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INTEGRATED WATER AND WASTE MANAGEMENT PLAN

KELVIN POWER PLANT COMBINED CYCLE GAS TURBINE PROJECT

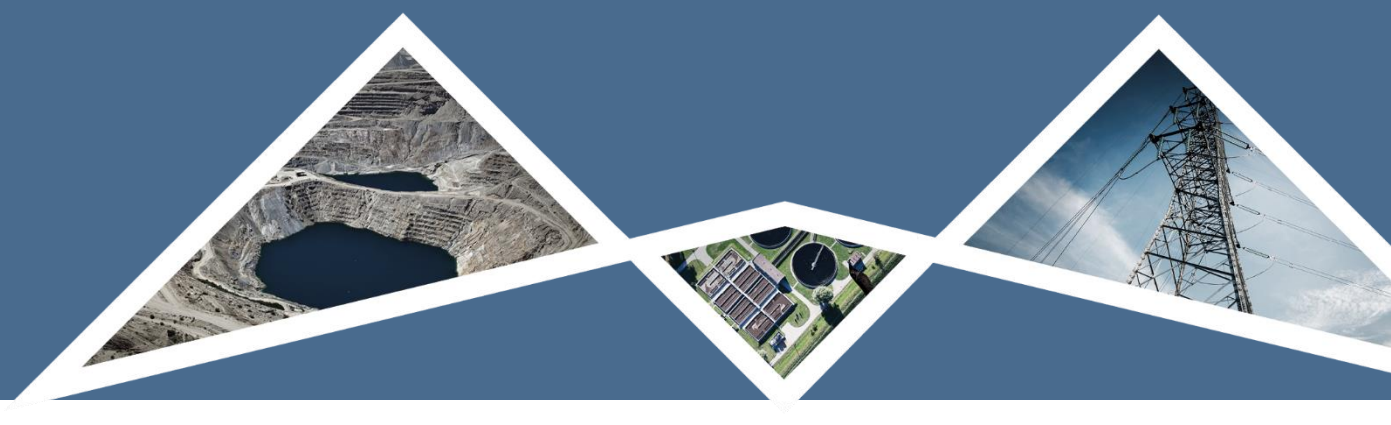

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Table of Contents

List of Figures

List of Tables

Appendices

Abbreviations

AIP	Alien Invasive Plants
CA	Competent Authority
CCGE	Combined Cycle Gas Engine
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CMS	Catchment Management Strategy
CoE	City of Ekurhuleni
DWS	Department of Water and Sanitation (formerly DWA / DHSWS)
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EHV	Extra High Voltage
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Services (Pty) Ltd.
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EMPR	Environmental Management Program
EMS	Environmental Management System
EO	Environmental Officer
GHG	Green House Gas
I&AP	Interested and Affected Party
ICE	Internal Combustion Engine
IOGP	International Association for Oil & Gas Producers
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IWWMP	Integrated Water and Waste Management Plan
LED	Local Economic Development
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
NEMA	National Environmental Management Act, (Act 107 of 1998).
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)
NWA	National Water Act, Act 36 of 1998

NWRS	National Water Resource Strategy
PES	Present Ecological Status
PPE	Personal Protective Equipment
PPP	Public Participation Process
PTN	Portion
RE	Remaining Extent
RQO	Resource Quality Objectives
SANS	South African National Standards
SASS	South African Scoring System
SAWQG	South African Water Quality Guidelines
SHE	Safety, Health and Environmental
SHEQ	Safety, Health, Environment and Quality
SWMP	Storm Water Management Plan
WARMS	Water Authorisation Registration and Management System
WMA	Water Management Area
WMS	Waste Management Strategy
WUL	Water Use Licence
WULA	Water Use Licence Application

1 INTRODUCTION

Kelvin Power (Pty) Ltd (hereafter referred to as Kelvin / "the applicant") has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to undertake the necessary environmental authorisations and associated consultation processes in support of their proposed development of a Combined Cycle Gas Turbine (CCGT) Power Plant at the Kelvin Power Station located in Kempton Park, City of Ekurhuleni Metropolitan Municipality

Kelvin Power (Kelvin) has an existing WUL (03/A21C/FGH//1110) authorising various water uses in terms of the National Water Act, 1998 (NWA) for the existing coal fired power station. The existing WUL covers the same property applicable for the proposed CCGT project as the same effluent discharge point is proposed be utilized for the CCGT project as for their current coal-fired operations. The process and effluents will be similar to the existing Kelvin power plant process, ie the majority of effluent will be heated water from cooling tower blowdown with a smaller quantity being from water treatment plant waste water. The water treatment plant for the CCGT will be much smaller but produce the same quality water as the existing water treatment plant

Kelvin, the Applicant, proposes to develop a CCGT Power Plant with generation capacity of up to 600 megawatts (MW) to be supplied to the Eskom grid. The proposed CCGT Power Plant will comprise of gas turbine(s), heat recovery boiler(s) and steam turbine(s). The main structures comprising the plant include a control room, gas turbine units, mechanical draft cooling tower, steam turbine building, heat recovery steam generator (HRSG) and HRSG stack, water treatment plant for cooling tower water, raw water and demineralised water tanks, fuel gas compressor building, a High Voltage switchyard, auxiliary buildings and administration buildings. Other possible infrastructure includes additional water and treated sewage wastewater reticulation pipelines, as well as electricity transmission lines to the Sebenza substation adjacent to the power station. The proposed CCGT plant will be located at the previous A-station location, which has been decommissioned. refer to Figure 1 for the locality map showing the proposed development location.

A CCGT power plant burns natural gas to produce electricity in a two staged process, creating a pressurised gas which powers a gas turbine that is connected to an electricity generator. The heat recovery system generator then captures exhaust heat produced by the gas turbine to power a steam turbine to produce additional power to run an electricity generator.

Kelvin plans to receive Natural Gas to the CCGT plant via Sasol's existing gas pipeline network. A pipeline connection will be required to connect to the existing gas pipeline network. It is noteworthy that various gas suppliers are currently being engaged for the supply of gas to the CCGT plant via the existing Sasol gas pipeline system.

The CCGT configuration will allow for the use of the waste heat for production of electricity thus allowing for production of electricity with the use of less fuel. The proposed power plant is anticipated to require gas supplied at approximately 40 bar and will consume approximately 21 kg/s with a net efficiency of approximately 60%.

The proposed CCGT includes Medium Voltage (MV) to Extra High Voltage (EHV) step-up transformers to raise the voltage to the grid specification. Electricity generated at the Kelvin Power CCGT Plant will be evacuated from the plant by means of new 275kV lines from the generating plant to the Sebenza 275/88kV Substation located adjacent (approximately 250m) to the proposed CCGT plant. The Sebenza Substation already has bays allocated for the integration of Kelvin Power within the substation network. The Sebenza Substation is connected to the Eskom grid via two 275kV powerlines to Prospect Substation each with a transfer capacity of 625MVA. Kelvin Power also aims to construct a diesel storage area and a chemical stores area whose combined capacities will be between 80 and 500 cubic metres.

As part of the CCGT plant, Kelvin also intends to establish a water treatment plant for process water and fire fighting purposes. Treated wastewater from the Diepsloot Wastewater Treatment Works, brought in through an existing pipeline network, will be treated at the proposed CCGT Power Plant's water treatment plant and will be reticulated for use throughout the plant. The treated effluent water will be discharged via the existing Kelvin Power effluent discharge point, located at 28° 11' 36.42"E 26° 06' 45.84" S, into the Modderfontein river channel.

1.1 ACTIVITY BACKGROUND

Kelvin wishes to develop a CCGT Power Plant at the existing Kelvin Power Station which is situated within the City of Ekurhuleni Metropolitan Municipality, Kempton Park and is approximately 5 km north west of the O.R. Tambo International Airport. The proposed development is to be located at the previous coal powered Kelvin A-Station Power Plant that is undergoing a decommissioning process. The proposed gas pipeline connection is to be located within an existing Kelvin Power servitude. The centre point of the site is approximately 26° 07'18.64"S 28°10'59.79"E.

Table 1: Applicant Details.

Applicant Details	
Applicant Name:	Kelvin Power (Pty) Ltd
Contact Person:	Segotsane Hendrick Seopa
Physical Address	3 Zuurfontein Road, Kempton Park, 1619
Postal Address:	Randfontein Office Park
	P.O. Box 311
	Kempton Park
	Gauteng
	1620
Tel:	+27 11 573 2578
Cellphone	+27 83 459 0090
Email:	oupa.seopa@kelvinpower.com

1.2 REGIONAL SETTING AND LOCATION OF ACTIVITY

The proposed Kelvin Power Station site situated on the boundary of two quaternary catchments, A21C and A21A, with 97% of the site in quaternary catchment A21C (Juksei River Catchment). An unnamed tributary drains north-west for approximately 1.1km to confluence with the Modderfonteinspruit from the Kelvin Power ash dams where effluent is discharged (downstream of the power station). The Modderfonteinspruit confluences with the Jukskei River which drains in a north westerly direction and confluences with the Crocodile River approximately 35 km downstream. The station is situated within an industrial area, however it is also close to a number of residential areas. In addition, there are large areas of Alexandra, located downstream, where it is understood that informal use of water from the Jukskei River occurs. A-station, the area now proposed for the CCGT plant, is located in an area where there are no water resources that would be directly affected by runoff.

The station is situated within an industrial area, however it is also close to a number of residential areas. In addition, there are large areas of Alexandra, located downstream, where it is understood that informal use of water from the Jukskei River occurs. Catchment A21C is 75 961 ha and the part of the Kelvin site contributing to this catchment is 154.7 ha (or 0.2%) and Catchment A21A is 48 189 ha and the portion of the Kelvin site contributing to this catchment is 5.4 ha (or 0.01%). The site is at an elevation of between 1620 and 1680 mamsl with a gentle slope of approximately 0.03 (3% or 3 meters of elevation for every 100m). The site falls within Integrated Unit of Analysis, IUA 1: Upper Crocodile/ Hennops/ Hartbeespoort, upstream of Hartbeespoort Dam and Resource Units 1.1 (Upper Hennops and Rietvlei Rivers to inflow of Rietvlei Dam, and dolomite aquifer

systems) and 1.7 (Jukskei, Klein Jukskei and Modderfonteinspruit). This IUA has been classified as a Class III river. In respect of the classification of rivers, this means that it is a river that is highly used and configuration of ecological categories of that water resource are highly altered from the predevelopment condition.

1.3 PROPERTY DESCRIPTION

The proposed CCGT plant is located entirely within the boundaries of the existing Kelvin power station. The existing Kelvin power station is located within Portion 391 of Farm Zuurfontein. Table 2 indicates the farm portions that fall within the proposed project including details on the project location as well as the distance from the proposed project area to the nearest towns. Figure 2 shows the properties and Kelvin Power Station boundary.

Table 2: Locality details

<table>
<tr><td>Property</td><td colspan="4">The proposed CCGT Power Plant is situated within Remainder of Portion 391 of Farm Zuurfontein 33. However the proposed treated effluent will be discharged at the existing Kelvin Power Discharge point located in Portion 89 of Farm Zuurfontein 33. Refer to Figure 2 for the Kelvin properties map.</td></tr>
<tr><td rowspan="2">Property Name, 21-digit Surveyor General Code and Ownership</td><td>Farm Name</td><td>Portion</td><td>LPI Code</td><td>Ownership Type</td></tr>
<tr><td>Farm Zuurfontein 33</td><td>89</td><td>T0IR00000000003300089</td><td>Applicant</td></tr>
<tr><td>Application Area (Ha)</td><td colspan="4">The applicant wishes to authorize a discharge point located at 26° 07'18.64"S 28°10'59.79"E.</td></tr>
<tr><td>Magisterial District</td><td colspan="4">The proposed project falls within the Ekurhuleni North Magisterial District, Gauteng Province.</td></tr>
<tr><td>Distance and direction from nearest towns</td><td colspan="4">The Kelvin Power Station is situated approximately 4km to the west of Kempton Park CBD, 11 km east of Sandton, and approximately 14km south east of Midrand.</td></tr>
<tr><td>Surrounding land uses</td><td colspan="4">The current land use description on the site is Public service infrastructure – power generation. Kelvin Power Station is an operational power station consisting of the A-station and B-station. The A-station is no longer operational and is undergoing a demolition process. The proposed CCGT is to be located at the current A-station footprint. The Kelvin Power Station is located adjacent to residential area such as the Kelvin Estate and Croydon suburb. It is however, mainly surrounded by Industrial land uses and the proposed CCGT plant is located at the furthest point of the Kelvin site from the residential areas. The proposed CCGT plant is not adjacent to any residential area. It is further noteworthy that there are Ash dams located within the boundary of the Kelvin Power Station, near which the proposed discharge point for the treated effluent is located.</td></tr>
</table>

The locality and extent of the proposed project is shown in Figure 1.

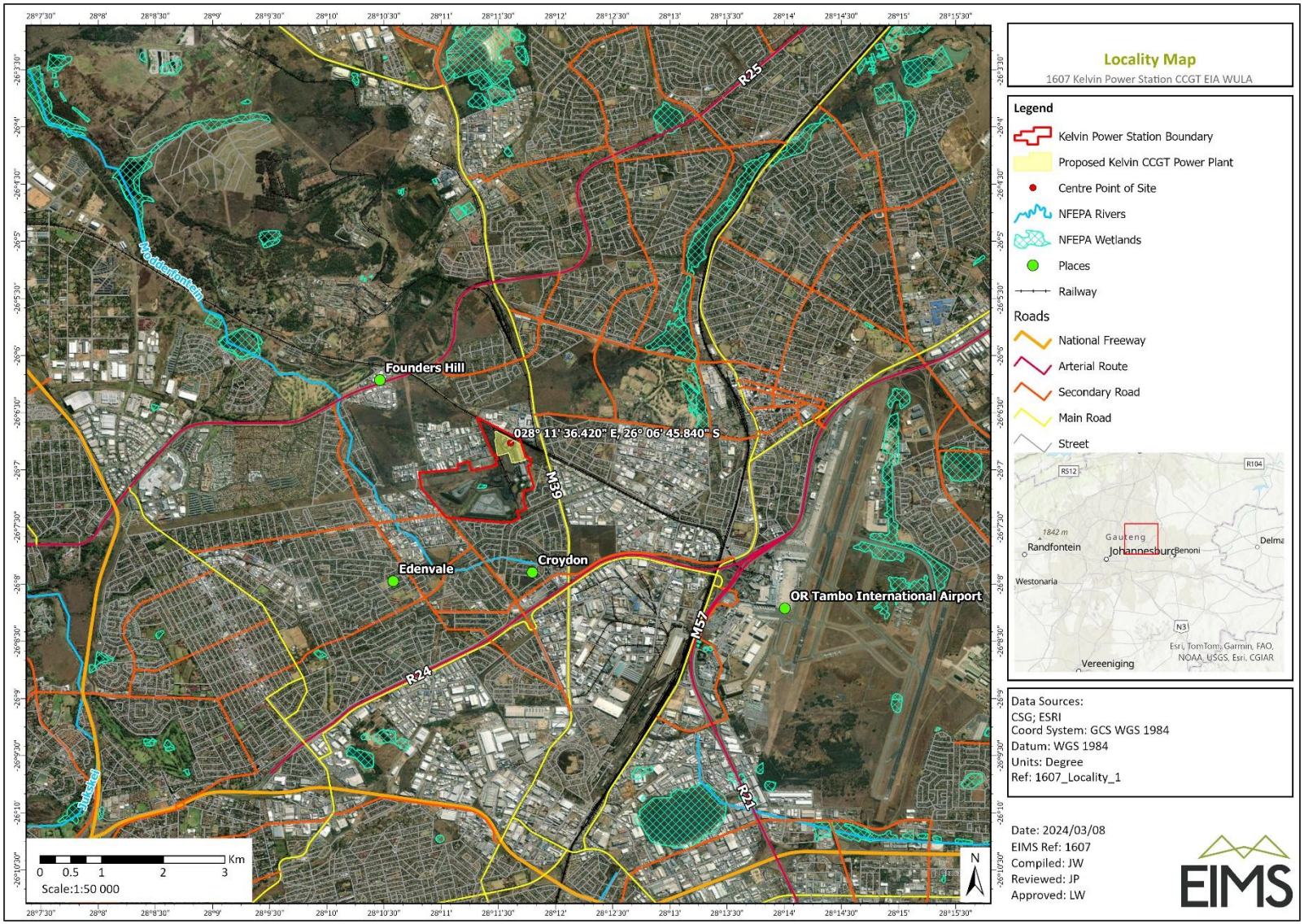


Figure 1: Locality map indicating the location of the Kelvin Power Station and Proposed CCGT Power Plant Footprint.

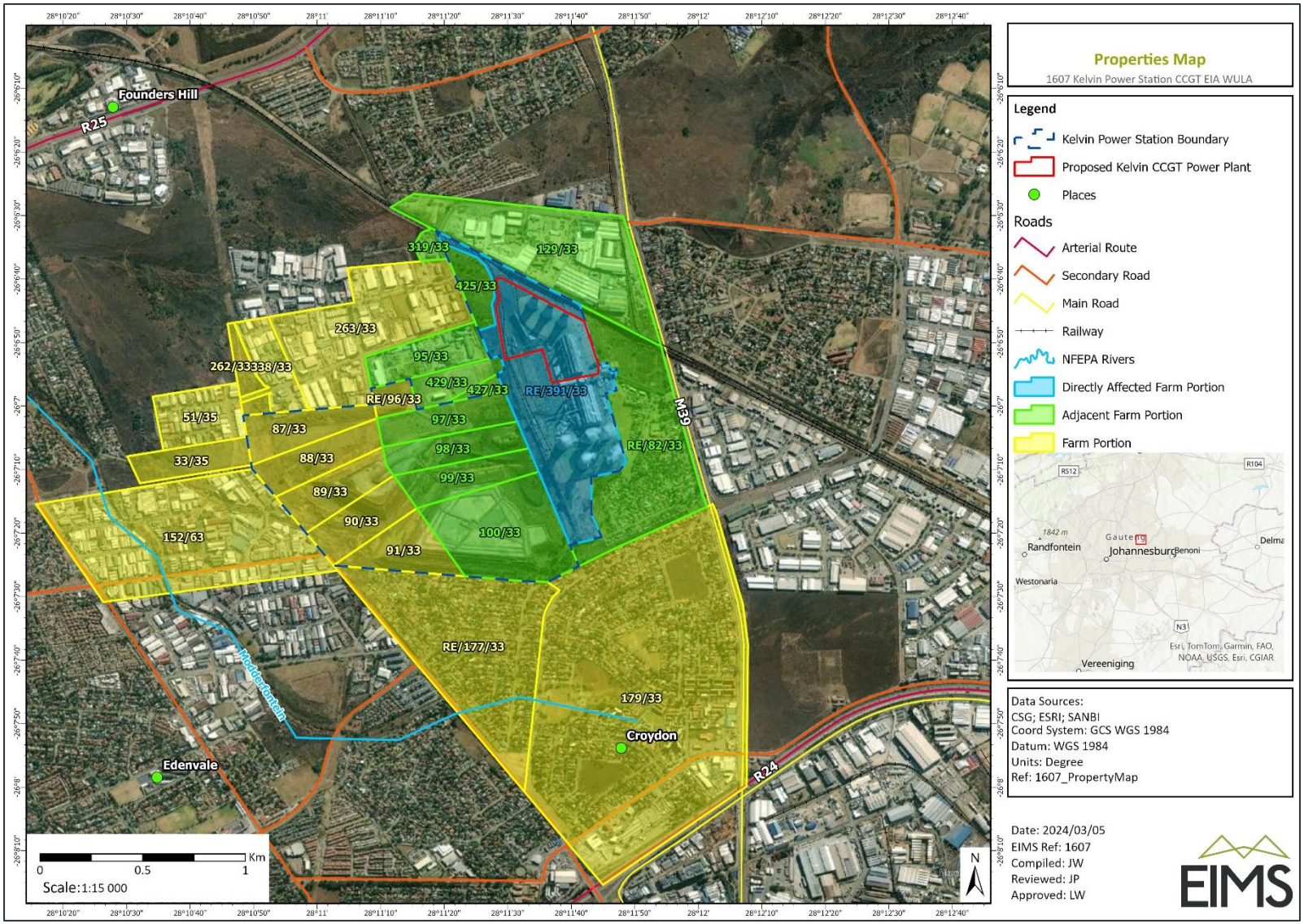


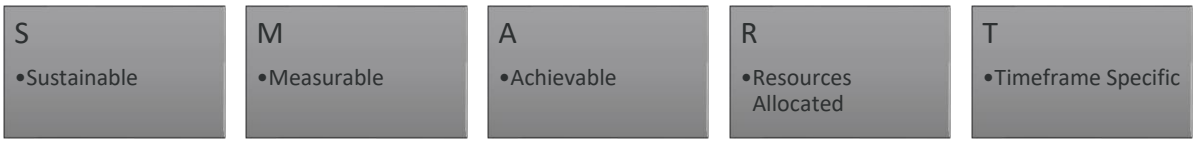
Figure 2: Properties map Indicating the Outline of the Kelvin Power Station Boundary and its associated Properties.

