact will be for the duration of the construction phase. The probability of the impact occurring is likely and will be of *medium* significance without the implementation of mitigation measures. The implementation of mitigation measures will reduce the significance of the impact to *low*.

Provision of poor sanitation and poor housekeeping during the construction phase will result in the contamination of the surface water, which will result in a high severity. The impact will be for the duration of the construction phase. The probability that this might occur is most likely and will result in an impact with a *medium* significance, which could be mitigated to a *low* significance.

The probability that proliferation of alien and weed species in any of the disturbed areas will lead to the altered vegetation communities within the river system is likely. This will have a high severity as this will change the receiving environment and functioning of the river system largely or significantly. Active rehabilitation will be required to address the impact and will continue throughout the medium term if rehabilitation was not successful. The impact will be of *medium* significance.

The ineffective rehabilitation of the disturbed area will likely result in the transformation of the instream biota and habitat which will result in the loss of biodiversity and the inability of the river system to support biodiversity. Impacts identified for the operational phase are expected to be of *medium* and *low* significance without the implementation of the mitigation measures included in the EMPr. The implementation of the mitigation measures will reduce the significance of the impacts to *low*.

It is not foreseen that the low crest weir, package plant and aerators will be removed. But should this happen for some or other reason the potential impacts will be similar to that during construction of the measures. It must be also be noted that the implementation of the project itself is considered to be a form of mitigation in terms of addressing the issues such as sedimentation and water contamination that is currently posing a threat to the health of the residents of EMM, the aquatic fauna and flora. Although the lake is not necessarily especially sensitive to further negative impacts, the ecology thereof may respond positively to intervention measures thus leading to an overall improvement of the system. For this reason, further degradation to the system should not be permitted, whether it be through direct impacts arising from the implementation of rehabilitation/intervention measures, or indirect impacts associated with the edge effects of increasing urbanisation. Therefore, whilst rehabilitation/intervention is deemed essential in order to prevent further degradation of the system, it is equally essential that such activities do not impact negatively on the lake and surrounding areas.

Alternative 1: Dredging

It is expected that the impacts of dredging will include:

- Changes to instream habitat and biota,
- Deterioration of surface water quality due to sedimentation,

- Contamination of soils and groundwater,
- Loss of sensitive aquatic taxa;
- Loss of terrestrial biodiversity;
- Proliferation of alien invasive species;
- Deterioration in air quality, and
- Increase in ambient noise levels.

Movement of earth moving equipment within the project area will be required for the removal of any existing infrastructure and establishment of foundations. The removal of any existing infrastructure from the lakebed will potentially result in the loss of and/or changes to the instream habitat and instream biota.

The dredging of the lake may result in the resuspension of Suspended solids into the lake, which will be washed down and impact the water quality for downstream users. The impact will be of short duration, until the SS settles on the lakebed. Erosion of stockpiles and poor stormwater management may result in sedimentation of the Boksburg Lake. The impacts will have a *medium high* impact which can be reduced to *medium low* when the mitigation measures have been implemented.

The dredging of the lake may also result in changes or loss of aquatic ecological habitats, system functioning and structure. The impact will be on *medium high* significance and may be reduced to *medium low* significance when the mitigation measures are implemented.

Dredging operations may lead to possible release of toxic substances, and destruction of the bottom benthic community. The impact is expected to be of *high* significance and cannot be mitigated.

It is expected that construction activities will be conducted during the dry months and this will likely result in an increase in nuisance dust. The impact will occur for the duration of the construction phase but will be localised and have a medium severity. The impact will thus have a *medium* significance but will be mitigated with the implementation of dust suppression measures to an impact with *low* significance.

Movement of the dredger may potentially increase ambient noise levels. The duration of the impact will be throughout the construction phase while construction activities are underway. Once the construction activities stop the ambient noise, levels will return to what it was prior to the construction activities. The impact will have an overall *medium* significance.

Due to the nature of construction activities hydrocarbon spillages is likely to occur. This will result in the deterioration of the water quality and contamination of soils and changes to the instream biota. The impact may occur throughout the construction phase but will be of local importance since the water may not be contained to the immediate site. The impact will reduce the functionality of the receiving environment but it will still continue to function in a modified way. Thus the impact will have a *medium* significance prior to the implementation of any mitigation measures. The implementation of mitigation measures will reduce the probability that an incident may occur and should the necessary materials be available the impact will be contained to the immediate site thus reducing the significance of the impact to *low*.

The movement of the dredger and personnel will result in the disturbance of the soil, which may result in the erosion of the lakebed and banks. The erosion will result in an increase in suspended solids and the loss of soil. This impact will be localised, but will have a high severity due to the loss of soils, which cannot be recovered without difficulty. The impact will have a *medium* significance prior to the implementation of mitigation measures. With the implementation of mitigation measures, the impact will be mitigated to a *low* significance.