1.4 PURPOSE OF IWWMP

Although the requirement for the compilation of an Integrated Water and Waste Management Plan (IWWMP) was originally aimed at collating and rationalising the information submitted for Water Use Licence Applications (WULA) to the DWS, it has progressed beyond this purpose to:

- Provide the regulatory authorities with focused and structured information not only to meet their general information needs, but also to articulate the required management measures and actions to achieve the water and waste related performance on an on-going basis; and
- Provide direction and guidance to the water user on water and waste management of any activity.
- The IWWMP should be used in conjunction with other guidelines developed by DWS, such as the External Guideline on the Water Use Authorisation Process and the series of Best Practical Guidelines for water resource protection in the Industries and Mines. The Department and/or relevant Catchment Management Agencies (CMA) implement the integrated water resource management (IWRM) at source by means of an IWWMP.
- The Department requires an IWWMP as a simple feasible, implementable plan for water users based upon site specific programmes, also taking into account the National Water Resource Strategy (NWRS), Catchment Management Strategy (CMS), Resource Quality Objectives (RQO's) and sensitivity of the receiving water resource, upstream and downstream cumulative impacts of water use activities, external water use authorisation guidelines, as well as water use specific supplementary information requirements. The most important component of the IWWMP development process is the formulation of various strategies, goals and objectives for the water use or waste management of an activity, in accordance with the set philosophies and policies. The policies must address the four key areas related to IWWMP development, namely process water, storm water, groundwater and waste. The purpose of an IWWMP is as follows:
    - Compilation of a site specific, implementable, management plan addressing all the identified water use and waste management related aspects (e.g., process water balances, storm water management, groundwater management, water re-use and reclamation, water conservation and demand management, waste minimization and recycling) of the specific activity, in order to meet set goals and objectives, in accordance with Integrated Water Resources Management principles;
    - Provision of management plan to guide a water user regarding the water and waste related measures which must be implemented on site in a progressive, structured manner in the short, medium and long term;
    - Documentation of all the relevant information, as specified in this guideline, to enable the Department to make the decision regarding the authorisation of a water use;
    - Clarification of the content of the IWWMP from the DWS officials and the water users, as the various regional offices of DWS might have different interpretations regarding the content of an IWWMP;
    - Standardisation of the format of the supporting documentation which the Department requires during submission of a WULA;
    - Provision of guidance on the content of information required in an IWWMP as part of the water use authorisation process and level of detail that the Department requires to enable them to evaluate the supporting documentation to make a decision on authorisation water use; and
    - Ensuring that a consistent approach is adopted by the Department and the various Regional Offices and CMA's with regards to IWWMPs.

It is the responsibility of the water user to demonstrate to the Department that the selected management measures in the IWWMP action plan adhere to the "SMART" concept i.e.:



It is a Departmental requirement that a water user needs to compile an IWWMP for any one of the following purposes:

- As the supporting technical documentation for any WULA (the main purpose of this document);
- When converting Existing Lawful Use (ELU) to licensed water use; and
- In order to comply with the conditions of an existing water use licence.

The implementation of the IWWMP is an interactive process whereas its performance is monitored on an annual basis. The assessment of the IWWMP document itself, as well as the submission of information relating to monitoring and auditing conducted in terms of it could lead to its shortcomings, which must be addressed in the annual update of the action plan of the IWWMP. This will ensure that the concept of continual improvement is applied throughout the life cycle of the activity (Operational Guideline: IWWMP dated February 2010 and GNR 267, the Water Use Licence Application and Appeals Regulations, dated March 2017).

In line with the guidelines of the DWS Operational Guideline: Integrated Waste and Water Management Plan (2010) and GNR 267, Water Use Licence Application and Appeals Regulations (2017), Figure 3 provides a guide to the structure of the IWWMP.

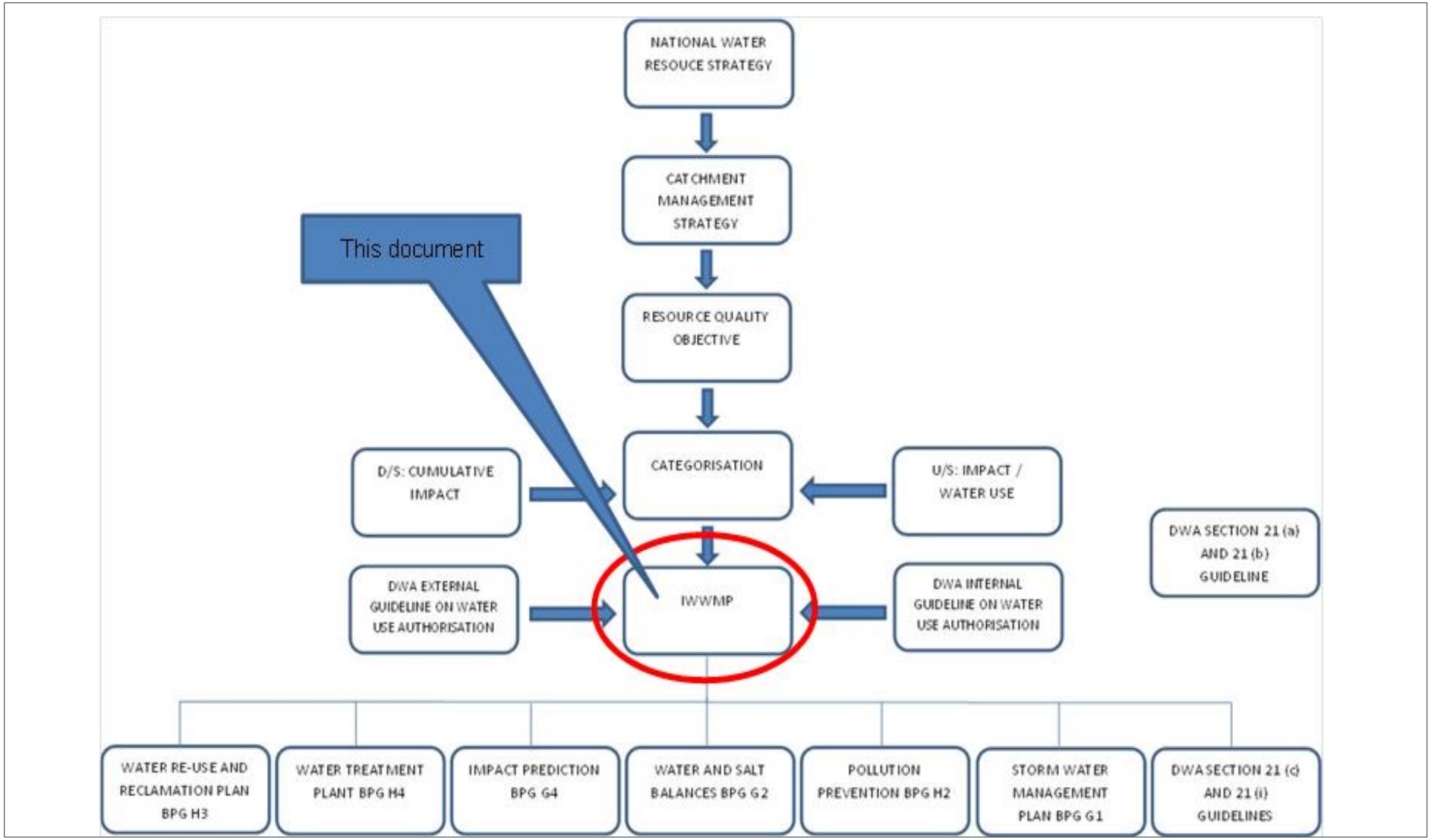


Figure 3: Schematic Layout of the IWWMP Approach

2 CONTEXTUALISATION OF THE ACTIVITY

The section below provides a detailed project description. The aim of the description is to indicate the activities that are performed at the Kelvin CCGT Plant. Furthermore, the detailed project description facilitates the understanding of the activities taking place that will result in impacts on the environment and for which mitigation measures are in place or plans are in place to implement these mitigation measures.

2.1 DESCRIPTION OF ACTIVITY

Kelvin intends to construct a CCGT plant with generation capacity of up to 600 MW at the previous Kelvin A-station site area. Kelvin aims to supply the electricity generated to Eskom, or other municipal or industrial users through a Power Purchase Agreement (PPA).

Project Configuration Options:

Hybrid Solution (Worst-Case Scenario and Subject of Specialist Studies):

The CCGT[1] Power Plant will feature a hybrid solution involving two different gas turbine frame sizes operated in CCGT mode. This solution, considered the worst-case scenario and therefore the focus of specialist studies, will consist of:

- One smaller CCGT: With a capacity of up to 150 MW.
- One larger CCGT: With a capacity of up to 450 MW.

Together, these CCGT plants will have a combined capacity to generate approximately 600 MW. The facility will also include associated high-voltage switchgear and control systems.

Alternative Solution (Single Large Gas Turbine):

The alternative to the hybrid solution is a configuration that consists of one large gas turbine operating in CCGT mode, coupled with one large steam turbine. This configuration is expected to provide similar capacity, with the following features:

One large gas turbine and one large steam turbine combined to achieve approximately 600 MW of power generation.

The facility will similarly include associated high-voltage switchgear and control systems.

While both configurations aim to achieve the same power output, the hybrid solution is regarded as the worst-case scenario due to the complexity and potential environmental impacts associated with the operation of two different gas turbine sizes.

Operation Process:

1. **Fuel Supply:**
    - Natural gas will be supplied from the Sasol gas pipeline network (A pipeline connection is required).
2. **Electricity Generation and Heat Recovery:**
    - The gas turbines will combust the natural gas, converting it into mechanical energy that drives a generator to produce electric power.
    - The combustion process will also generate hot exhaust gas. The hot exhaust gas will be captured by a Heat Recovery Steam Generator (HRSG).
3. **Steam Cycle:**

[1] A CCGT power plant refers to a gas turbine consisting of a heat recovery system generator that captures exhaust heat produced by the gas turbine to power a steam turbine to produce additional power to run a generator or mechanical drive.

- Treated water in the HRSG will be heated, producing high-pressure steam.
- The high-pressure steam will drive a steam turbine, converting the potential energy into mechanical energy to power a generator.
- The steam will then be condensed and recycled back to the boiler.

Main Structures and Components:

- Up to three (3) gas turbines and generators using gas as a fuel source.
- Up to three (3) HRSGs for capturing exhaust heat.
- Up to two (2) steam turbines.
- Control room.
- Mechanical draft cooling tower for steam condensation.
- Steam turbine building.
- Up to three (3) HRSG main stacks (50 to 60 meters high with a 6-9m diameter).
- Up to three (3) bypass stacks (20 to 60 meters high, 4-9 meter diameter).
- Water treatment plant for process water and fire fighting purposes.
- Raw water and demineralized water tanks.
- Firewater storage and control system.
- Fuel gas compressor building.
- High Voltage switchyard.
- Auxiliary and administration buildings.
- Compressed air station for service and process air.
- Closed Fin-fan coolers for lubrication oil cooling.
- Site access roads.
- Diesel storage area (maximum capacity of 50m^3) with off-loading facilities.
- Diesel generator for black start up and emergency operation

Electrical Equipment:

- The plant will include electrical equipment associated with the generation and evacuation of power, such as generators, transformers, MV motors, LV motors, circuit breakers, busbars, cabling, substation, and associated auxiliaries.

Ancillary Infrastructure:

- The ancillary infrastructure will include access roads within the site boundary, warehousing and buildings, workshops, guard house, administration and control building, ablution facilities, storage facilities, maintenance and cleaning area, operational and maintenance control centre, and fencing.

Construction Phase:

- Temporary work areas, including laydown areas, will be established during the construction phase. A laydown has been identified and will be located towards the eastern boundary of the site where the current A-station cooling towers (to be demolished) are located.

Cycle Efficiency:

- The proposed CCGT Power Plant configuration will utilize waste heat from the gas turbine to generate steam for the steam turbine, resulting in increased cycle efficiency and reduced fuel consumption.
- The proposed power plant is anticipated to require gas supplied at a pressure of approximately 40 bar and will consume approximately 21 kg/s with a net efficiency of approximately 60%.

Power Evacuation:

- The plant will include high voltage (HV) to medium voltage (MV) step-up transformers to tie the generators to the national grid. Electricity generated will be evacuated via two new 275kV transmission lines .
- Eskom and City Power share ownership of the Sebenza Substation, which has space allocated for the integration of Kelvin Power via two 275kV bays. The Sebenza Substation is connected to the Eskom grid via two 275kV powerlines.

Water Supply:

- Treated wastewater from the Diepsloot Wastewater Treatment Works, brought in through an existing pipeline network, will be treated at the proposed CCGT Power Plant's water treatment plant and will be reticulated for use throughout the plant.
- Additional water may be sourced from Randwater or on-site boreholes.

Waste Water Discharge:

i. Treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel.

Table 3 below provides a Description and dimensions of key infrastructure for the proposed Kelvin Power CCGT Power Plant.

Table 3: Description and dimensions of key infrastructure

Component	Description
Control Room	Small distributed control room to control the operations of the CCGT plant – approximately 100m^2 in size and 15m high.
GT Generator Step-up Transformer	Generator step-up transformers (GSU) are the critical link between the power station and the transmission network, often operated day and night at full load.
ST Generator Step-up Transformer	

Component	Description
Steam Turbine Building	The steam generated from the CCGT is moved to a steam turbine where the potential energy contained in the steam will be converted to mechanical energy powering a generator that will produce electricity. The steam is then discharged into a condenser where it is then collected and returned to the boiler to be reused in the steam cycle. The steam turbine building will cover an area of approximately 2000m^2 and will be approximately 35m high.
Laydown / maintenance area	A general laydown and maintenance area covering an area of 22 200 m^2. This will allow for placement of equipment during construction as well as maintenance of the CCGT plant.
Cooling Towner	Rows of mechanical cooling towers covering an area of approximately 2500 m^2. The height of the towers is approximately 20m.
Cooling Tower Water Treatment Plant	A separate, small water treatment plant for treatment of cooling tower water covering an area of approximately 200m^2.
Gas Turbine Unit(s)	Gas turbine units consisting of one large gas turbine and potentially several small CCGT options to complement the large CCGT. The height of the gas turbine building will be approximately 35m. Up to three stacks would be included with a height of 50m – 100m.
Heat Recovery Steam Generator(s)	CCGT power plants refer to a gas turbine system with an additional component known as a heat recovery steam generator (HRSG) for cogeneration. Waste heat recovered from the gas turbine exhaust to power a steam engine for the generation of power. The footprint is approximately 420m^2.
Heat Recovery Steam Generator Stack(s)	The HRSG stack is the exhaust outlet for the HRSG. It releases the flue gases (after heat recovery) into the atmosphere at a safe height. The height of the HRSG is approximately 20 - 50m.
Water Treatment Plant	Waste water from the Diepsloot Waste Water Treatment Works, brought in through an existing pipeline network will be treated at the Kelvin Power CCGT water treatment plant, and will be reticulated for usage through the plant through small reticulation pipelines. After use, the treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel. The Water Treatment Plant that will cover an area of approximately 3000m^2. Approximately 52,000 m^3/ day of this grey water is available to the Site. After use, the treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel. Additional water may be sourced from Randwater or on-site boreholes.
Raw Water and Demineralized Water Tank	Two tanks each with a 45m circumference, each covering an area of 150m^2.
Fuel Gas compressor and building	For gas pressurisation and gas conditioning including gas heating.

Component	Description
High Voltage Switchyard	A HV Switchyard that will cover an area of approximately 10 000 m^2. The MV to EHV Step-up transformers will be installed here to tie the generators to the grid.

Kelvin Power wishes to commission the proposed CCGT plant in 2027/2028. The planned operational life cycle of the proposed CCGT plant is 20 years from commissioning.

2.2 EXTENT OF THE ACTIVITY

The CCGT facility will have a footprint of approximately 5.9 ha, an additional 2 ha will be required as a laydown and maintenance area.

Waste water from the Diepsloot Waste Water Treatment Works, brought in through an existing pipeline network will be treated at the Kelvin Power CCGT water treatment plant, and will be reticulated for usage through the plant through small reticulation pipelines. After use, the treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel. The Water Treatment Plant that will cover an area of approximately 1000m^2. Approximately 52,000 m^3/ day of this grey water is available to the Site. After use, the treated effluent water will be discharged via the existing Kelvin Power effluent discharge point into the Modderfontein river channel.

A separate small water treatment plant for treatment of cooling tower water covering an area of approximately 200m^2.

Treated water will be discharged at the existing Kelvin Power Station located at 26° 7'18.64"S 28°10'59.79"E.

2.3 KEY ACTIVITY PROCESSES AND PRODUCTS

The applicant proposed to develop a CCGT Power Plant with a generation capacity of up to 600MW of electricity to be supplied to the Eskom grid. A CCGT power plant burns natural gas to produce electricity in a two staged process, creating a pressurised gas which powers a gas turbine that is connected to an electricity generator. The heat recovery system generator then captures exhaust heat produced by the gas turbine to power a steam turbine to produce additional power to run an electricity generator.

2.4 ACTIVITY LIFE DESCRIPTION

The planned operational life cycle of the proposed CCGT Power Plant is anticipated to be approximately 30 years from date of initial commencement.

2.5 ACTIVITY INFRASTRUCTURE DESCRIPTION

For a full description of the technical aspects of the infrastructure for the Kelvin CCGT Power Plant, please refer to Section 2.1 of this report.

2.6 KEY WATER USES AND WASTE STREAMS

The following details are relevant to the current application:

- Section 21 (f): Discharging waste or water containing waste into a water resource. (discharging treated effluent into the Modderfontein spruit);
- Section 21 (h): Disposing of waste in a manner which contains waster from or which has been heated in any industrial or power generation process (discharging of treated cooling water);
- The following waste streams are anticipated for this project;
    - General office waste and/or Municipal solid waste;
    - Industrial and effluent waste;

- Surface Water run-off (Drainage would include oily water separation from areas such as turbine buildings and surface water from roads)

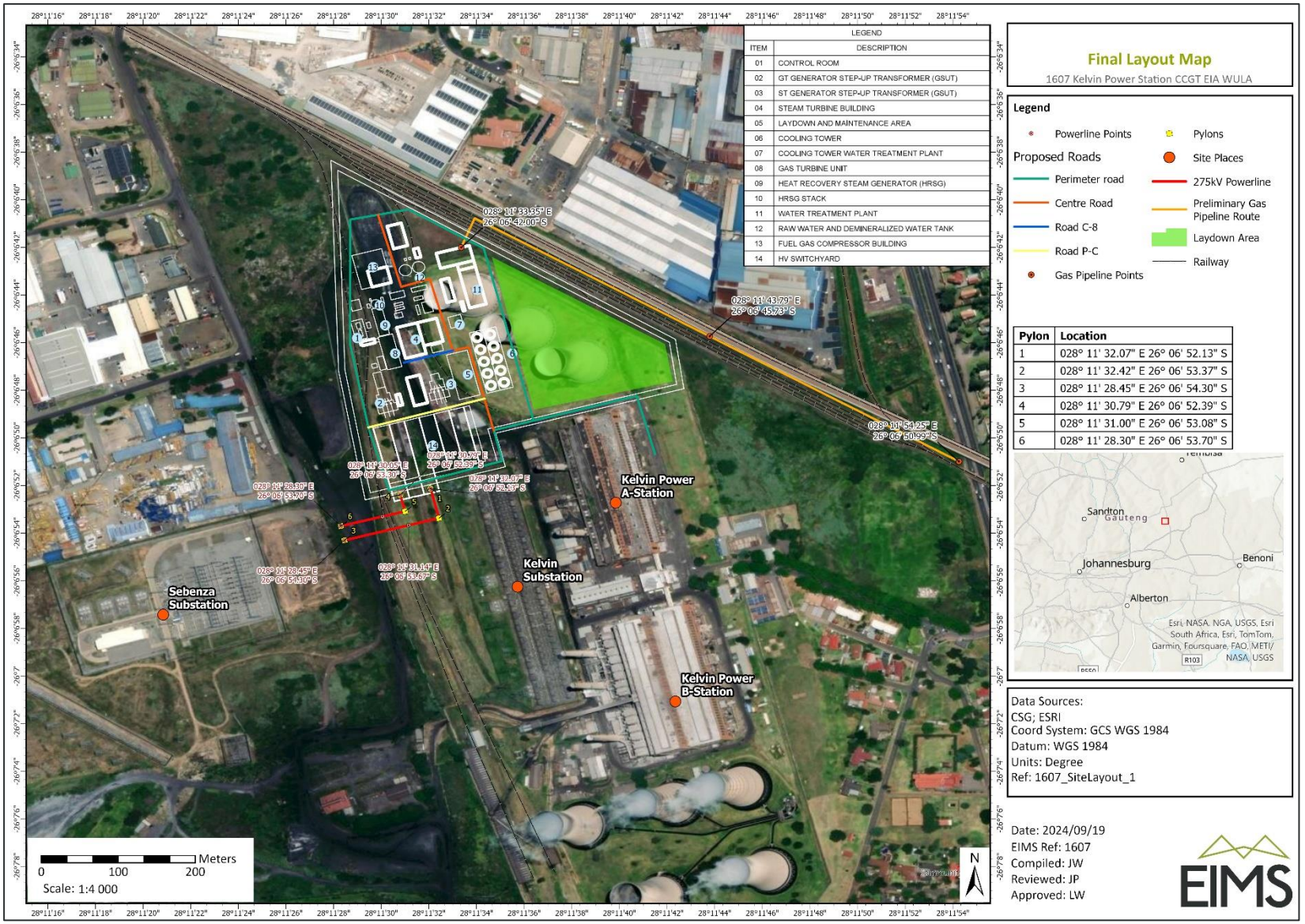


Figure 4: Final Site Layout Map

2.7 ORGANISATIONAL STRUCTURE OF ACTIVITY

The reporting structure/procedure for Kelvin is presented in Figure 5: Internal Communication Structure at the Kelvin Power Station. below.

	Notes	Responsibility/Who	Responsibility/Who
Internal Communication	Internal communication is primarily conducted through scheduled meetings.	Environmental Management	As scheduled
	On-site employees participate in daily safety meetings or toolbox talks.	Site Supervisors	Daily
	Regular environmental feedback meetings provide updates and insights to senior management to support decision-making.	Environmental Management	Regularly (as scheduled)

Figure 5: Internal Communication Structure at the Kelvin Power Station.

2.8 BUSINESS AND CORPORATE POLICIES

Kelvin holds a business and corporate policy as stipulated in the Environmental and Social Policy of 2010 document. The policy emphasizes the company's commitment to:

- Provide sustainable energy and integrate environmental and social factors into business decisions.
- Identify all environmental and social issues associated with activities and manage them in a sustainable manner.
- Ensure compliance with applicable legal and other requirements and where appropriate perform better than required.
- Implement and maintain an environmental and social management system based on ISO 14001, OHSAS 18001 and SA8000.
- Continuously improve performance through regular review of objectives and targets.
- Pursue efficient use of energy, material and natural resources, to prevent pollution, minimise waste and encourage recycling where appropriate.
- Respect and protect the values of the culturally diverse society by interacting with stakeholders.
- Increase the level of environmental competency, awareness and culture in employees and contractors through communication, training and promotion of best practice.;

3 REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

This IWWMP forms part of the WULA for the Kelvin CCGT Power Plant. This section will discuss the various regulatory requirements relevant to the IWWMP including the water uses being applied to as well as details on the existing lawful uses.

3.1 SUMMARY OF WATER USES

This section focuses on the water use activities to be applied for as part of the WULA. A summary of the water uses applied for is indicated in Table 4.Table 4: Water Uses for the Kelvin CCGT Power Plant.

Water use	Description	Property Description	Coordinates	Volumes abstracted/ discharged per day/ Storage capacity m3
Section 21(f)	Treated water discharge from the Waste Water Treatment Plant	Farm Zuurfontein 33 IR 89	Lat: 26° 7'18.64" S. Long: 28°10'59.79" E	6 301.37 m^3/per day (2 300 000 m^3/y)
Section 21(h)	Discharge of water from cooling tower blowdown	Farm Zuurfontein 33 IR 89	Lat: 28° 0'52.84"S Long: 26°49'2.14"E	63.014 m^3/per day (23 000 m3/yr)

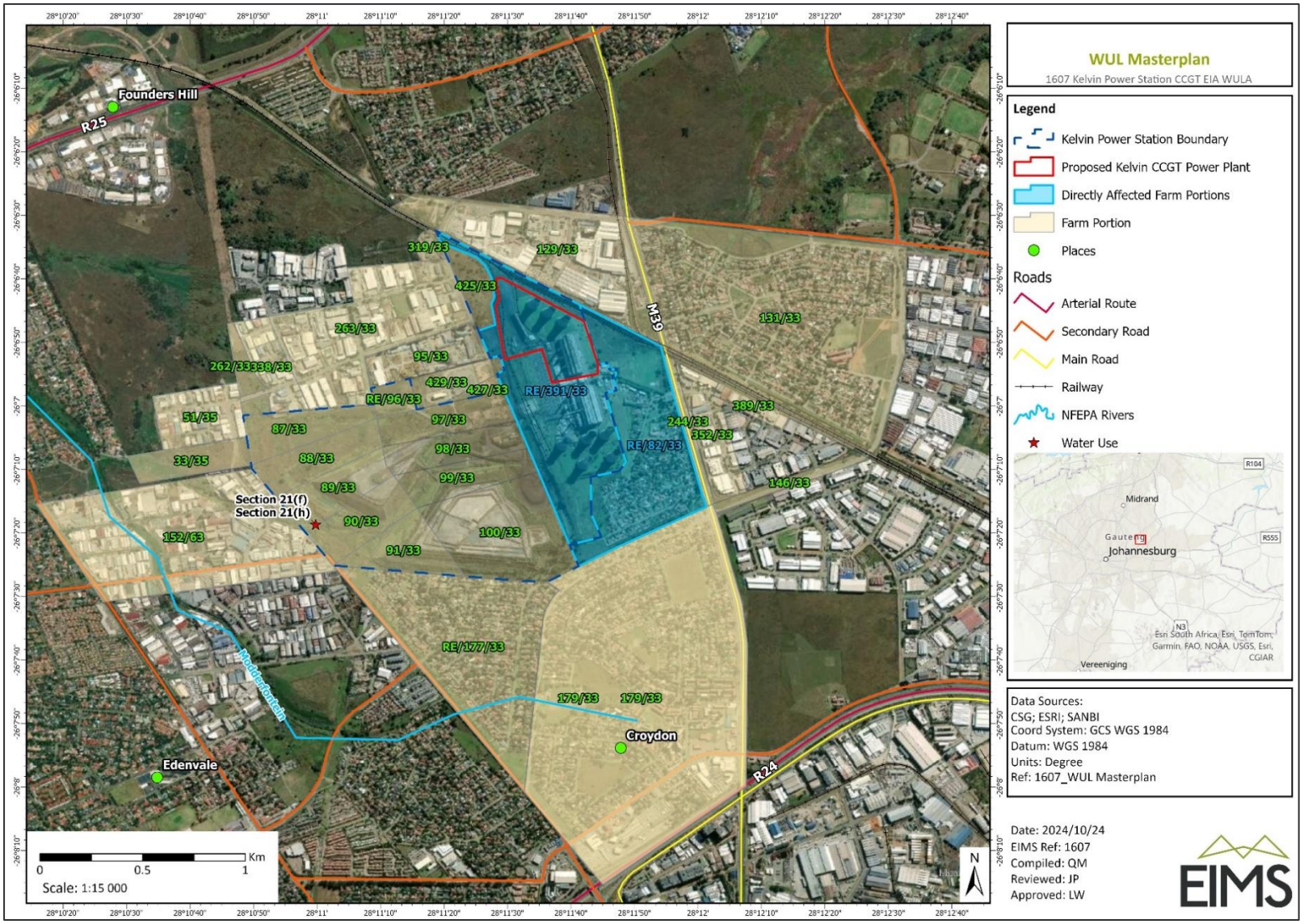


Figure 6: Geographical locations of discharge point/water uses for the Kelvin CCGT Power Plant

3.2 EXISTING LAWFUL USES

In terms of Section 32 of the NWA, an existing lawful water use is defined as follows:

"*Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (1 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of this Act, or which has been declared an existing lawful water use in terms of Section 33 of the Act*".

Kelvin Power has various existing water uses for its power station located in Kempton Park, Ekurhuleni Metropolitan Municipality in the Gauteng as the power station was constructed prior to the promulgation of the NWA.

3.3 GENERAL AUTHORISATION WATER USES

No general authorisations are currently in place.

3.4 EXISTING WUL AUTHORISATIONS

Kelvin Power (Kelvin) has an existing WUL (03/A21C/FGH//1110) authorising various water uses in terms of the National Water Act, 1998 (NWA) for the existing coal fired power station. The existing WUL covers the same property applicable for the proposed CCGT project as the same effluent discharge point is proposed be utilized for the CCGT project as for their current coal-fired operations. Kelvin Power is currently authorised to discharge waste or water containing waste into a water resource which has been heated for industrial use purposes and disposing waste in a manner that may detrimentally impact on a water resource in terms of the National Water Act, 1998 (Act no 36 of 1998). This authorisation is in respect to the current coal fired power generation activity.

3.5 NEW WATER USES TO BE LICENCED

The Kelvin CCGT Power Plant is seen as a new and separate application and as such new water uses are required to be authorised. The water uses being applied for are listed in Table 4 above. The following water uses are applied for as part of this WULA.

The following water uses will be required in the ambit of Section 21 (f) and (h):

- Treated water discharge from the Waste Water Treatment Plant; and
- Discharge of water from cooling tower blowdown

Registration and licensing requirements

According to the GN 665 general authorisations, dated 06 September 2013, subject to the provisions of this general authorisation, a person who discharges wastewater into a water resource in terms of this authorisation must submit a registration form or any other information requested in writing by the responsible authority for registration of the water use before commencement of the discharge. Registration is, therefore, required.

According to the GN 665 general authorisations, the following exclusions from the general authorisation are applicable –

2.2 Exclusions

a) through sea outfalls;

b) to an aquifer;

c) any other groundwater resource;

d) any water resource with a closed drainage system; or

e) directly into an off channel dam.

GN 665 general authorisations further state that:

A person who-

a) owns or lawfully occupies property registered in the Deeds Office as at the date of this notice;

b) lawfully occupies or uses land that is not registered or surveyed; or

c) lawfully has access to land on which the use of water takes place,

may on that property or land outside the areas excluded in paragraph 2.2 above,

i) discharge up to 2 000 cubic metres of wastewater on any given day into a water resource that is not a listed water resource set out in Table 2.3, which may be amended from time to time, provided the discharge-

a) complies with the general wastewater limit values set out in Table 2.1, which may be amended from time to time;

b) does not alter the natural ambient water temperature of the receiving water resource by more than 3 degrees Celsius; and

c) is not a complex industrial wastewater.

ii) discharge up to 2 000 cubic metres of wastewater on any given day into a listed water resource set out in Table 2.3, which may be amended from time to time, provided the discharge-

a) complies with the special wastewater limit values set out in Table 2.1, which may be amended from time to time;

b) (b) does not alter the natural ambient water temperature of the receiving water resource by more than 2 degrees Celsius; and

c) is not a complex industrial wastewater,

and if the discharging of wastewater-

(aa) does not impact on a water resource or any other person's water use, property or land; and

(ab) is not detrimental to the health and safety of the public in the vicinity of the activity.

iii) not discharge storm water runoff from any premises containing waste, or water containing waste emanating from industrial activities and premises, into a water resource.

Kelvin CCGT Power Plant will discharge 6 301.37 m^3/per day from the Waste Water Treatment Plant and 63.014 m^3/per day of water from cooling tower blowdown. Kelvin is thus excluded from authorisation under the GA and is required to apply for a full Water Use License.

3.6 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NEMWA)

On 1 June 2014, the NEMWA came into force. Waste is, accordingly, subject to all the provisions of the NEMWA.

The objectives of this Act are:

a) to protect health, well-being and the environment by providing reasonable measures for-

i. minimising the consumption of natural resources;

ii. avoiding and minimising the generation of waste;

iii. reducing, re-using, recycling and recovering waste;

iv. treating and safely disposing of waste as a last resort;

v. preventing pollution and ecological degradation;

vi. securing ecologically sustainable development while promoting justifiable economic and social development;

vii. promoting and ensuring the effective delivery of waste services;

viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and

ix. achieving integrated waste management reporting and planning;

b) to ensure that people are aware of the impact of waste on their health, well-being and the environment;

c) to provide for compliance with the measures set out in paragraph (a); and

d) generally, to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.

Section 16 of the NEMWA states:

1. A holder of waste must, within the holder's power, take all reasonable measures to-

    a) "*Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;*

    b) Reduce, re-use, recycle and recover waste;

    c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

    d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;

    e) Prevent any employee or any person under his or her supervision from contravening the Act; and

    f) *Prevent the waste from being used for unauthorised purposes.*"

The NEMWA provides for specific waste management measures to be implemented, as well as providing for the licensing and control of waste management activities. No NEMWA listed activities have been identified for this project. However, Kelvin Power will be responsible for ensuring that all waste produced at the CCGT plant is handled in accordance with the requirements of the Waste Act.

The Waste Classification and Management Regulations (GNR 634) are published under the NEMWA. The purpose of these Regulations is to –

a) Regulate the classification and management of waste in a manner which supports and implements the provisions of the Act;

b) Establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence;

c) Prescribe requirements for the disposal of waste to landfill;

d) Prescribe requirements and timeframes for the management of certain wastes; and

e) Prescribe general duties of waste generators, transporters and managers.

Waste classification, as presented in Chapter 4 of these regulations, entails the following:

f) Wastes listed in Annexure 1 of these Regulations do not require classification in terms of SANS 10234;

g) Subject to sub regulation (1), all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation;

h) Waste must be kept separate for the purposes of classification in terms of sub regulation (2), and must not be mixed prior to classification;

i) Waste-must be re-classified in terms of sub regulation (2) every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors;

j) Waste that has been subjected to any form of treatment must be re-classified in terms of sub regulation (2), including any waste from the treatment process; and

k) If the Minister reasonably believes that a waste has not been classified correctly in terms of sub regulation (2), he or she may require the waste generator to have the classification peer reviewed to confirm the classification.

Furthermore, Chapter 8 of the Regulations stipulates that unless otherwise directed by the Minister to ensure a better environmental outcome, or in response to an emergency so as to protect human health, property or the environment –

l) Waste generators must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Act prior to the disposal of the waste to landfill;

m) Waste generators must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Act; and

n) Waste managers disposing of waste to landfill must only do so in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7 (1) of the Act.

It is noteworthy that Kelvin Power holds a Waste Management License/registration as a hazardous waste generator under the Waste Information Systems (WIS) Regulations. The certificate was issued on the 24th of April 2013.

3.7 OTHER AUTHORISATIONS

This section discusses other Environmental Authorisations required/underway for the Kelvin Power CCGT project

3.7.1 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

In accordance with the provisions of Sections 24(5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIAs in order to apply for, and be considered for, the issuing of an EA. These EIA Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity.

An environmental Scoping and Impact Assessment process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and Impact Assessment studies accordingly provide a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts.

The DFFE have published a number of guidelines and protocols which have been considered in the compilation of this report and include but not limited to:

- Public Participation Guideline in terms of NEMA EIA Regulations (2017).
- Need and desirability Guideline in terms of NEMA (2012).
- National guideline on minimum information requirements for preparing Environmental Impact Assessments for mining act activities that require environmental authorisation (2018).
- 2004 Information Series covering various aspects of the EIA process.
- Procedures for assessment and minimum criteria for specialist studies.

The impacts of climate change as a result of, as well as potentially affecting the project, are addressed by the environmental management tools of integrated environmental management (IEM) and EIA, as prescribed by the

NEMA 107 of 1998. Given that the purpose of EIA is to give effect to the general objectives of IEM (section 24(1), NEMA), including sustainable development, there is a logical and necessary interrelationship between climate change and EIA.