Material removed from the lake will be stockpiled outside the 1:100 year floodlines. Uncontrolled runoff from the stockpiles will result in erosion of the stockpiles and the sedimentation of the Boksburg Lake. It is expected that the impact will have a *medium* significance prior to the implementation of any mitigation measures, which will be reduced to a *low* significance with the implementation of mitigation measures.

The storing and placing of construction materials and stockpiles, including the dredged material in the riparian area or within the 1:100 year floodline will result in the destruction of instream habitat and biota and increase in the silt load into the Boksburg Lake. The probability of the impact occurring is most likely and will have an impact with a *medium* significance without the implementation of mitigation measures. The impact will be mitigated to a *low* significance through the implementation of mitigation measures.

The lack of proper waste management will result in the deterioration of surface water, loss of instream habitat and an increase in general and hazardous waste to be managed. This will have a high severity should it occur but will have a short duration. Without the implementation of mitigation measures, the impact will have a *medium* significance. The implementation of mitigation measures set out in the EMPr will reduce the significance of the impact to a *low*.

Laydown areas will be provided for the construction equipment in agreement with the landowners. Surface water can be contaminated due to insufficient bunding of hydrocarbon fuels or provision of maintenance areas for the construction equipment. This impact will be for the duration of the construction phase. The probability of the impact occurring is likely and will be of *medium* significance without the implementation of mitigation measures. The implementation of mitigation

measures will reduce the significance of the impact to *low*.

Provision of poor sanitation and poor housekeeping during the construction phase will result in the contamination of the surface water, which will result in a high severity. The impact will be for the duration of the construction phase. The probability that this might occur is most likely and will result in an impact with a *medium* significance, which could be mitigated to a *low* significance.

The probability that proliferation of alien and weed species in any of the disturbed areas will lead to the altered vegetation communities within the river system is likely. This will have a high severity as this will change the receiving environment and functioning of the river system largely or significantly. Active rehabilitation will be required to address the impact and will continue throughout the medium term if rehabilitation was not successful. The impact will be of *medium* significance.

Provision of poor sanitation and poor housekeeping during the construction phase will result in the contamination of the surface water, which will result in a high severity. The impact will be for the duration of the construction phase. The probability that this might occur is most likely and will result in an impact with a *medium* significance, which could be mitigated to a *low* significance.

The probability that proliferation of alien and weed species in any of the disturbed areas will lead to the altered vegetation communities within the river system is likely. This will have a high severity as this will change the receiving environment and functioning of the river system largely or significantly. Active rehabilitation will be required to address the impact and will continue throughout the medium term if rehabilitation was not successful. The impact will be of *medium* significance.

It must be noted that EMM has used dredging in the past to try and rehabilitate the lake. Past experience has shown that dredging is not an effective way to rehabilitate the lake long term.

Alternative 2: Lake Drawdown

It is expected that the impacts of drawdown and infilling of the lake will include:

- Loss of instream habitat and biota,
- Deterioration of downstream surface water quality,
- Contamination of soils and groundwater,
- Loss of sensitive aquatic taxa;
- Loss of terrestrial biodiversity;
- Proliferation of alien invasive species;
- Increase in ambient noise levels.

Movement of earth moving equipment within the project area will be required for the removal of any existing infrastructure and establishment of foundations. The removal of any existing infrastructure from the lakebed will potentially result in the loss of and/or changes to the instream habitat and instream biota.

The drawing down and infilling of the lake will result in a permanent loss of the aquatic ecosystem and its function. The impact is expected to be of *high* significance and cannot be mitigated. Although the heritage study found no resources of cultural and/or heritage importance that will be affected by the project, a possibility remains that, there may be some resources that may be affected. It must be noted that the Lake itself has a historical cultural value as it has been used by the community since its inception. The social impact from the loss of the lake is also expected to be of high significance and cannot be mitigated a once the lake is infilled, the social recreational function is also lost.

The infilling of the lake may result in sedimentation of the water resources downstream of the Boksburg Lake. The impacts will have a *medium high* impact which can be reduced to *medium low* when the mitigation measures have been implemented.

It is expected that construction activities will be conducted during the dry months and this will likely result in an increase in nuisance dust. The impact will occur for the duration of the construction phase but will be localised and have a medium severity. The impact will thus have a *medium* significance but will be mitigated with the implementation of dust suppression measures to an impact with *low* significance.

Movement of construction vehicles and machinery may potentially increase ambient noise levels. The duration of the impact will be throughout the construction phase while construction activities are underway. Once the construction activities stop the ambient noise, levels will return to what it was prior to the construction activities. The impact will have an overall *medium* significance.

Due to the nature of construction activities hydrocarbon spillages is likely to occur. This will result in the contamination of soils and groundwater. The impact will have a *medium* significance prior to the implementation of any mitigation measures. The implementation of mitigation measures will reduce the probability that an incident may occur and should the necessary materials be available the impact will be contained to the immediate site thus reducing the significance of the impact to *low*.

The lack of proper waste management will result in the deterioration of surface water, loss of instream habitat and an increase in general and hazardous waste to be managed. This will have a high severity should it occur but will have a short duration. Without the implementation of mitigation measures, the impact will have a *medium* significance. The implementation of mitigation measures set out in the EMP will reduce the significance of the impact to a *low*.

Laydown areas will be provided for the construction equipment in agreement with the landowners. Groundwater can be contaminated due to insufficient bunding of hydrocarbon fuels or provision of maintenance areas for the construction equipment. This impact will be for the duration of the construction phase. The probability of the impact occurring is likely and will be of *medium* significance without the implementation of mitigation measures. The implementation of mitigation measures will reduce the significance of the impact to *low*.

Provision of poor sanitation and poor housekeeping during the construction phase will result in the contamination of the downstream surface water resources, which will result in a high severity. The impact will be for the duration of the construction phase. The probability that this might occur is most likely and will result in an impact with a *medium* significance, which could be mitigated to a *low* significance.

The probability that proliferation of alien and weed species in any of the disturbed areas will lead to the altered vegetation communities within the river system is likely. This will have a high severity as this will change the receiving environment and functioning of the river system largely or significantly. Active rehabilitation will be required to address the impact and will continue throughout the medium term if rehabilitation was not successful. The impact will be of *medium* significance.

Provision of poor sanitation and poor housekeeping during the construction phase will result in the contamination of the surface water resources, which will result in a high severity. The impact will be for the duration of the construction phase. The probability that this might occur is most likely and will result in an impact with a *medium* significance, which could be mitigated to a *low* significance.

The probability that proliferation of alien and weed species in any of the disturbed areas will lead to the altered vegetation communities in the area. Active rehabilitation will be required to address the impact and will continue throughout the medium term if rehabilitation was not successful. The impact will be of *medium* significance.

No-go (compulsory)

The status quo (no-go) option will mean that the current state of the Boksburg Lake, including severe sedimentation and water quality issues will continue. The status quo assessment of the lake showed that the levels of E coli and faecal coliforms in the lake are at unacceptable levels. This was supported by the findings of the aquatic assessment which found that currently the only fish species in the lake are the hardy species that can survive in ecosystems with poor water quality. The state of the lake is such a state that it cannot in its current state be utilised for recreational purposes as it was intended. It is expected that should the situation not be resolved, the lake will fill up with sediments and sewage and will eventually dry up.

As the status quo assessment of the lake shows, in the long term if nothing was done to the lake it would completely silt up defeating the purpose of the lake for recreational and aesthetics.

The status quo assessment the sediment trapping in the Lake is estimated as 96 %. The 2010 to 2016 observed sediment load at the Lake inlet is therefore $4391/0.96 = 4574$ t/a.

Based on the Oct 2016 survey of the FSC=420329 m³ it could take more than 50 years for the Lake to silt up completely. The trap efficiency will decrease as the equilibrium is reached which should be considered, but an extreme flood could bring in up to 13 times the mean annual sediment load, which could speed up the siltation process.

The construction of the silt trap designed by Aurecon upstream of Boksburg lake would intercept silt before it entered the lake that would then extend this 50-year projection.

In the "do nothing" approach where no mitigation measures are taken to ameliorate the inflows to the lake it would cease to be a lake but a swamp filled with hazardous sedimentation.

Measures to be taken in a "do nothing" approach would be to rather concentrate on improving the water quality flowing into the lake in line with the recommendations in Chapter 2 Catchment Management.

This approach will have the benefit of starting to achieve the objectives on the purposes of the lake for its recreational and aesthetic requirements. It will however not address the sediments.

Purification of water depends on natural filtration, chemical absorption and adsorption by soil particles and organic matter, living organism uptake of nutrients, and living organism decomposition processes in soil and water environments. Human activities that contaminate storm water with pollutants, or alter the composition of soil and water-based organisms, eventually reduce or retard the natural water purification process and cause accelerated movement of water through the system. Improving the water quality of the inflows to the lake is a fundamental step in letting the natural process purify the water.

Soils, especially in wetland and riparian areas, along with vegetation and microorganisms play very important roles in natural water purification. Microorganisms in soils, wetlands and riparian areas either utilize or breakdown numerous chemical and biological contaminants in water. If the general quality of the water entering the lake is improved where vegetation and micro-organisms life can be sustained these processes would in time breakdown chemical and biological contaminants in water and sediments. Furthermore, if the Catchment Management measures were implemented as proposed "clean" sediments would then enter the lake and ultimately cap the older sediments.