NEMA sets out the general objectives of IEM in South Africa, of which the following two are of relevance for this report:

- Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities. This is to be done with a view to minimising negative impacts, maximising benefits and promoting compliance with the principles of environmental management set out in section 2 (of NEMA).
- Ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them.

A Screening Tool Report was generated from the DFFE Screening tool as per the requirements of Regulation 16 (1)(b)(v) of the EIA Regulations 2014, as amended, and was included in the Application for EA. The screening Tool provided a list of specialist studies for consideration and inclusion in the Scoping and EIA process. In this regard, a Site Sensitivity Verification Report (SSVR) has been compiled to consider the recommendations of the DFFE Screening Tool Report and to provide a rationale for the selection of specialist studies included in line with the recommendations of the Plan of Study for EIA.

In terms of Section 24(2) of NEMA, the Minister and/or any MEC in concurrence with the Minister may identify activities which require authorisation as these activities may negatively affect the environment. Environmental Impact Assessment (EIA) Regulations were promulgated in 2014 and amended in 2023 in terms of Section 24(5) and Section 44 of the National Environmental Management Act (NEMA), Act 107 of 1998 and consist of the following:

- *Regulation 982* provides details on the processes and procedures to be followed when undertaking an Environmental Authorisation application process (also referred to as the EIA Regulations);
- *Listing Notice 1* (Regulation 983) defines activities which will trigger the need for a Basic Assessment process;
- *Listing Notice 2* (Regulation 984) defines activities which trigger an Environmental Impact Assessment (EIA) process. If activities from both R 983 and R 984 are triggered, then an EIA process will be required; and
- *Listing Notice 3* (Regulations 985) defines certain additional listed activities for which a Basic Assessment process would be required within identified geographical areas.

The above regulations were assessed to determine whether the proposed project will trigger any of the above listed activities, and if so, which Environmental Authorisation Process would be required. The triggered listed activities presented in Table 5 will require authorisation in terms of GNR 984 Listing Notice 2 of the NEMA EIA Regulations 2014 as amended. A Scoping and EIA process is required in line with all the requirements of the NEMA EIA Regulations, 2014, as amended.

Table 5: Listed Activities in terms of NEMA EIA Regulations.

Listing Notice	Activity Description	Applicability
Listing Notice 1 of the EIA Regulations, 2014		

60	*The expansion and related operation of facilities or infrastructure for the bulk transportation of dangerous goods - (i) in gas form, outside an industrial complex, by an increased throughput capacity of 700 tons or more per day.*	A gas pipeline linking the CCGT plant to the Sasol gas pipeline system will be required. The new pipeline will have a throughput capacity of greater than 700 tons per day.
Listing Notice 2 of the EIA Regulations, 2014		
2	*The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.*	The CCGT plant will generate up to 600MW of electricity.
4	*The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*	Dangerous goods stored on site would be chemicals for the water treatment plant and diesel storage. Exact volumes cannot be accurately determined at this stage however the combined storage of all dangerous goods will definitely exceed 80 cubic meters and will definitely be less than 500 cubic meters
6	*The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding:* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or* *(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.*	An AEL is required for the CCGT. A WUL will also be required.
9	*The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial*	Electricity generated at the Kelvin Power CCGT Plant will be evacuated from the plant

	complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is- *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c) within an existing transmission line servitude; and* *(d) will be removed within 18 months of the commencement of development*	by means of two new 275kV lines (or possibly cables) with an approximate length of 250 m from the generating plant to the Sebenza 275/88kV Substation located adjacent to the proposed CCGT plant
Listing Notice 3 of the EIA Regulations, 2014		
4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas.*	The project involves development of access roads wider than 4m, with a reserve less than 13,5 m in areas considered as high agricultural potential land (land capability class value of 12).

3.7.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT(NEMAQA)

The National Framework for achieving the NEM:AQA was published in the Government Gazette on the 11th of September 2007 (and amended in 2018). The National Framework is a medium- to long term plan on how to implement the NEM:AQA to ensure the objectives of the act are met. The National Framework states that aside from the various spheres of government responsibility towards good air quality, industry too has a responsibility not to impinge on everyone's right to air that is not harmful to health and well-being. Industries therefore should take reasonable measures to prevent such pollution degradation from occurring, continuing, or recurring. In terms of NEM:AQA, certain industries have further responsibilities, including:

ii. Comply with any relevant national standards for emissions from point, non-point or mobile sources in respect of substances or mixtures of substances identified by the Minister, Member of the Executive Council (MEC) or municipality.

iii. Comply with the measurement requirements of identified emissions from point, non-point or mobile sources and the form in which such measurements must be reported and the organs of state to whom such measurements must be reported.

iv. Comply with relevant emission standards in respect of controlled emitters if an activity undertaken by the industry and/or an appliance used by the industry is identified as a controlled emitter.

v. Comply with any usage, manufacture or sale and/or emissions standards or prohibitions in respect of controlled fuels if such fuels are manufactured, sold or used by the industry.

vi. Comply with the Minister's requirement for the implementation of a pollution prevention plan in respect of a substance declared as a priority air pollutant.

vii. Comply with an Air Quality Officer's (AQOs) legal request to submit an Atmospheric Impact Report (AIR) in a prescribed form (if required).

viii. Take reasonable steps to prevent the emission of any offensive odour caused by any activity on their premises.

ix. Furthermore, industries identified as Listed Activities have further responsibilities, including:

a. Making application for an Atmospheric Emission License (AEL) and complying with its provisions.

b. Compliance with any minimum emission standards in respect of a substance or mixture of substances identified as resulting from a listed activity.

c. Designate an Emission Control Officer if required to do so.

3.7.2.1 NATIONAL MINIMUM EMISSION LIMITS

The Minister, in terms of Section 21 of the NEM:AQA, published a list of activities which result in atmospheric emissions and which are believed to have significant detrimental effects on the environment, human health and social welfare. The Listed Activities and Minimum National Emission Standards (MES) were first published on the 31st of March 2010 (Government Gazette No. 33064), with a revision of the schedule on the 22nd of November 2013 (Government Gazette No. 37054) and an amendment of certain sections and annexure A on the 31st of October 2018 (Government Gazette No. 42013). The project processes fall under Category 1: Combustion Installations. Based on the nature of the operations and wording in the latest Listed Activities and Minimum National Emission Standards, the proposed project at the site triggers Subcategories 1.4 and 1.5 of the listed activities (Table 6):

x. Gas Combustion Installations – Gas combustion used primarily for steam raising or electricity generation (more than 50-megawatt (MW) heat input per unit). MES subcategory 1.4 are applicable (Table 6) during normal operating conditions using natural gas.

Table 6: MES for Gas Combustion Installations

Subcategory 1.4: Gas Combustion Installations		
Description	Gas combustion (including gas turbines burning natural gas) used primarily for steam raising or electricity generation.	
Application	All installations with design capacity equal to or greater than 50 MW heat input per unit based on the lower calorific value of the fuel used.	
Substance or mixture of substances		**mg/Nm^3 under normal conditions of 3% O_2, 273 K and 101.3 kPa**
Common Name	**Chemical Symbol**	**New plant**
Particulate matter (PM)	Not applicable	10
Sulfur dioxide	SO_2	400
Oxides of nitrogen	NO_x expressed as NO_2	50

Notes:

(a) The following special arrangement shall apply:

i. Reference conditions for gas turbines shall be 15% O_2, 273 K and 101.3 kPa; and

ii. Where co-feeding with waste materials with calorific value allowed in terms of the Waste Disposal Standards published in terms of the Waste Act, 2008 (Act No.59 of 2008) occurs, additional requirements under subcategory 1.6 shall apply. (This would not be applicable to the current project)

Table 7: MES for Reciprocating Engines

Subcategory 1.5: Reciprocating Engines

Description	Liquid and gas fuel stationary engines used for electricity generation.	
Application	All installations with design capacity equal to or greater than 10 MW heat input per unit, based on the lower calorific value of the fuel used.	
Substance or mixture of substances		**mg/Nm^3 under normal conditions of 3% O_2, 273 K and 101.3 kPa**
Common Name	**Chemical Symbol**	**New plant**
Particulate matter (PM)	Not applicable	50
Oxides of nitrogen	NO_x expressed as NO_2	2000 (Liquefied fuels fired) 400 (Gas fired)
Sulfur dioxide	SO_2	1170 (Liquefied fuels fired)

3.7.2.2 ATMOSPHERIC EMISSION LICENSE (AEL) APPLICATION

The application for an AEL must include all sources of emission, not only those considered listed activities. In terms of the AEL application, the applicant should take into account the following sections of NEM:AQA:

37. *Application for atmospheric emission licences:*

(1) A person must apply for an AEL by lodging with the licencing authority of the area in which the listed activity is to be carried out, an application in the form required.

(2) An application for an AEL must be accompanied by –

(a) The prescribed processing fee; and

(b) Such documentation and information as may be required by the licencing authority.

38. Procedure for licence applications:

(1) The licencing authority –

(a) May, to the extent that is reasonable to do so, require the applicant, at the applicant's expense, to obtain and provide it by a given date with other information contained in or submitted in connection with the application;

(b) May conduct its own investigation on the likely effect of the proposed licence on air quality;

(c) May invite written comments from any organ of state which has an interest in the matter; and

(d) Must afford the applicant an opportunity to make representations on any adverse statements or objections to the application.

(2) Section 24 of the NEMA and section 22 of the Environmental Conservation Act apply to all applications for atmospheric emission licences, and both an applicant and the licencing authority must comply with those sections and any applicable notice issued or regulations made in relation to those sections.

(3) –

(a) An applicant must take appropriate steps to bring the application to the attention of relevant organs of state, interested persons and the public.

(b) Such steps must include the publication of a notice in at least two newspapers circulating the area in which the listed activity is applied for is or is to be carried out and must-

(i) Describe the nature and purpose of the licence applied for;

(ii) *Give particulars of the listed activity, including the place where it is to be carried out;*

(iii) *State a reasonable period within which written representations on or objections to the application may be submitted and the address or place where it must be submitted; and*

(iv) *Contain such other particulars as the licencing authority may require.*

46. Variation of provisional atmospheric emission licences and atmospheric emission licences

(1) A licensing authority may, by written notice to the holder of a provisional atmospheric emission licence or an atmospheric emission licence, vary the licence –

(a) if it is necessary or desirable to prevent deterioration of ambient air quality;

(b) if it is necessary or desirable for the purposes of achieving ambient air quality standards;

(c) if it is necessary or desirable to accommodate demands brought about by impacts on socioeconomic circumstances and it is in the public interest to meet those demands;

(d) at the written request of the holder of the licence;

(e) if it is transferred to another person in terms of section 44; or

(f) if it is reviewed in terms of section 45.

(2) The variation of a licence includes –

(a) the attaching of an additional condition or requirement to the licence;

(b) the substitution of a condition or requirement;

(c) the removal of a condition or requirement; or

(d) the amendment of a condition or requirement.

(3) If a licensing authority receives a request from the holder of a licence in terms of subsection (1)(d), the licensing authority must require the holder of the licence to take appropriate steps to bring the request to the attention of relevant organs of state, interested persons and the public if –

(a) the variation of the licence will authorise an increase in the environmental impact regulated by the licence;

(b) the variation of the licence will authorise an increase in atmospheric emissions; and

(c) the proposed variation has not, for any reason, been the subject of an authorisation in terms of any other legislation and public consultation.

(4) Steps in terms of subsection (3) must include the publication of a notice in at least two newspapers circulating in the area in which the listed activity authorised by the licence is, or will be, carried out –

(a) describing the nature and purpose of the request;

(b) giving particulars of the listed activity, including the place where it is or will be carried out;

(c) stating a reasonable period within which written representations on or objections to the request may be submitted, and the address or place where representations or objections must be submitted; and

(d) containing such other particulars as the licensing authority may require.

(5) Sections 38 and 40, read with the necessary changes as the context may require, apply to the variation of a licence.

4 PRESENT ENVIRONMENTAL STATUS

This section of the Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area as well as baseline information received from certain specialists assessments.

4.1 LOCATION

Kelvin wishes to develop a CCGT Power Plant at the existing Kelvin Power Station which is situated within the City of Ekurhuleni Metropolitan Municipality, Kempton Park and is approximately 5 km north west of the O.R. Tambo International Airport. The proposed development is to be located at the previous coal powered Kelvin A-Station Power Plant that is undergoing a decommissioning process. The proposed gas pipeline connection is to be located within an existing Kelvin Power servitude. The proposed CCGT Power Plant is situated within Remainder of Portion 391 of Farm Zuurfontein 33. However the proposed treated effluent will be discharged at the existing Kelvin Power Discharge point located in Portion 89 of Farm Zuurfontein 33. Refer to Figure 6 above for a map showing the geographical locations of discharge point/water uses for the Kelvin CCGT Power Plant

4.2 TOPOGRAPHY AND GEOLOGY

The site area gently slopes from east to west with a mean altitude of approximately 1670 mamsl. In terms of geology the site is underlain mostly by granodiorite and mafic and ultramafic rocks. Refer to Figure 7 and Figure 8 for maps showing the site topography and geology, respectively.

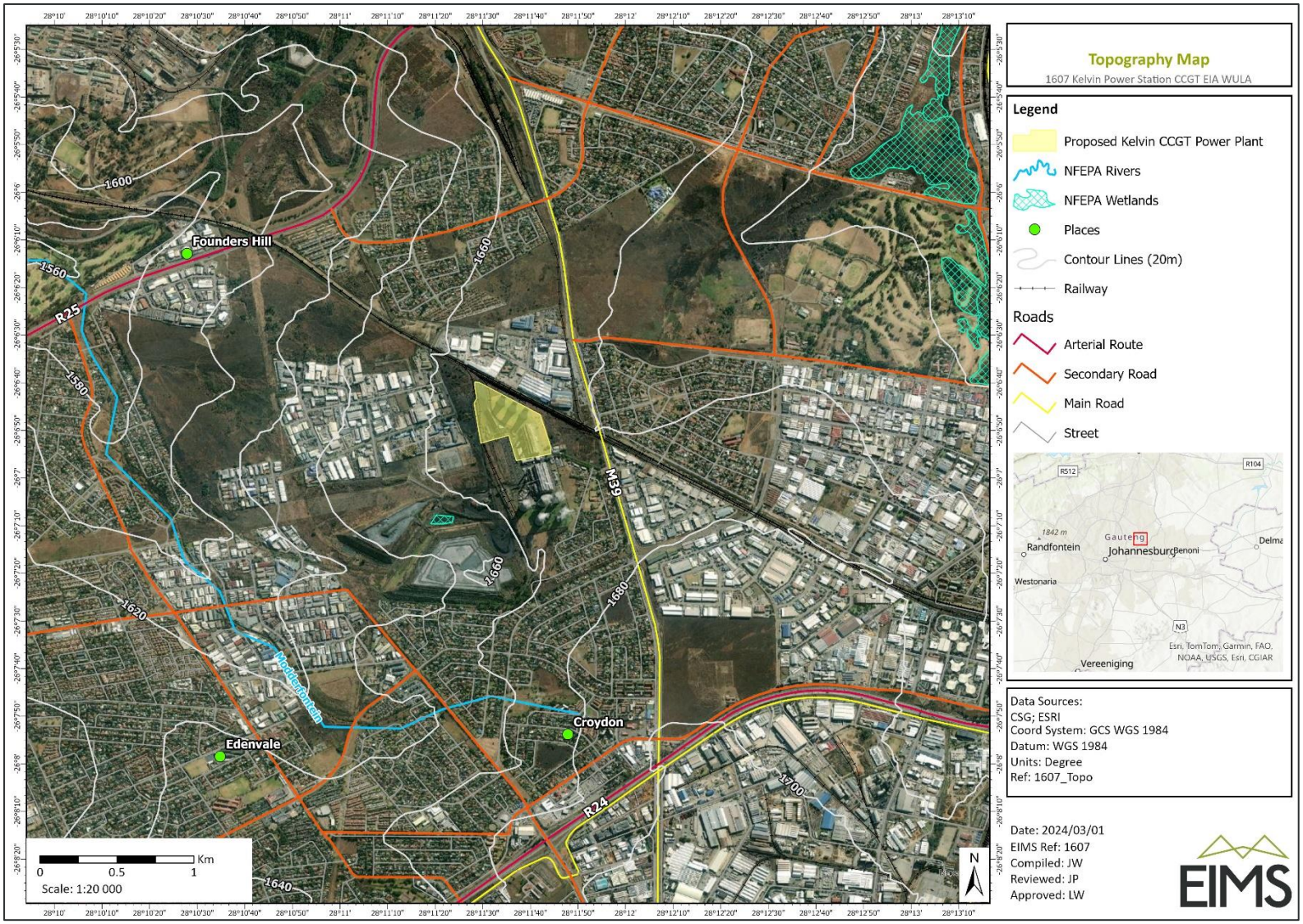


Figure 7: Topography map

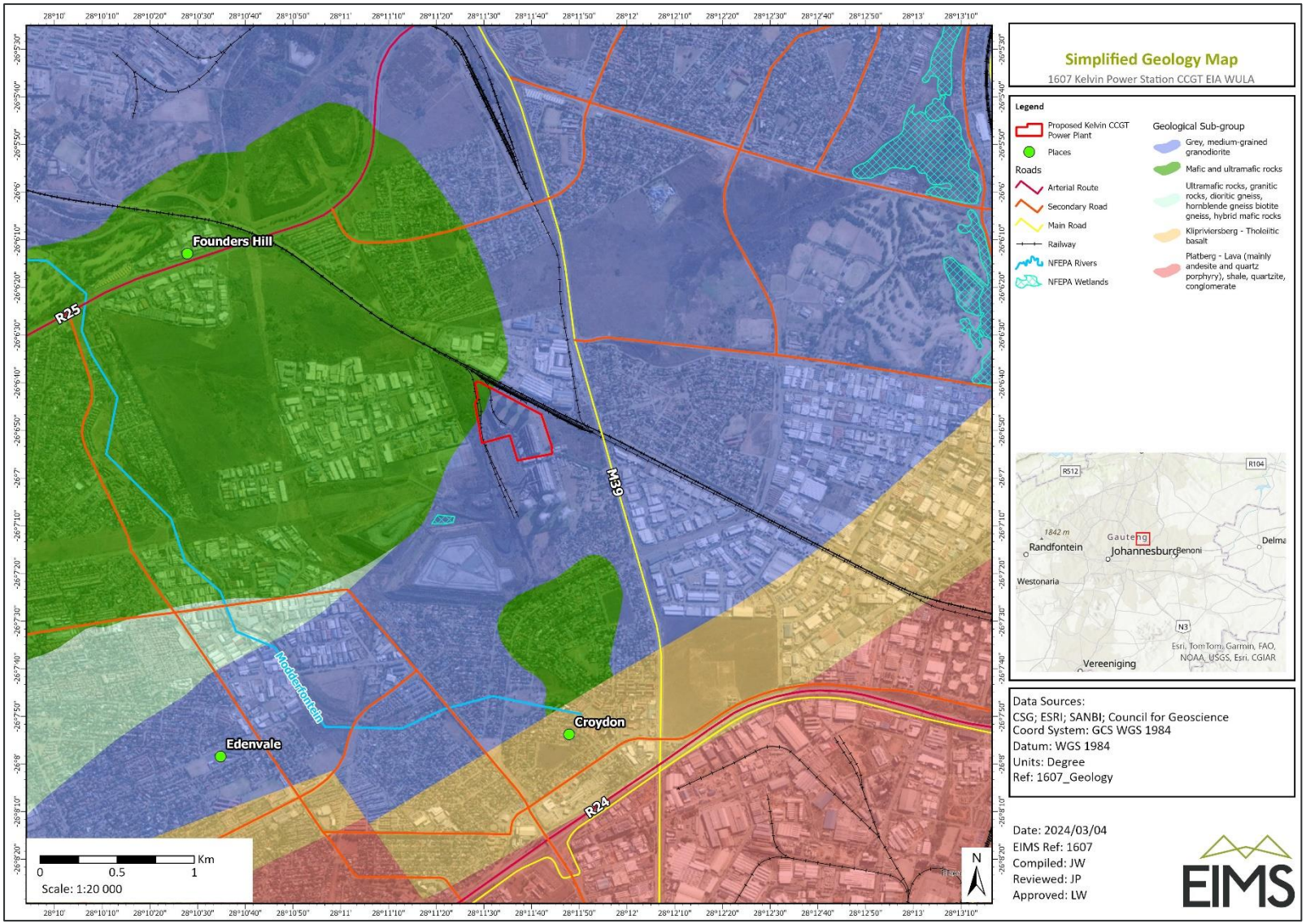


Figure 8: Geology Map

4.3 GENERAL SITE CONDITIONS

The site is located within land zoned as Publiclic service infrastructure – power generation. Kelvin Power Station is an operational power station consisting of the A-station and B-station. The A-station is no longer operational and is undergoing a demolition process. The proposed CCGT is to be located at the current A-station footprint. The Kelvin Power Station is located adjacent to residential area such as the Kelvin Estate and Croydon suburb. However, the proposed CCGT plant sire will not be adjacent to existing residential areas, being located more than 500m from those existing residential areas. It is however, mainly surrounded by Industrial land uses. It is further noteworthy that there are Ash dams located within the boundary of the Kelvin Power Station, near which the proposed discharge point for the treated effluent is located.