Improvement of the water quality entering the lake would facilitate the natural water purification processes to start

activating with better Dissolved Oxygen (DO) content in the water. DO can be improved with aeration techniques.

In effect if the water quality of the inflows to the lake are improved and the natural water purification processes are activated then Boksburg Lake will become its own water treatment works.

6. IMPACT SUMMARY OF THE PROPOSAL OR PREFERRED ALTERNATIVE

For proposal: **Aerators, Low Crest Weir and Package Filter Plant**

The Boksburg Lake study area has been critically modified from its reference condition (Channeled Valley Bottom Wetland). This change is associated with an intermediate level of ecosystem service provision, where the majority of "higher" scoring services are associated with hydrogeological service provision (e.g., flood attenuation and toxicant assimilation). However, the use of the lake for recreational purposes and direct resource provision (e.g., water) is severely reduced given the low water quality, sediment build-up, presence of solid waste and litter as well as the significant encroachment of invasive alien vegetation. Measures to rehabilitate the system and to improve service provision and ecological functioning should be sought. The main impacts of the proposed project are expected to be on the riparian and aquatic ecology, in terms of water quality, aquatic ecology and riparian habitat degradation. These impacts will be limited to the construction phase, until rehabilitation is complete. During the operation phase, it is expected that there may be need to inspect and/or repair the low crest weir from time to time. This may have very low impacts on the lake due to the fact that access to the lake will be required. The aerators will need to be freed from debris from time to time, which will also require access to the lake from time to time.

The implementation of the mitigation measures in the EMP will ensure that the impacts are kept to a minimum and/or avoided. The operation of the package plant is not expected to have any high significance impacts on the lake as no access to the lake will be required for the maintenance and repair of the plant.

For alternative: **Dredging**

The wetland delineation study found that dredging of the Boksburg Lake will not only significantly improve attenuation of stormwater, but also remove nutrient rich sediment that may pose a problem to the ecology of the system (by causing eutrophication). However, it must be ensured that the disturbed and removed sediment, as well as dirty water, does not migrate downstream and impact upon the ecology of other freshwater features;

An estimated 60 000m³ of de-watered sediments would be excavated from the lake. A number of options were considered for the treatment of the sediments so that they could be used but the cost thereof is prohibitive and rendering them inert is not conclusive. If the sediments were to be disposed of to a licensed hazardous waste facility they would have to be transported in closed contained vehicles and the cost of disposal is prohibitive.

Dredging the lake does not address the cause of its current condition. If the sediments were to be removed, in a number of years the process will have to be repeated and it will not improve the water quality. The poor water quality of the lake is because of the high Chemical Oxygen Demand (COD), low Dissolved Oxygen (DO) levels and the high Suspended Solids (SS) which originate from the sewerage that enters the municipal storm water system that drains into the lake.

However previous experience has demonstrated that dredging is not a long term viable option. EMM has dredged the lake, with the last operation being conducted in the 1990s. However, with time the situation has reverted back to what it was before dredging was conducted. Although dredging can be useful in addressing the sedimentation, it will not address the current water quality situation in the lake.

For alternative: **Lake Drawdown**

Although the majority of the impacts are classified as low to medium, the drawing down and infilling of the lake will also have *high* significance impacts for downstream users and once the lake has been turned into a park, the impacts (loss of the aquatic ecosystem and function) will be irreversible.

Boksburg lake has been in existence since the 1890's and has been iconic landmark in the history of Boksburg. From a historical and heritage consideration the Boksburg community do not support this option.

One of the functions of the Boksburg Lake is that it forms a storm water attenuation function during storm events and by draining it this function will be lost causing flooding downstream.

Downstream of the Boksburg Lake is the Cinderella Lake. If Boksburg lake was to be drained all the inflows that currently enter Boksburg lake would go directly into Cinderella Dam and in effect the problems being experienced in Boksburg Lake would just be transferred downstream.

Having assessed the significance of impacts of the proposal and alternative(s), please provide an overall summary and reasons for selecting the proposal or preferred alternative.

The Boksburg Lake study area has been critically modified from its reference condition (Channeled Valley Bottom Wetland). This change is associated with an intermediate level of ecoservice provision, where the majority of "higher" scoring services are associated with hydrogeological service provision (e.g., flood attenuation and toxicant assimilation). However, the use of the lake for recreational purposes and direct resource provision (e.g., water) is severely reduced given the low water quality, sediment build-up, presence of solid waste and litter as well as the significant encroachment of invasive alien vegetation. Measures to rehabilitate the system and to improve service provision and ecological functioning should be sought. An assessment of the lake including the status quo assessment and description of the desired state was conducted as part of drafting of the rehabilitation plan. A number of options that may be implemented to rehabilitate the state of the lake were identified.