Figure 9: View of the existing Kelvin Power discharge point with view of Industrial land use in neighbouring property.

Figure 10: Downstream view of the existing Kelvin Power discharge point with view of the Ash-dam.

Figure 11: View of the Kelvin A-station, cooling towers and access road

Figure 12: Kelvin A-station cooling towers (CCGT Power Plant footprint)

Figure 13: General conditions of the study area.

Figure 14: View of the Sebenza switch yard.

4.4 CLIMATE

Climate change metrics focus on temperature; the number of very hot days (where temperatures exceed 35°C); rainfall and extreme rainfall events (more than 20 mm in 24 hours). The baseline (1961 to 1990) annual averages for these metrics were accessed for the area near the project site from the South Africa 'Green Book' (CSIR, 2019). The metrics include three percentiles[1] (10th, 50th, and 90th) as an indication of the variability within the measured data set.

Baseline annual average temperature was in the range 15.57°C (10th percentile) and 15.81°C (90th percentile) (Figure 17) with the number of very hot days varying between 0.12 (10th percentile) and 0.84 (90th percentile) days per year (Figure 18). The range between the 10th and 90th percentiles is 832.92 mm and 916.83 mm (Figure 19). Extreme rainfall days varied between 8.89 (10th percentile) and 9.94 (90th percentile) days per year (Figure 20).

Recent change in climatic conditions near the project site were accessed from MeteoBlue a weather forecasting platform developed at the University of Basel, Switzerland and based on models of National Oceanic and Atmospheric Administration (NOAA) or National Centres for Environmental Prediction (NCEP). The data sets also include historical climate data tracking changes in climate by referencing ERA5, the fifth generation ECMWF (European Centre for Medium-Range Weather Forecasts) atmospheric reanalysis of the global climate, for the period between 1979 to 2021, with a spatial resolution of 30 km. Based on a point selected over the project site, an increasing trend in the annual average temperatures have been observed from 15.3°C in 1979 to 16.7°C in 2023 (Figure 15). The lower part the graph shows the so-called warming stripes. Each coloured stripe represents the average temperature for a year - blue for colder and red for warmer years. The change in rainfall over the same period (1979 – 2023) displays a slight decreasing trend from 807.5 mm in 1979 to 720.1 mm in 2023 (Figure 16), where the difference from long-term average for each year in the data set is visualised by the stripes in the lower panel of Figure 16 brown stripes indicate lower than average rainfall and green stripes above average rainfall).

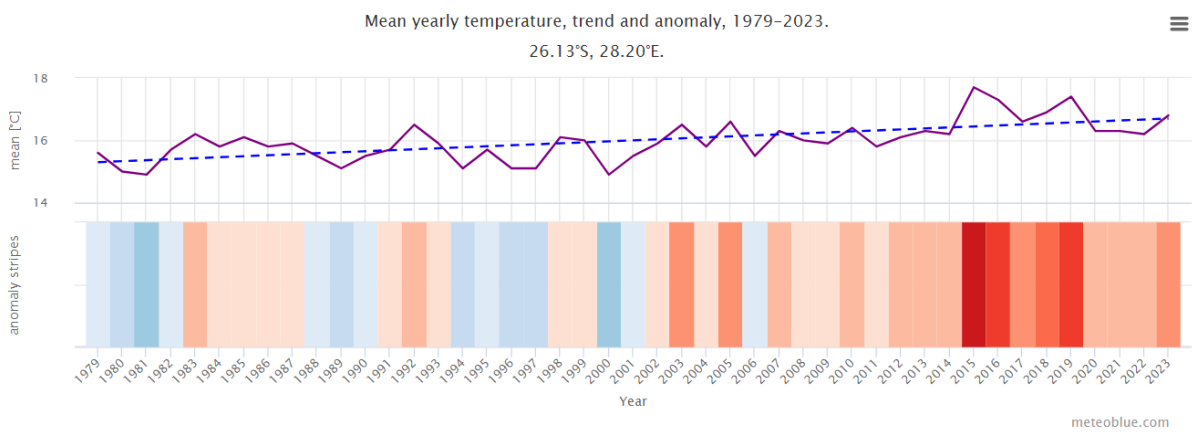


Figure 15: Annual average temperature (top panel) and temperature anomaly (lower panel) between 1979 and 2023 (meteoblue AG, 2024)

[1] A percentile is a statistical measure to indicate the value below which a given percentage of observations in a group of observations falls. For example, the 90th percentile is the value below which 90% of the observations fall. The 10th percentile is the value below which 10% of the observations fall.

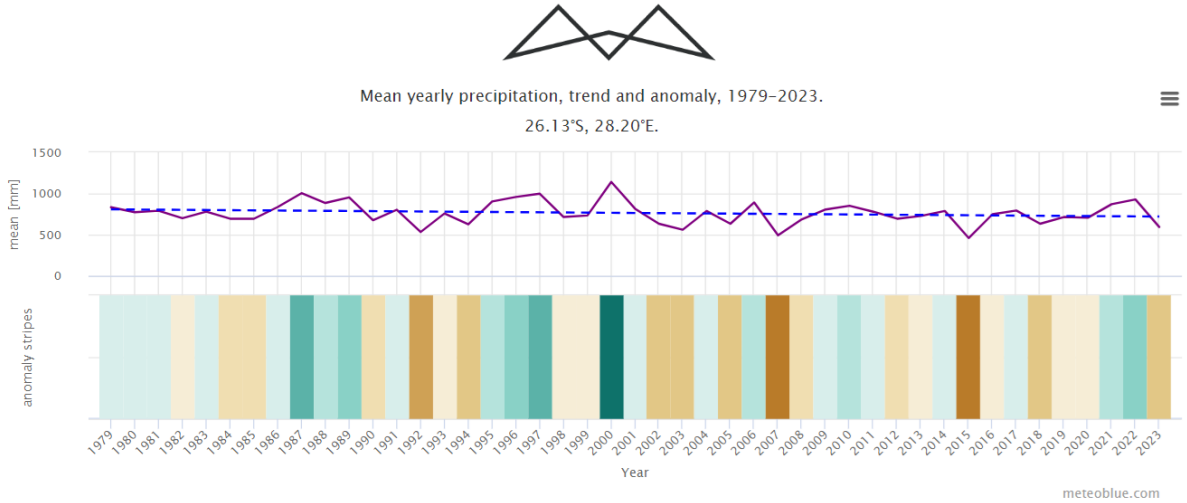


Figure 16: Annual average rainfall (top panel) and rainfall anomaly (lower panel) between 1979 and 2023 (meteoblue AG, 2024)

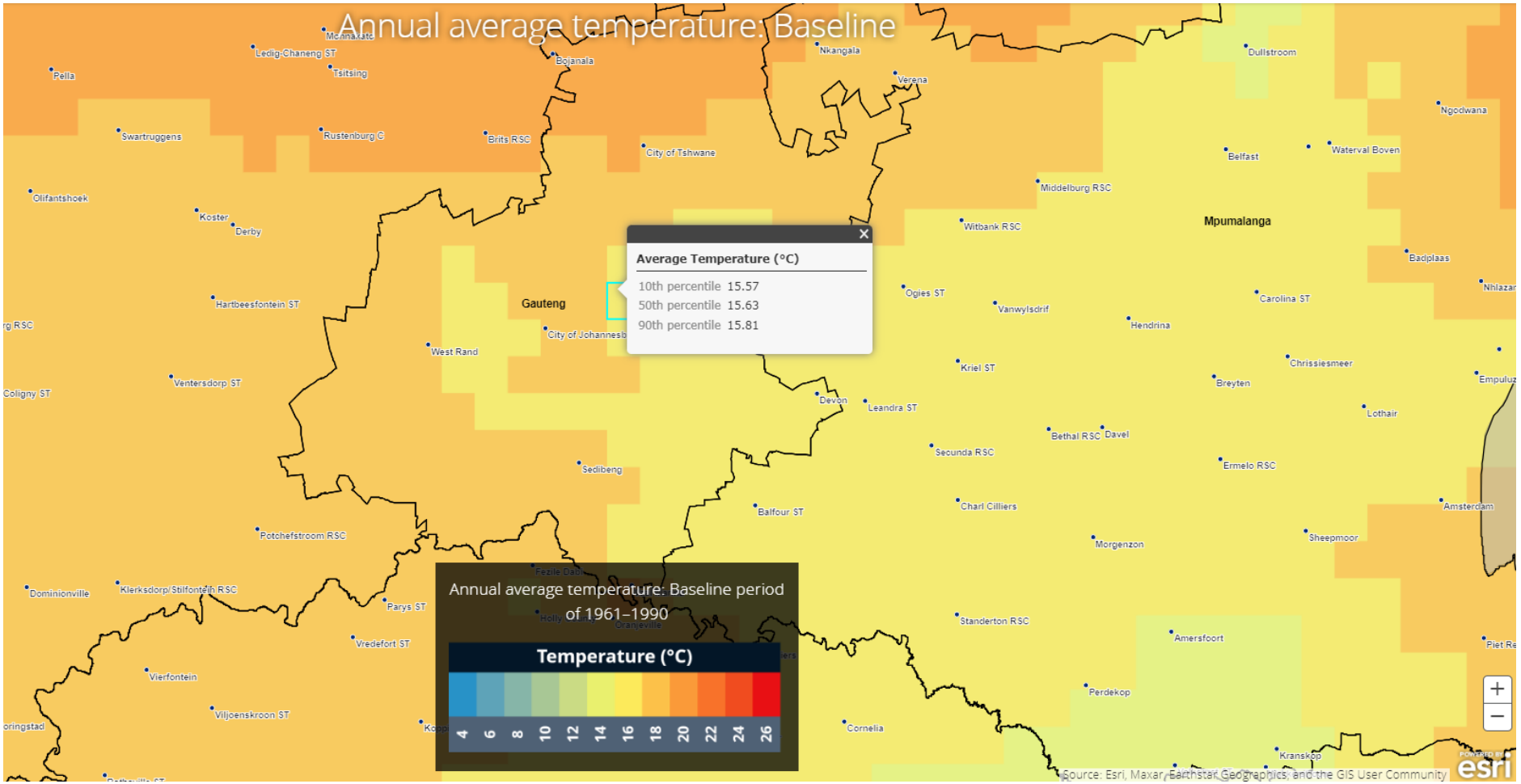


Figure 17: Baseline (1961 to 1990) annual average temperature for the project area (CSIR, 2019)

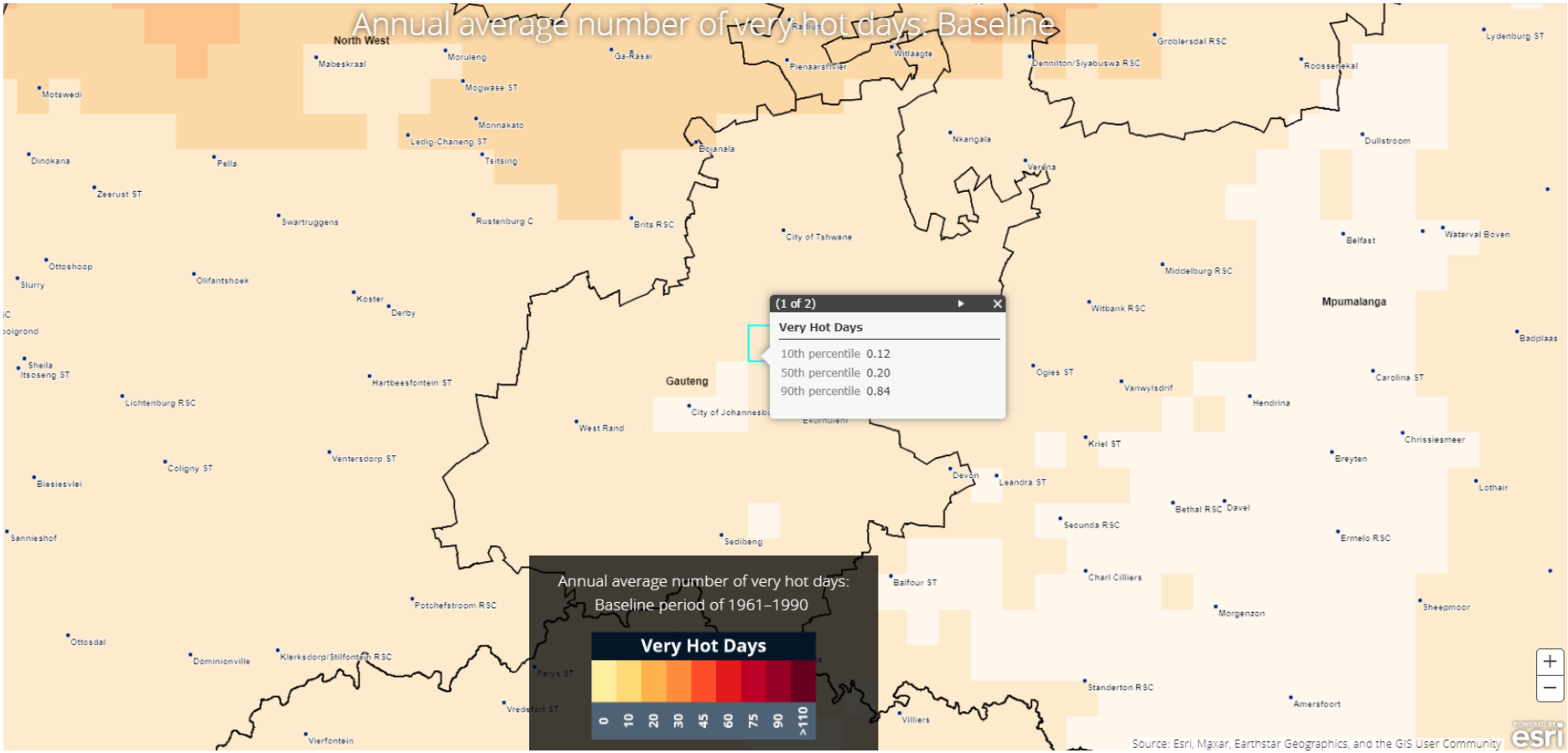


Figure 18: Baseline (1961 to 1990) number of very hot days (>35°C) annually for the project area (CSIR, 2019)

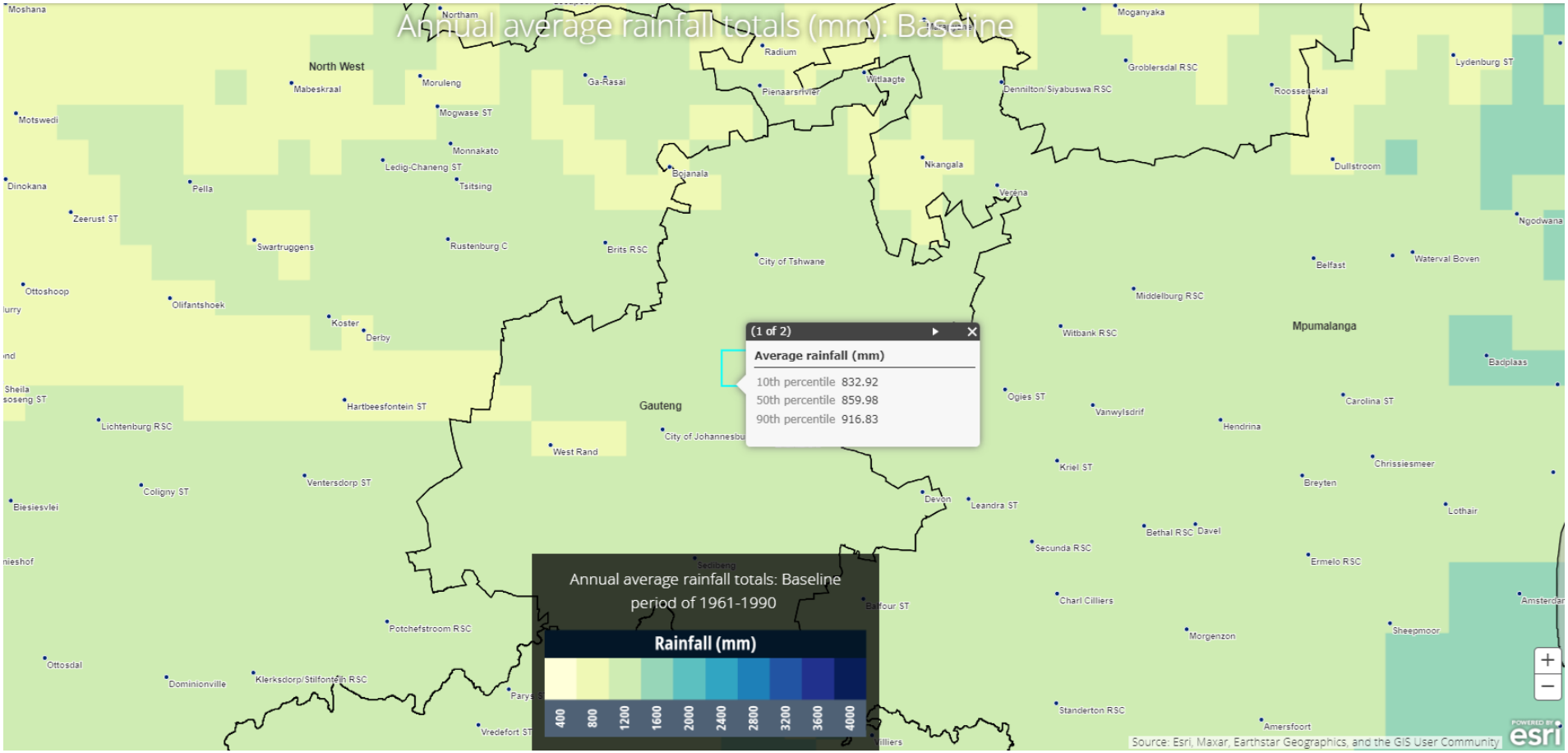


Figure 19: Baseline (1961 to 1990) annual average rainfall for the project area (CSIR, 2019)