The main impacts associated with the proposed project are expected to be on the riparian and aquatic ecology, in terms of water quality, aquatic ecology and riparian habitat degradation. These impacts will be limited to the construction phase, until rehabilitation is complete. During the operation phase, it is expected that there may be need to inspect and/or repair the low crest weir from time to time. The aerators will need to be freed from debris from time to time, which will also require access to the lake from time to time. The impacts from the operational phase are expected to be of medium significance, which can be reduced to low significance when the mitigation measures have been implemented.

The preferred option will result in the long term improvement of the situation in the lake, where dredging has historically been proven to have short term benefits. Should the lake be infilled, the ecological and social functions of the lake will be lost. The lake also has an attenuation effect and can also cause upstream and downstream flooding which had to be considered. Case studies of similar situations have shown that the use of aerators had marked impact on improving the condition of the water. Aerators have previously been successfully used in Boksburg lake. These were the turbine type and were damaged by polypropylene bags, tyres and other debris from the lake and as a consequence removed. The proposed vertical shaft aerators proposed work in a different way and have an anti-fouling propeller. These were used for approximately 10 years in the Brakpan Lake and within a week of the removal of these units the Blue-Green algae proliferated. The installation of the aeration units will include a screening pen to filter out large debris.

The implementation of the mitigation measures in the EMP will ensure that the impacts are kept to a minimum and/or avoided. The operation of the package plant is not expected to have any high significance impacts on the lake as no access to the lake will be required for the maintenance and repair of the plant.

7. SPATIAL DEVELOPMENT TOOLS

Indicate the application of any spatial development tool protocols on the proposed development and the outcome thereof.

The Spatial Development Framework (SDF) is the legislated component of the municipality's Integrated Development Plan (IDP) that prescribes development strategies and policy guidelines to restructure and reengineer the urban and rural form. The SDF is the municipality's long-term vision of what it wishes to achieve spatially, and within the IDP programmes and projects. The SDF should not be interpreted as a blueprint or master plan aimed at controlling physical development, but rather the framework giving structure to an area while allowing it to grow and adapt to changing circumstances. The proposed project has considered and is guided by the Regions SDF and IDP priorities of the area. It aims to empower the local economy, which is individuals and local business in terms of job creation and skills development.

According to the EMM SDF The land use proposals of the Ekurhuleni Spatial Development Framework require the implementation of a range of policies and strategies in order to re-create a smart, creative and developmental city. The policies and strategies required for spatial transformation includes the Environmental Policies as follows:

- Integrating Natural Open Space into the Urban Context to protect open spaces as well as making use of open spaces to fulfil a variety of socio-economic community needs. The rehabilitation of the Boksburg Lake will enable and encourage the EMM and its communities to make use of the Lake and associated park for its original purpose, recreational.
- Integrated Water Resources Management Planning (IWRMP): According to the EMM SDF, pollution from various sources, be it illegal dumping or lack of adequate solid waste collection services, is a serious threat to the sustainability of the vibrant ecosystem of the natural resources in the Metro. Some of the resultant impacts on the natural water courses are:
 - Lakes pollution;
 - Wetland vital ecosystem integrity degradation; and
 - River pollution.

The SDF states that there is a definite strain and deterioration of wellness and proper functioning of the ecosystem in most of the water courses within the Metro and that there is an urgent need for a collective, particularly within the structures of EMM, to address the situation. The rehabilitation of the Boksburg Lake will contribute to the IWRMP and SDF as it will reduce pollution in the lake.

The project is expected to create employment during the construction phase as well as boosting the local economy. Although the direct socio-economic benefits are expected to be short term. The proposed project is aimed at protecting biodiversity by ensuring that the state of the Boksburg Lake is improved. The construction of the erosion protection measures will result in the reduction in sedimentation of the river, improving the aquatic environment.

According to the Gauteng Province Environmental Management Framework, which forms part of the Gauteng SDF, the project is located within Zone 1 (Urban Development Zone: high control zones) (Figure 18)).