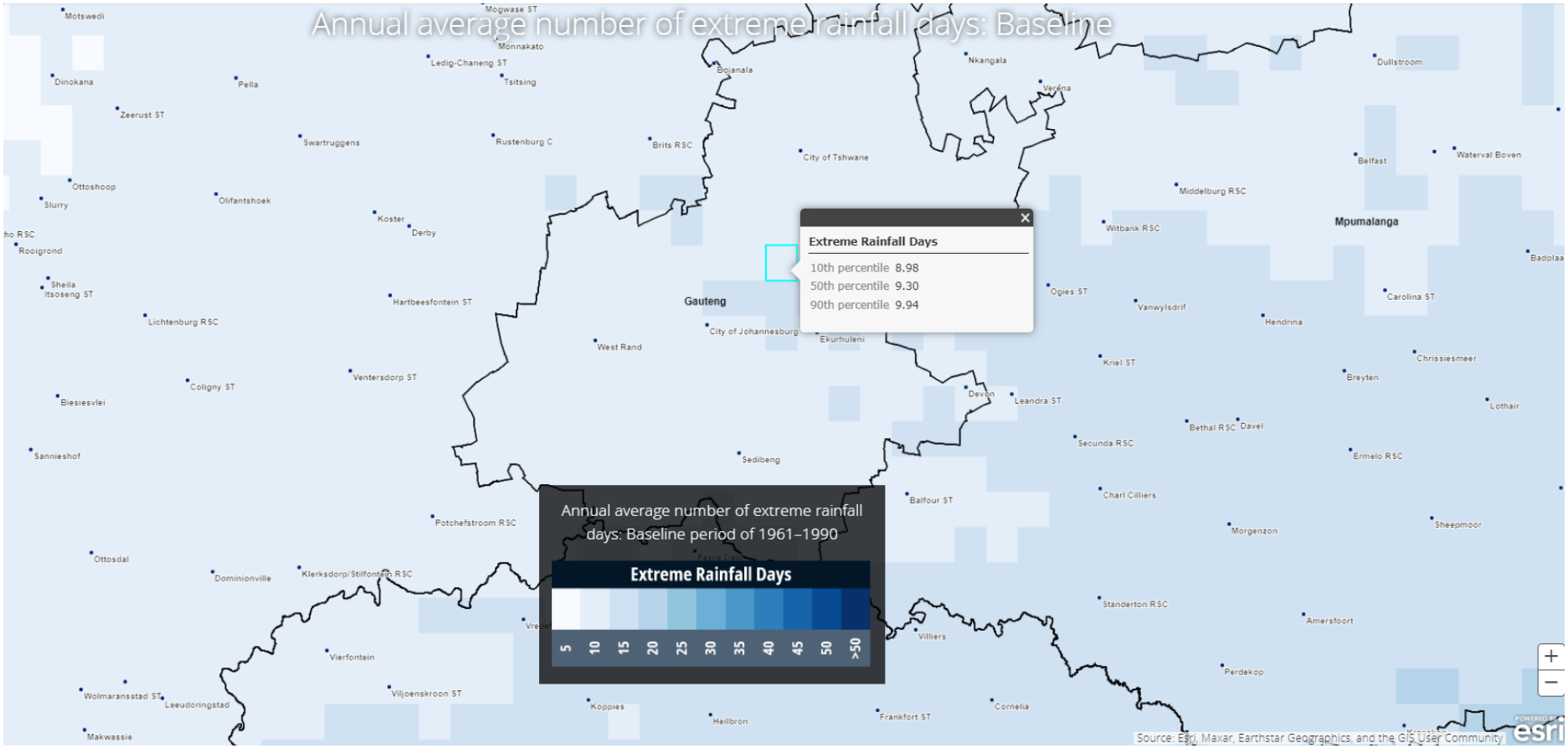


Figure 20: Baseline (1961 to 1990) annual average number of extreme rainfall days (>20 mm in <24 hours) for the project area (CSIR, 2019)

4.5 SOILS AND LAND CAPABILITY

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area falls within the Ab 11 land type (see Figure 21). The Ab 11 land type mainly consists of Hutton, Willowbrook and Rensburg soil forms according to the Soil classification working group, (1991), with the occurrence of other soils within the landscape. The Hb land type are characterised by red-yellow apedal, freely drained soils; red, dystrophic and/or mesotrophic. The land terrain units for the featured Ab 11 land type are illustrated in Figure 22 with the expected soils listed in Table 8. Refer to Figure 24 for a simplified soil map.

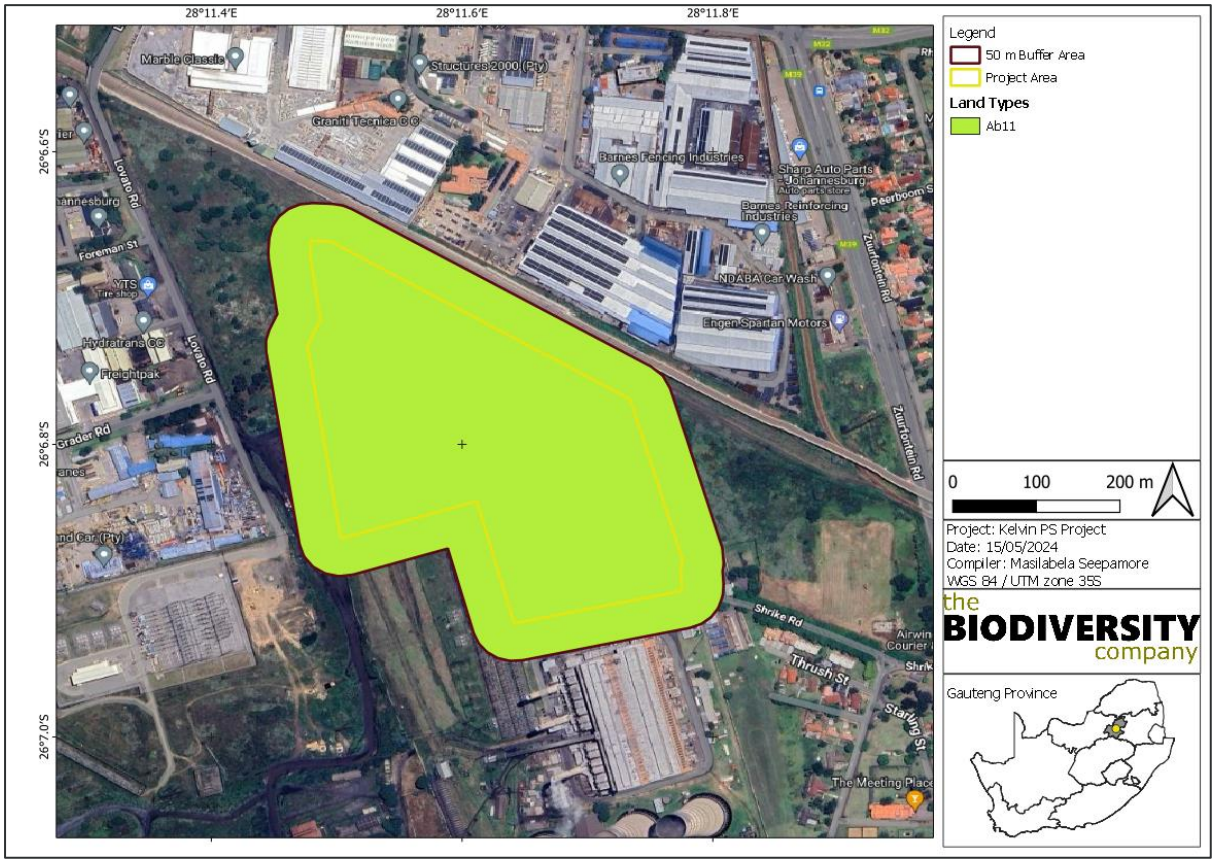


Figure 21: Map showing land types associated with the project area

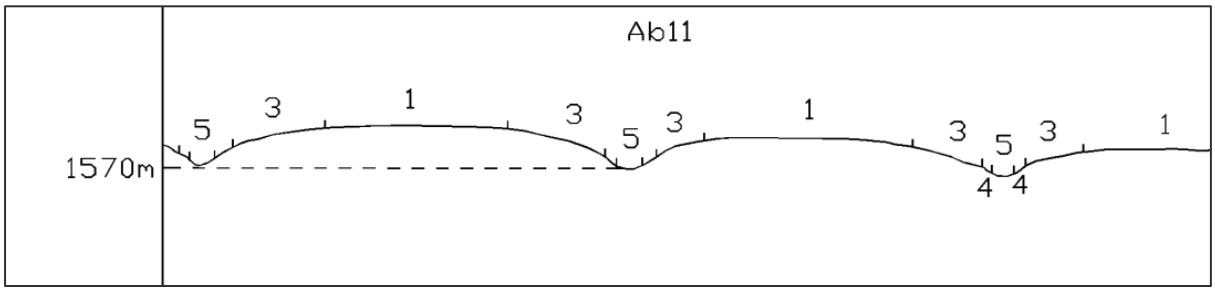


Figure 22: Illustration of land type Ab 11 terrain units (Land Type Survey Staff, 1972 - 2006)

Table 8: Soils expected at the respective terrain units within the Ab 11 land type (Land Type Survey Staff, 1972 - 2006)

Terrain units							
1 (45%)		**3 (45%)**		**4 (5%)**		**5 (5%)**	
Hutton	80%	Hutton	65%	Hutton	40%	Willowbrook, Rensburg	50%
Shortlands	10%	Shortlands	10%	Valsrivier	20%	Bonheim	20%

Terrain units							
1 (45%)		3 (45%)		4 (5%)		5 (5%)	
Bainsvlei	5%	Bainsvlei	10%	Bainsvlei	15%	Valsrivier	20%
Bare Rocks	5%	Bonheim	5%	Bonheim	15%	Westleigh	10%
		Westleigh	5%	Westleigh	10%		
		Bare Rocks	5%				

The slope percentage of the proposed project area has been calculated and is illustrated in Figure 23. Most of the project area is characterised by a slope percentage ranging between 0 to 10% with some irregularities in areas with slopes between 10 to 25%. This illustration indicates a mostly non-uniform topography with occurrence of some steep sloping being present.

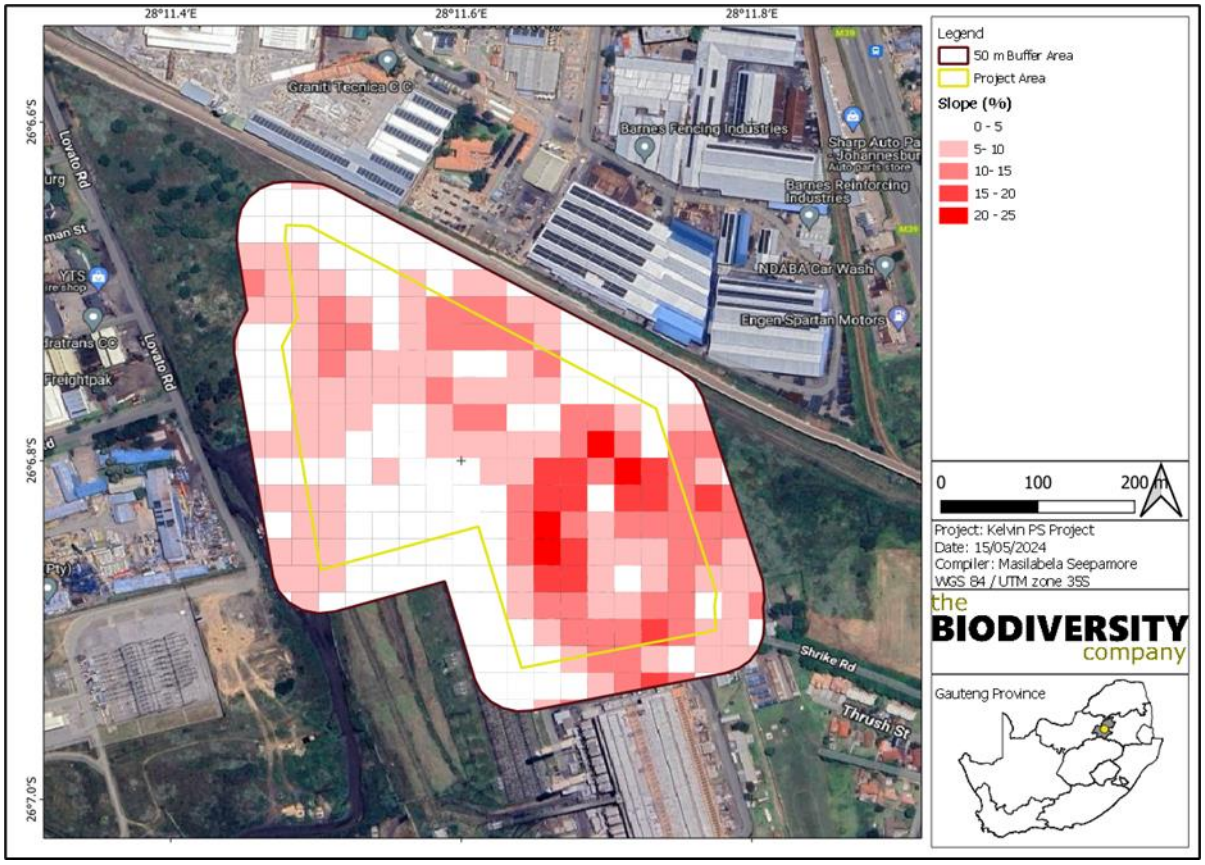


Figure 23: Slope percentage map

The three representative soil forms that were identified within the 50 m buffer area include the Nkonkoni, Glenrosa and Witbank soil forms. The proposed project area is dominated by the Witbank and Glenrosa soil forms and with Nkonkoni soil form being the least dominant soil form within the 50 m buffer area (see Figure 24). The study area falls predominately on shallow red apedal soil which are mostly covered by transported anthropogenic materials. The different soil forms identified within the proposed project area, as well as the current land uses are illustrated in Figure 25 and Figure 26, respectively.

The most sensitive soil form identified within the proposed project area, with a moderate suitability for crop production is the Nkonkoni soil form. The Nkonkoni soil form consists of an orthic topsoil horizon on top of a red apedal horizon underlain with a lithic horizon below. The soil is characterised with a moderate suitability for crop production due to its good drainage, aeration and inherent fertility. However, the presence of a shallow lithic horizon may impede root development and decrease the total soil water storage capacity which is critical for crop production under rainfed conditions.

Other less sensitive soil forms identified within the project area include Glenrosa and Witbank soil forms. The Glenrosa soil form consists with an orthic topsoil horizon on top of a lithic horizon below. The Witbank soil form consists of transported technosols mainly anthropogenic material covering natural soil. These soils are considered to have a lower suitability for crop production due to their restrictive limitations which include impermeable subsoil horizon of a fractured rock and occurrence of various elements at high concentrations that can be toxic for majority of important agronomic crops, which are found within the transported anthropogenic materials.

The most sensitive land capability of the above-mentioned soils has been determined to be class “IV”, and the other less sensitive soils were determined to be of class “VI” and “VIII.” The land capability class “IV” is characterised with severe limitations with a low arable potential and is mostly suitable for long term leys. The land capability class “VI” is characterised by limitations that preclude cultivation, and is mostly suitable for veld, pasture, and afforestation. Lastly, the land capability class “VIII” is characterised with extremely severe limitations, non-arable and is mostly suitable for wildlife. A climate capability of level 8 has been assigned to the proposed project area given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. By using the determined land capability for the most sensitive soils and the determined climate capability, a land potential of “L6” was calculated for the most sensitive land capability class. The land potential level for the less sensitive soil forms was calculated to be “L7” and “L8”. The areas associated with the “L6”, “L7” and “L8” land potential are considered to be non-arable.

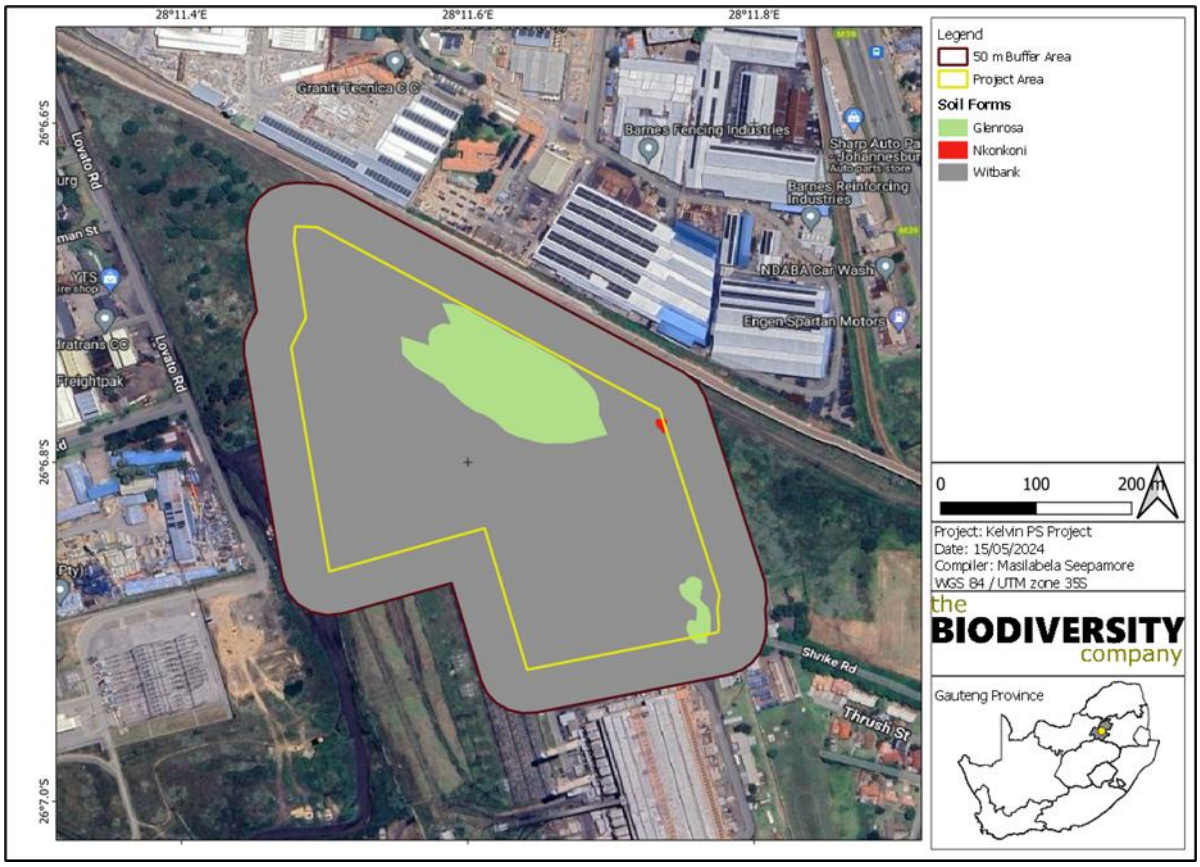


Figure 24: Soil forms found within the proposed project area

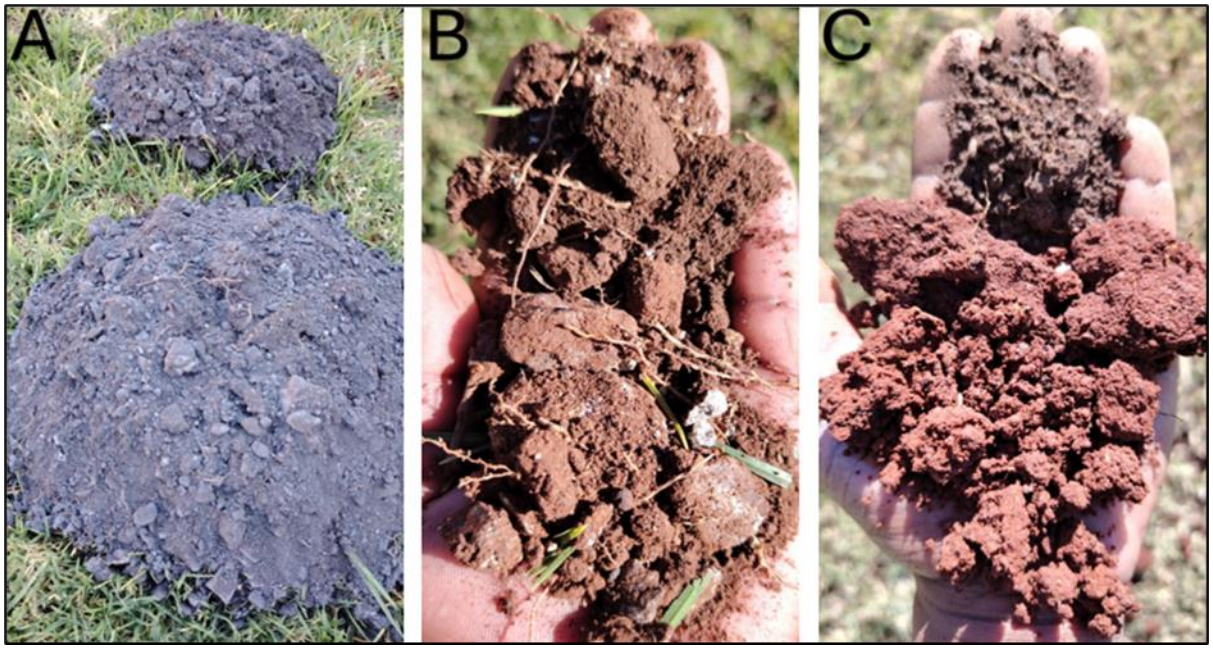


Figure 25: Diagnostic soil horizons identified on-site: A) Witbank Technosols; B) Glenrosa soil form; and C) Nkonkoni soil form.

Figure 26: Different land uses identified within the 50 m buffer area; A) & B) Kelvin PowerStation Infrastructure; and C) & D) occurrence of anthropogenic material on top and within the soil.

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which seven potential land capability classes are located within the proposed Kelvin Power's CCGT development area;

- Land Capability 9 to 10 (Moderate High Sensitivity); and
- Land Capability 11 to 15 (High to Very High Sensitivity).

The land capability dataset (DAFF, 2017) indicates a dominant land capability category expected throughout the project focus area which falls under "Moderate High" sensitivity category, with few isolated "High to Very High" category (see Figure 27).

Considering the soil properties, agricultural potential as well as the current land use of the proposed development area, the soil specialist concluded that the site has a “Low” agricultural sensitivity. Based on the confirmed sensitivities, the overall sensitivity of the proposed project area is also categorized as “Low” (refer to Figure 28 and Figure 29).

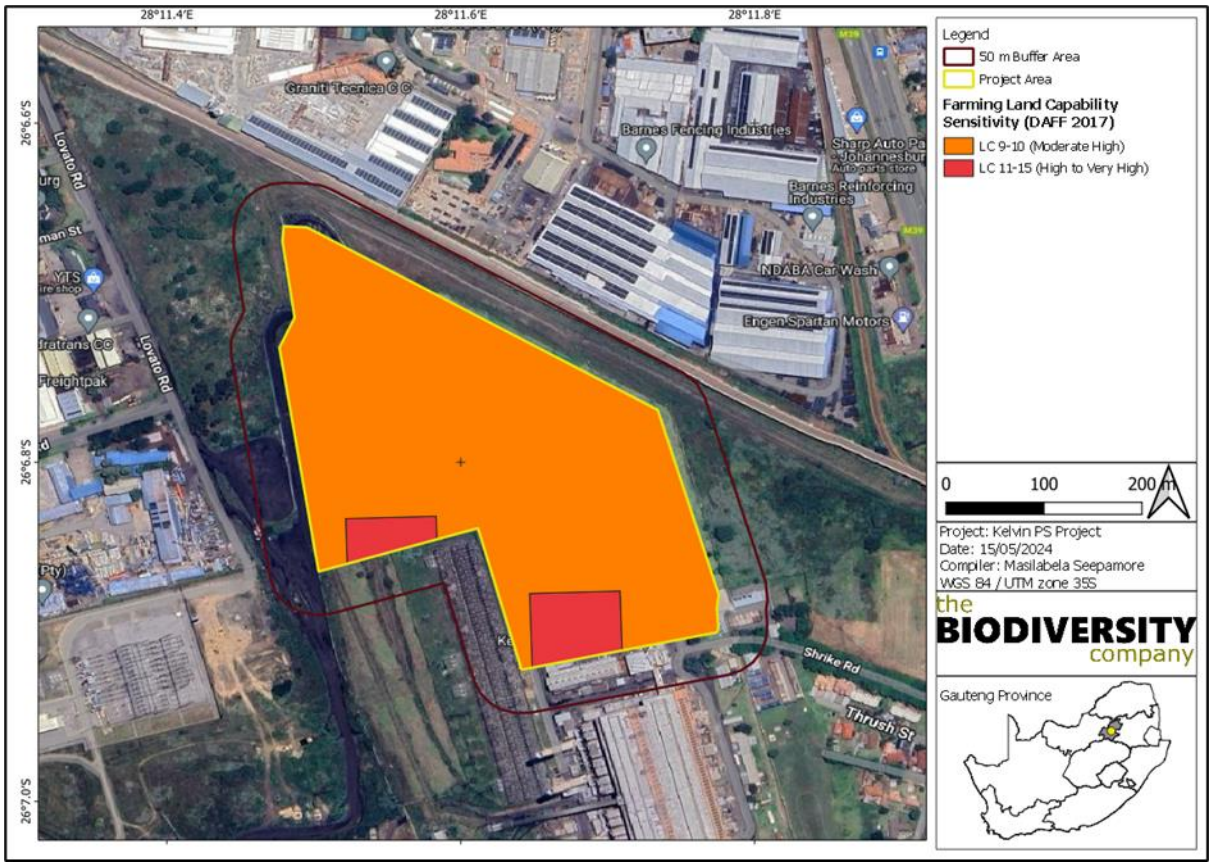


Figure 27: Land Capability Sensitivity (DAFF, 2017)

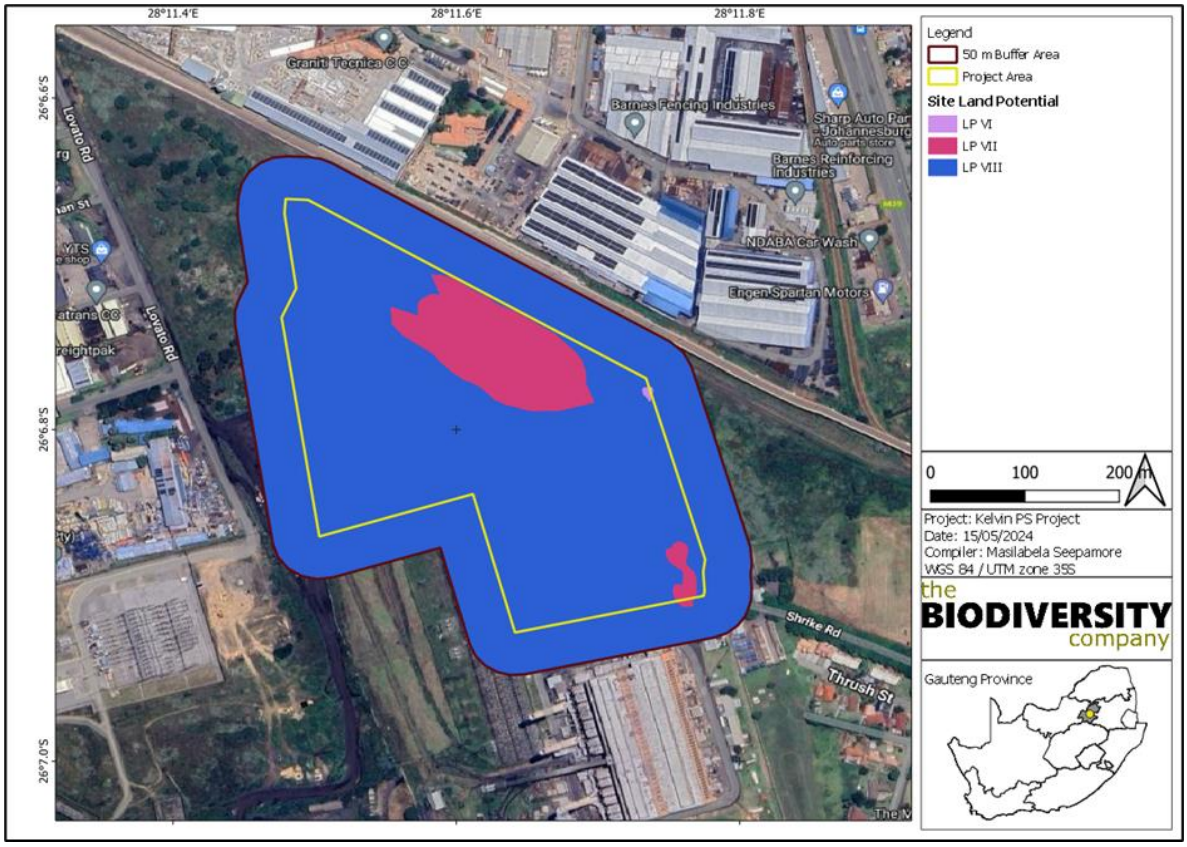


Figure 28: Specialist determined land potential.

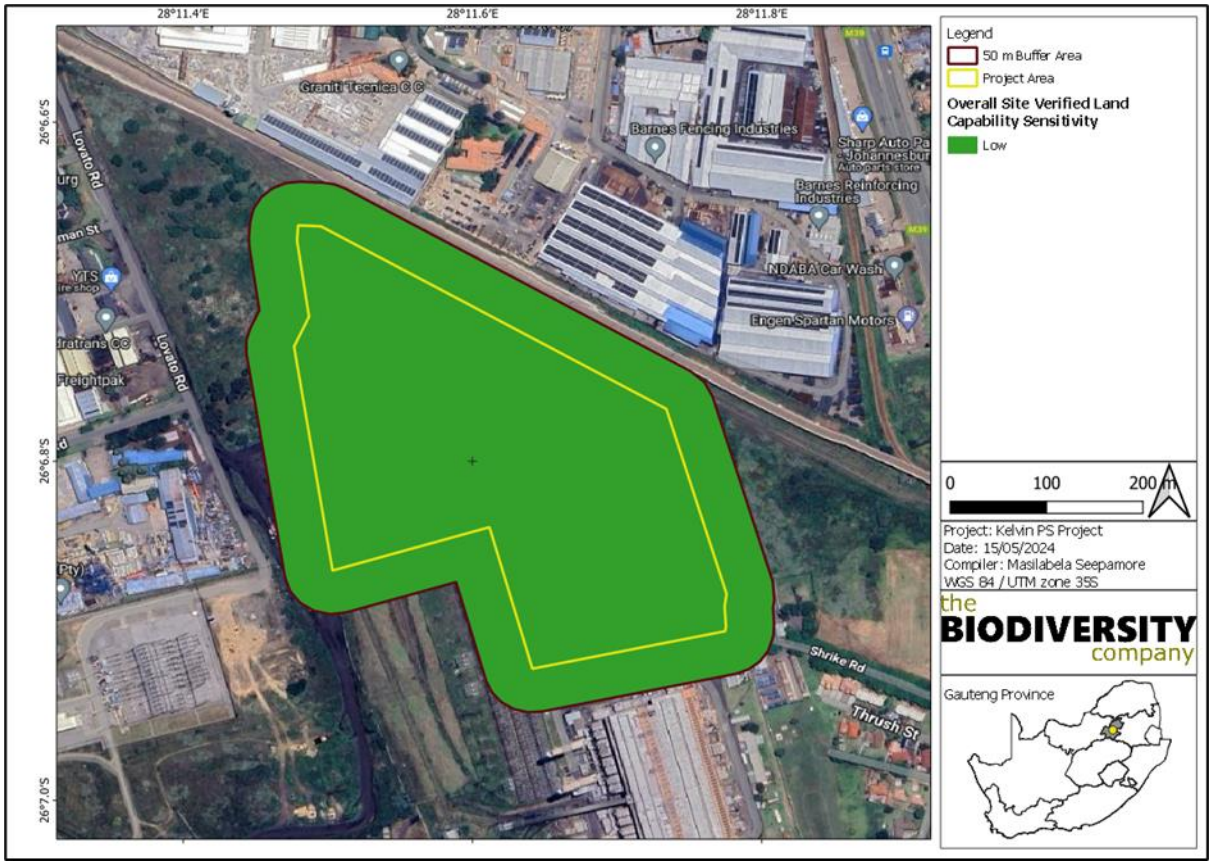


Figure 29: Overall site verified land capability sensitivity

4.6 SOCIO-ECONOMIC

The proposed site for the project is located in Ward 17 of the City of Ekurhuleni Metropolitan Municipality that is located in the Gauteng Province. Wards 18 and 104 of the City of Ekurhuleni Metropolitan Municipality and Ward 32 of the City of Johannesburg are in close proximity of the site.

The City of Ekurhuleni Metropolitan Municipality is located in the Gauteng Province and covers an extensive area from Germiston in the west and Nigel and Springs in the east. It is one of the most densely populated areas on both the province and the country (www.municipalities.co.za). The area accounts for nearly a quarter of Gauteng's economy. The municipal area consists of 112 wards. Cities and towns in the municipal area includes Alberton, Bedfordview, Benoni, Birchleigh, Boksburg, Brakpan, Clayville, Daveyton, Dunnottar, Edenvale, Geduld, Germiston, Kathlehong, Kempton Park, Kwa-Thema, Machenzieville, Nigel, Olifantsfontein, Springs, Tembisa, Tokoza, Vosloorus and Vorsterkroon. The municipality covers an area of 1 975km^2 and the main economic sectors are Manufacturing, Finance and Business services, Community services, Trade, Transport, Construction, Electricity, and Mining.

CoE is home to the largest airport in South Africa. Ekurhuleni is Gauteng's first aerotropolis. This is a metropolis with an airport at its centre. O.R. Tambo International Airport has two terminals handling domestic and international flights. Terminal A handles international traffic and Terminal B domestic flights. The airport services airlines from all five continents and plays a vital role in serving the local, regional, intra-, and inter-continental air transport needs of South Africa and sub-Saharan Africa. It is the biggest and busiest airport in Africa.

According to the Census 2022, the population of South Africa is approximately 62 million and has shown an increase of about 19.8% since 2011. The household density for the country is estimated on approximately 3.48 people per household, indicating an average household size of 3-4 people for most households, which is down from the 2011 average household size of 3.58 people per household. Smaller household sizes are in general associated with higher levels of urbanisation.

The greatest increase in population since 2011 has been in the Ekurhuleni MM (Table 9). The increase in population on provincial, regional, and local level was higher than on national level, except in the City of Johannesburg MM. Population density refers to the number of people per square kilometre and the population density on a national level has increased from 42.45 people per km^2 in 2011 to 50.81 people per km^2 in 2022. In the study area the population density has increased since 2011 with the highest density in the City of Johannesburg MM.

Table 9: Population density and growth estimates (sources: Census 2011, Census 2022)

Area	Size in km^2	Population 2011	Population 2022	Population density 2011	Population density 2022	Growth in population (%)
Gauteng Province	18,178	12,272 263	15,099,422	675.12	830.64	23.04
Ekurhuleni MM	1,976	3,178 470	4,066,691	1,608.54	2,058.04	27.94
City of Johannesburg MM	1,643	4,434,631	4,803.262	2,699.11	2,923.47	8.31

The number of households in the study area has increased on all levels (Table 10). The proportionate increase in households were greater than the increase in population on all levels and exceeded the growth in households of 12.3% on a national level. The average household size has shown a decrease on all levels, which means there are more households, but with less members.

Table 10: Household sizes and growth estimates (sources: Census 2011, Census 2022)

Area	Households 2011	Households 2022	Average household size 2011	Average household size 2022	Growth in households (%)
Gauteng Province	3,908,826	5,318,665	3.14	2.84	36.07
Ekurhuleni MM	1,015,398	1,421,003	3.13	2.86	39.95

Area	Households 2011	Households 2022	Average household size 2011	Average household size 2022	Growth in households (%)
City of Johannesburg	1,434,715	1,841,917	3.09	2.61	28.38

The total dependency ratio is used to measure the pressure on the productive population and refer to the proportion of dependents per 100 working-age population. As the ratio increases, there may be an increased burden on the productive part of the population to maintain the upbringing and pensions of the economically dependent. A high dependency ratio can cause serious problems for a country as the largest proportion of a government's expenditure is on health, social grants and education that are most used by the old and young population.

Census 2022 shows that since 2011 the dependency ratios have decreased on all levels, with the highest total dependency ratio in the Ekurhuleni MM (Table 11). The decrease is most likely due to an increase in people of working age and a decrease in Youth. The same trend applies to the youth and employment dependency ratios. Employed dependency ratio refers to the proportion of people dependent on the people who are employed, and not only those of working age. The aged dependency ratio showed an increase in all areas since 2011. Census 2022 has not yet released employment data to enable calculation of the employment dependency ratios for comparative purposes.