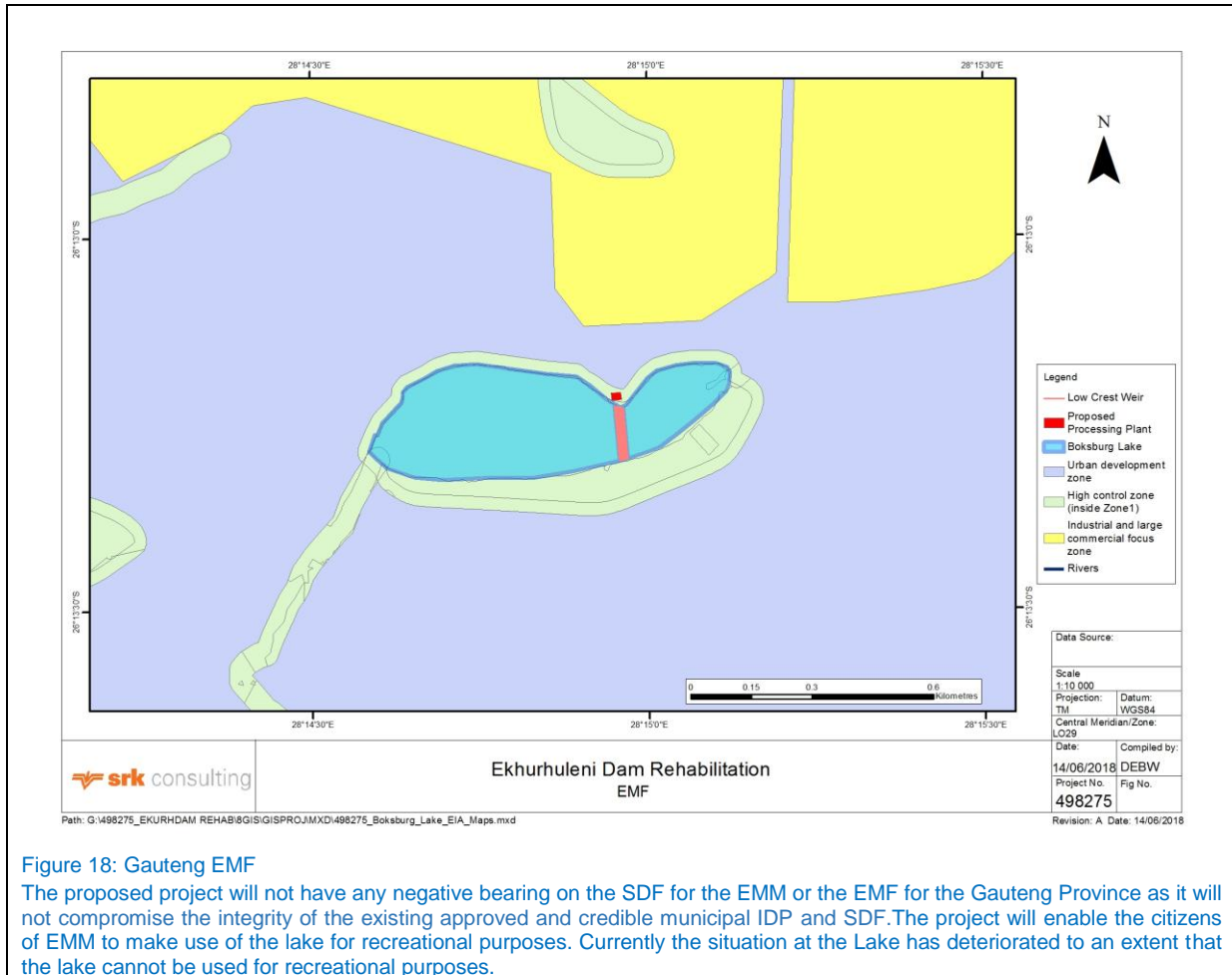


Figure 18: Gauteng EMF

The proposed project will not have any negative bearing on the SDF for the EMM or the EMF for the Gauteng Province as it will not compromise the integrity of the existing approved and credible municipal IDP and SDF. The project will enable the citizens of EMM to make use of the lake for recreational purposes. Currently the situation at the Lake has deteriorated to an extent that the lake cannot be used for recreational purposes.

8. RECOMMENDATION OF THE PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the Environmental Assessment Practitioner as bound by professional ethical standards and the code of conduct of EAPASA).

YES	<input type="checkbox"/>
X	<input checked="" type="checkbox"/>

If “NO”, indicate the aspects that require further assessment before a decision can be made (list the aspects that require further assessment):

N/A

If “YES”, please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application:

This BAR addresses a detailed analysis of the potential impacts associated with the proposed rehabilitation project. The proposed development will have an impact of low significance, provided that the mitigation measures proposed in this report and the EMPr are effectively implemented. The construction of the remediation measures must be conducted under duty of care and must be in accordance with the mitigation measures that were included in the EMPr to ensure that impacts are prevented and if they do occur they are kept to the minimum. It is therefore recommended that the proposed project is approved, subject to the following conditions and mitigation measures:

- The EMPr of this proposed development must form part of the contractual agreement and be adhered to by both the contractors and the applicant.
- Adequate stormwater management must be incorporated into the design of the project in order to prevent erosion and the associated sedimentation of the aquatic system;
- The construction footprint shall be kept to a minimal.
- All hazardous storage containers, storage areas and bunding areas for hazardous substances must comply with the relevant SANS standards to prevent leakage;
- Bulk storage of hydrocarbons must be stored in a dedicated area outside the project site and must include a bund

<p>or a drain where necessary to contain any spillages during the use, loading and off-loading of the substances;</p> <ul style="list-style-type: none"> • The time in which soils are exposed during construction activities will remain as short as possible; • Stockpiles shall be maintained until the topsoil is required for rehabilitation purposes; • All construction materials shall be kept out of the wetlands and riparian areas; • Exotic or invasive plants shall be controlled as they emerge; • An alien vegetation control program must be developed and implemented within the riparian and all disturbed areas. After removal of alien vegetation, the affected areas must be re-assessed to determine the success of the program and any follow up measures that may be required.; • A suitably qualified specialist (ecologist) shall be contracted to identify alien species and carry out eradication measures according to the Conservation of Agricultural Resources Act and Associated Regulations as follows: <ul style="list-style-type: none"> ○ Category 1 weeds and invader plants: the Contractor shall actively remove all growth forms of Category 1 weeds from all work areas, at all times; and ○ Category 2 and 3 weeds and invader plants: the Contractor shall actively remove all Category 2 and 3 plants prior to flowering. • The eradicated plant material must be disposed of at an approved solid waste disposal site; and • During post-construction, an alien vegetation removal and monitoring plan must be compiled for those areas which were not effectively rehabilitated. • A Water Use Licence must be obtained for the construction activities within 100 m of the Boksburg Lake <p>It is the considered opinion of the EAP that the rehabilitation of the Boksburg Lake project will comply with current relevant legislation, and that with the implementation of the mitigation measures in this BAR, there are no environmental impacts identified as highly detrimental to the environment. An aquatic ecological specialist study was conducted as part of the BA.</p>

9. THE NEEDS AND DESIREBILITY OF THE PROPOSED DEVELOPMENT (as per notice 792 of 2012, or the updated version of this guideline)

Questions (Notice 792, NEMA, 2012)		Response
PART I: NEED		
1.	Is the land use associated with the activity being applied for considered within the timeframe intended by the existing approved SDF agreed to be the relevant environmental authority?	N/A. The proposed project has no bearing on the SDF.
2.	Should the development, or if applicable, expansion of the town/area concerned in terms of this land use occurs here at this point in time?	Yes. The project will result in the improvement in the status of the Boksburg Lake, which will enable the citizens of EMM of make use of the Lake for recreational purposes.
3.	Does the community/area need the activity and the associated land use concerned? This refers to the strategic as well as local level.	Yes. The project will result in the improvement in the status of the Boksburg Lake, which will enable the citizens of EMM of make use of the Lake for recreational purposes.
4.	Are the necessary services with adequate capacity currently available (at the time of application) or must additional capacity be created to cater for the development?	No additional capacity will be required for the project.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of the services and opportunity cost)?	Not applicable. The objective of the project is to rehabilitate the Boksburg Lake so that it can be used for recreational purposes as it was intended. The project will have no bearing on the infrastructure planning of the municipality.
6.	Is the project part of a national programme to address an issue of national concern or importance?	The protection of water resources forms part of the National Water Resources Strategy II that was adopted by the Government in 2013. The water resource protection theme emphasises the need to protect our fresh water ecosystems, which are under threat because of pollution from many sources. The NWRS (II) states that South Africa's water ecosystems are not in a healthy state. Of the 223 water ecosystem types, 60% are threatened, with 25% of these critically endangered. Less than 15% of water ecosystems are located within protected areas, many of which are threatened and degraded by upstream human activities. The Boksburg

		Lake forms part of the water ecosystems under threat. The water quality assessment conducted provided clear evidence that there is contamination from Wastewater Treatment Plants in the catchment, with E coli and fecal coliform levels within unacceptable ranges. It is expected that the rehabilitation of the lake, which includes aeration, low crest weir and a package treatment plant will assist in improving the state of the lake leading to an improved aquatic ecosystem, contributing the NWRS.
PART II : DESIRABILITY		
1.	Is the development the best practicable environmental option for this land/site?	Yes. An assessment of the available feasible options showed that the proposed option is the best option, taking into account the cost of implementing the project as well as historical evidence that shows that the process will help improve the lake's status. It is expected that the aeration process alone will lead to a significant improvement in the COD and DO levels of the lake and will enable aerobic conditions to return to lake. Aerators have proven that they increase the ability of lakes to survive pollution, increased nutrient levels and eutrophication. By providing sub surface aeration with directional mixing, the water moves in a circular pattern around the entire lake, breaks up stratification and increases in DO levels, the aerators assist nature in returning a healthy state of aerobic equilibrium. With the aeration of the water and improved DO content aerobic conditions will return which in turn the digestion of the SS. It is possible that only this intervention could restore the lake, however if the SS levels and nutrient loadings are not resolved with aerators the next step would be to filter out the SS. The removal of the SS would require the construction of low crest weir and the establishment of a filtration plant
2.	Would the approval of this application compromise the integrity of the existing approved and credible IDP and SDF as agreed to by the relevant authorities?	No. The project has no bearing on the IDP or SDF of the Ekurhuleni Metropolitan Municipality. The objective of the project is to rehabilitate and improve the state of the Boksburg Lake so that it can be used for recreational purposes as it was intended.
3.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	No. The Gauteng EMF shows that the project is located in Zone 1 (Urban Development Zone). The project will however not have any implications on the integrity of the EMFs. The objective of the project to ensure the improvement in the state of the Boksburg Lake so that it can be used for recreational purposes as it was intended.
4.	Do location factors favour this land use at this place? (this relates to the contextualization of the proposed land use on this site within its broader context).	N/A. The Boksburg Lake is already in existence.
5.	How will the activity of the land use associated with the activity being applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	The project is located on the Boksburg Lake, which is considered a sensitive area. The lake is deemed to have been significantly modified historically, it is deemed unlikely that further negative impacts would have a significant impact on the ecology of the lake, although cognisance must be taken of downstream, cumulative effects of such impacts. The rehabilitation of the Lake is considered to be an essential intervention, in order to address issues such as severe sedimentation and water contamination from WWTW, which if not addressed, may result in continued contamination of the lake and eventual loss of the lake to sedimentation. Although there are no cultural areas that will be affected by the project, the Boksburg Lake is considered an important part of the heritage of the EMM community, which is deemed worthwhile to save.
6.	How will the development impact on people's health and well-being? (E.g. In terms of noise, odours,	The project will result in an improved state of the Boksburg Lake. This will provide a safer environment to

	visual character and sense of place, etc.)?	<p>the public to use the lake for recreational purposes as it was intended.</p> <p>During construction, there will be particulate emissions (dust) related to debris handling; truck transport; materials storage, handling and transfer; open areas (windblown emissions). Gas emissions are also expected to occur due to vehicle and construction equipment activity (exhaust fumes). These impacts, however, can be mitigated and managed to acceptable levels, with a post mitigation impact that is not significant.</p> <p>Movement of construction vehicles and machinery result in the production of construction related noise from construction vehicles and machineries which may cause a nuisance to people living near the project area. However, the implementation of appropriate mitigation measures would reduce the noise levels to remain within applicable and acceptable SANS levels (SANS 10103:2008). Occupational health and safety standards will apply.</p> <p>It is expected that the project will not have an impact on the visual character and sense of place, especially since landscaping techniques will be used around the lake.</p>
7.	Will the proposed activity or the land use associated with the activity being applied for, result in unacceptable opportunity costs?	No. The project will not result in any opportunity costs. The objective of the project is to rehabilitate the Boksburg Lake.
8.	Will the proposed land use result in unacceptable cumulative impacts?	No. It is expected that the project may result in cumulative impacts on water quality. The impacts will be short lived, during the construction phase. It is however expected that implementation of the mitigation measures included in the EMPr will reduce the significance of the impact to low.

10. THE PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED (CONSIDER WHEN THE ACTIVITY IS EXPECTED TO BE CONCLUDED)

The Environmental Authorisation is required for a minimum of 40 years.

11. ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) (must include post construction monitoring requirements and when these will be concluded.)

If the EAP answers “Yes” to Point 7 above, then an EMP is to be attached to this report as an Appendix

EMPr attached

Yes X

SECTION F: APPENDIXES

The following appendixes must be attached as appropriate (this list is inclusive, but not exhaustive):

It is required that if more than one item is enclosed that a table of contents is included in the appendix

Appendix A: Site plan(s) – *(must include a scaled layout plan of the proposed activities overlain on the site sensitivities indicating areas to be avoided including buffers)*

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Route position information

Appendix E: Public participation information

Appendix F: Water use license(s) authorisation, SAHRA information, service letters from municipalities, water supply information

Appendix G: Specialist reports

Appendix H: EMPr

Appendix I: Other information

CHECKLIST

To ensure that all information that the Department needs to be able to process this application, please check that:

- Where requested, supporting documentation has been attached;
- All relevant sections of the form have been completed.

Prepared by

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Ndomupei Masawi
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Manda Hinsch

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendix A: Site plan(s)

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Appendix I: Other information

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