Table 11: Dependency ratios (source: Census 2011, Census 2022).

Area	Total dependency	Youth dependency	Aged dependency	Employed dependency*
Gauteng	**38,97**	**32,94**	**6,03**	**63,60**
Gauteng '22	**38,86**	**31,30**	**7,55**	
Ekurhuleni MM	***39,44***	***33,89***	***5,55***	***64,55***
Ekurhuleni MM '22	***37,31***	***30,38***	***6,93***	
Ward 17	33,18	26,27	6,91	48,15
Ward 18	38,61	25,81	12,80	45,55
Ward 104	38,56	30,26	8,31	48,11
City of Johannesburg MM	***37,62***	***31,92***	***5,69***	***61,75***
City of Johannesburg MM '22	***36,82***	***30,01***	***6,82***	
Ward 32	38,24	33,32	4,92	47,74

* Employment data for Census 2022 not yet released

Poverty is a complex issue that manifests itself in economic, social, and political ways and to define poverty by a unidimensional measure such as income or expenditure would be an oversimplification of the matter. Poor people themselves describe their experience of poverty as multidimensional. The South African Multidimensional Poverty Index (SAMPI) (Statistics South Africa, 2014) assess poverty on the dimensions of health, education, standard of living and economic activity using the indicators child mortality, years of schooling, school attendance, fuel for heating, lighting, and cooking, water access, sanitation, dwelling type, asset ownership and unemployment.

The poverty headcount refers to the proportion of households that can be defined as multi-dimensionally poor by using the SAMPI's poverty cut-offs (Statistics South Africa, 2014). The poverty headcount has increased in the Ekurhuleni MM between 2011 and 2016 (Table 12), indicating an increase in the number of multi-dimensionally poor households in the Ekurhuleni MM. Census 2022 has not yet released data on poverty.

The intensity of poverty experienced refers to the average proportion of indicators in which poor households are deprived (Statistics South Africa, 2014). The intensity of poverty has increased on all levels. The intensity of poverty and the poverty headcount is used to calculate the SAMPI score. A higher score indicates a very poor community that is deprived on many indicators. The SAMPI score on a local level has increased significantly between 2011 and 2016. It is anticipated that the scores would have increased even more since 2016 due to the aftermath of the Covid-19 pandemic.

Table 12: Poverty and SAMPI scores (sources: Census 2011 and Community Survey 2016).

Area	Poverty headcount 2011 (%)	Poverty intensity 2011 (%)	SAMPI 2011	Poverty headcount 2016 (%)	Poverty intensity 2016 (%)	SAMPI 2016
Gauteng Province	4,8	43,8	0,021	4,6	44,1	0,020
Ekurhuleni MM	6,4	44,5	0,028	6,6	44,7	0,030
City of Johannesburg MM	3,7	43,3	0,016	3,5	44,1	0,015

4.7 SURFACE WATER AND WETLANDS

South Africa is divided into nineteen (19) Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level is achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA progressively develops a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a WMA is the CMS which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources.

The Kelvin site is situated on the boundary of two quaternary catchments, A21C and A21A, with 97% of the site in quaternary catchment A21C, the Jukskei River catchment. An unnamed tributary drains north-west for approximately 1.1km to confluence with the Modderfonteinspruit from the catchment of the ash dams where effluent is discharged. The Modderfonteinspruit confluences with the Jukskei River which drains in a north westerly direction and confluences with the Crocodile River approximately 35 km downstream. The station is situated within an industrial area, however it is also close to a number of residential areas. In addition, there are large areas of Alexandra, located downstream, where it is understood that informal use of water from the Jukskei River occurs. A-station, the area now proposed for the CCGT plant, is located in an area where there are no water resources that would be directly affected by runoff. Drainage from this section is currently via stormwater drains that drain directly to Main Channel which ultimately discharges to Modderfonteinspruit. Kelvin has implemented a surface water monitoring programme that includes daily monitoring of the effluent and weekly monitoring at the effluent discharge point into the unnamed tributary as well as at points up and downstream of this in the Modderfonteinspruit.

The station is situated within an industrial area, however it is also close to a number of residential areas. In addition, there are large areas of Alexandra, located downstream, where it is understood that informal use of water from the Jukskei River occurs. Catchment A21C is 75 961 ha and the part of the Kelvin site contributing to this catchment is 154.7 ha (or 0.2%) and Catchment A21A is 48 189 ha and the portion of the Kelvin site contributing to this catchment is 5.4 ha (or 0.01%). The site is at an elevation of between 1620 and 1680 mamsl with a gentle slope of approximately 0.03 (3% or 3 meters of elevation for every 100m).

The site falls within Integrated Unit of Analysis, IUA 1: Upper Crocodile/ Hennops/ Hartbeespoort, upstream of Hartbeespoort Dam and Resource Units 1.1 (Upper Hennops and Rietvlei Rivers to inflow of Rietvlei Dam, and dolomite aquifer systems) and 1.7 (Jukskei, Klein Jukskei and Modderfonteinspruit). This IUA has been classified as a Class III river. In respect of the classification of rivers, this means that it is a river that is highly used and configuration of ecological categories of that water resource are highly altered from the predevelopment condition. Refer to Figure 30 for a surface water map of the area.

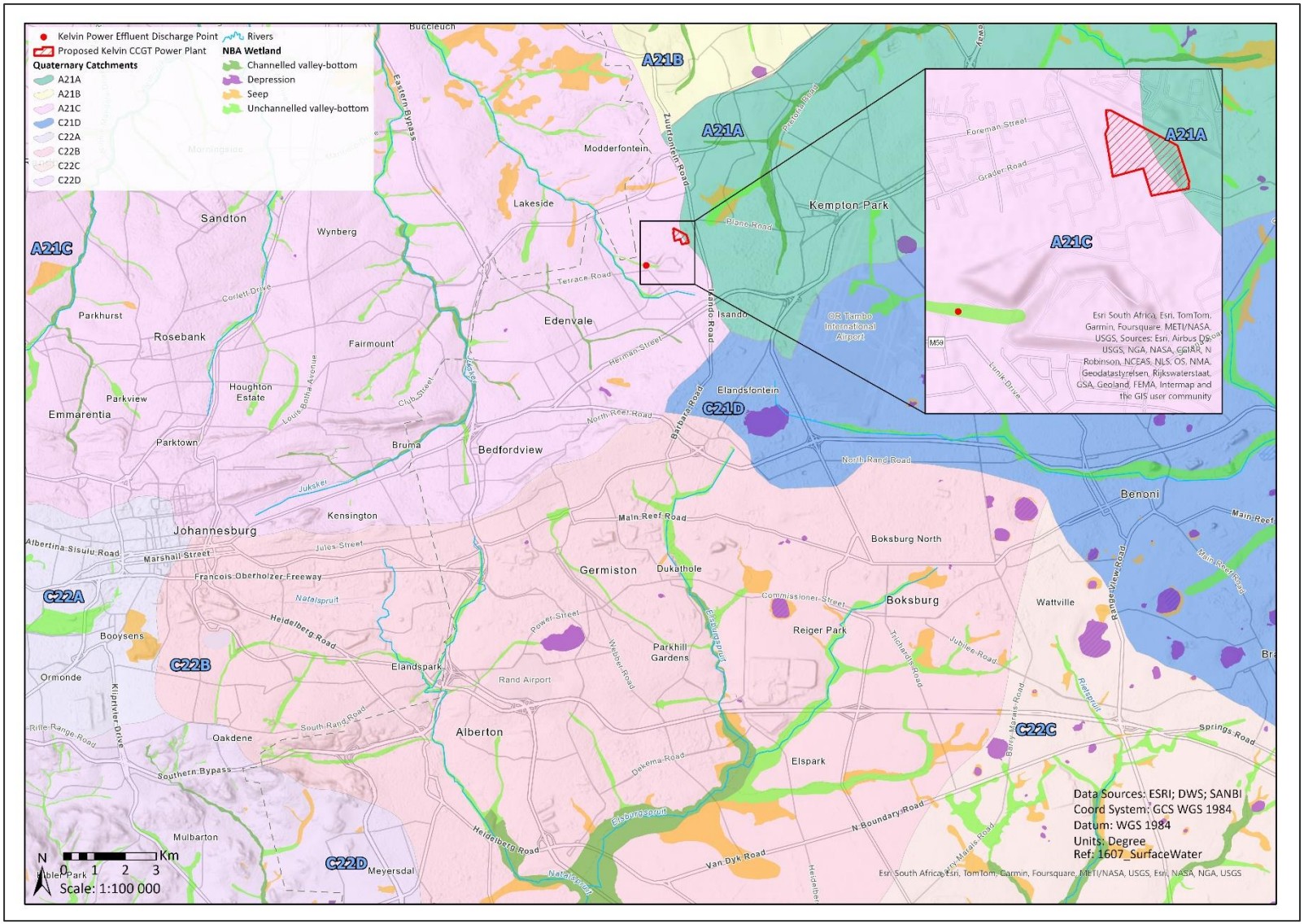


Figure 30: Surface Water Map Showing the location of the Kelvin Power Station and Proposed Treated Effluent Discharge Point.

A freshwater ecologist conducted a site visit on the on the 07th of May 2024 wherein development area was traversed on foot, with several checks being undertaken to identify any soil wetness indicators, and to determine the local soil forms. No natural watercourses or wetlands are located within the proposed development area.

4.8 GROUNDWATER

Kelvin currently undertakes groundwater monitoring at twenty-one (21) groundwater localities, of which nineteen (19) are sampled on a quarterly basis. This is in compliance with their existing WUL: 03/A21C/FGH/1110 for the existing coal fired powered station and is proposed will continue with ground water monitoring focussed on the areas surrounding the proposed CCGT plant.

4.9 AQUATIC BIO-MONITORING

Kelvin undertakes aquatic biomonitoring as part of their existing WUL: 03/A21C/FGH/1110 for the existing coal fired powered station. The sites selected for the biomonitoring points are located in upstream and downstream of the receiving water bodies. The sites were also selected to be accessible, representative of as many habitats as possible and to be as closely comparable as possible.

4.10 WATER BALANCE

A dynamic water balance is fundamental to optimise water management and minimising raw water usage at the power generating plant. Dynamic water balances enable instantaneous examination of the changing situation of the CCGT Plant operation. They also allow the investigation of different scenarios, such as evaporation and drift losses, process changes or new developments, which are critical to the planning process. The purpose of the water balance is to demonstrate that the Kelvin CCGT Plant will be able to manage all water in its operational area, including rainfall, through the different phases of the operational period. Dynamic water balances are thus an important operational and regulatory tool for water and pollution control as well as an essential part of life-cycle analysis for all current and future activities at the power generating plant.

The water balance is, therefore, utilised as a management tool, for example, in simulating the effect of additional water management measures or the effect of expansion projects on the water management system. Assessment of the water balance will reveal the areas of concern for water management. Refer to Figure 31 for the Kelvin 600 MW CCGT Power Project Preliminary Water Balance.

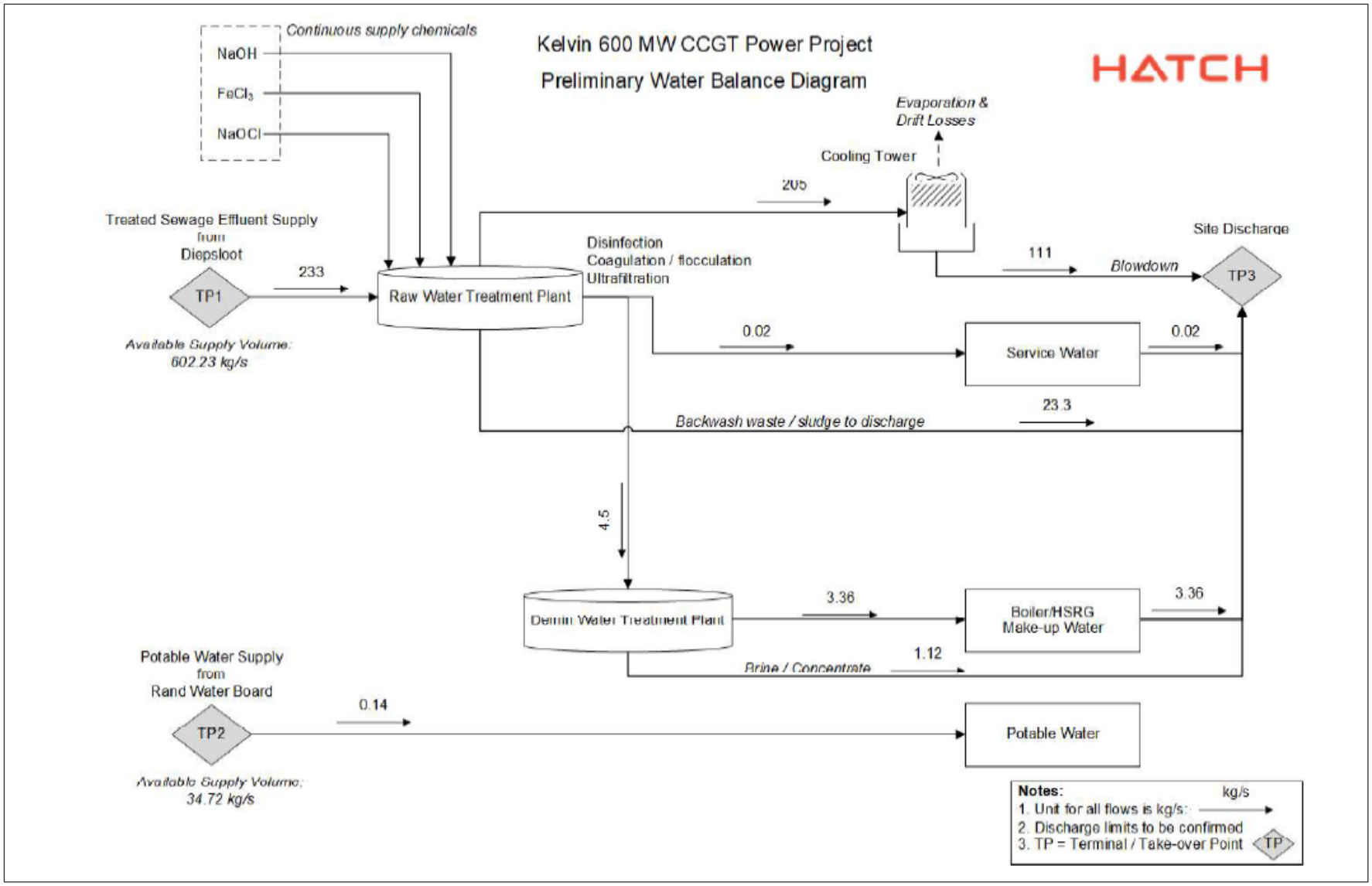


Figure 31: Water balance estimate

4.11 OPERATIONAL MANAGEMENT

The Procedures are in place at Kelvin, including the recommendations of the EMPr, Kelvin Power Environmental and Social Policy (based on ISO 14001, OHSAS 18001 and SA8000), and Occupational Health & Safety Policy to ensure that all incidents are reported and investigated, and that the appropriate corrective and preventative actions are implemented.

Emergency Incidents as defined/described in the NWA must be reported to DWS, South African Police Services (SAPS) or the relevant Fire Department and the relevant catchment management agency as soon as reasonably practicable after obtaining knowledge of the incident. Initially via telephone, followed by a formal email or letter. The notifications sent to DWS contain the following information:

- Date and time of the incident.
- Description of the incident.
- Source of pollution.
- Risks/impact to safety, health, property or environment resulting from the incident.
- Remedial action taken or to be taken by the person in control, to remedy the effects of the incident and to prevent similar incidents in the future.

Formal incident investigations are undertaken by the relevant manager and the actions based on the investigations are uploaded to the business unit's Action Management System. A follow up action plan is submitted to DWS within 14 days of the incident occurring, which indicates the following:

- Measures taken to correct the impact of the incident.
- Measures taken to correct further impacts from the incident.
- Measures taken to prevent the reoccurrence of a similar incident.

A formal incident investigation is not undertaken for minor incidents, unless the same incident has repeatedly occurred three or more times within three months.

4.11.1 ORGANISATION STRUCTURE

The responsibility for implementing environmental management, including the approved Environmental Management Programme (EMPr), Integrated Water Use License (IWUL), and all relevant authorizations and regulations, lies with Kelvin Power (Pty) Limited and the on-site Environmental Manager.

The General Manager oversees environmental management as part of daily operations, supported by the Environmental Manager, Safety Manager, section heads, foremen, and supervisors. Kelvin Power (Pty) Ltd has designated an environmental team to manage and monitor these activities. Refer to

The role of the Environmental Manager is to ensure compliance with all IWUL, EMPr, and environmental authorization conditions, oversees contractors' adherence to environmental requirements, and addresses conflicts related to EMPr implementation. They also inform contractors of restricted/no-go areas and promptly report any incidents or breaches to the General Manager. Additionally, the Environmental Manager is responsible for conducting internal audits of all environmental authorizations, licenses, and approvals.

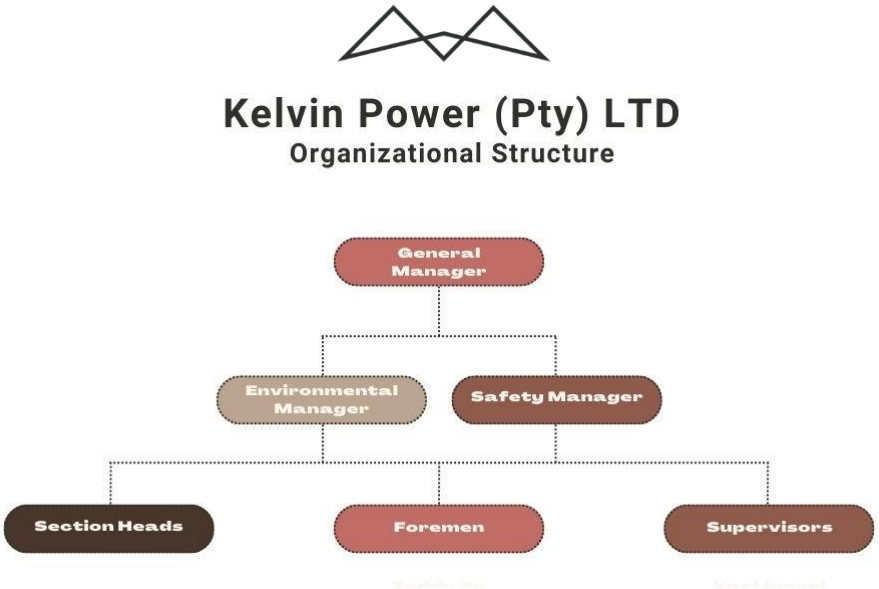


Figure 32: Kelvin Power organizational structure.

4.11.2 RESOURCES AND COMPETENCE

Environmental management resources are provided through various means, as outlined below:

Budgeting: At the start of each financial year, a dedicated budget is allocated for implementing and monitoring environmental management activities and site impacts. This budget is reviewed regularly to address any additional needs that may arise.

Human Resources: Kelvin Power appoints personnel responsible for overseeing environmental compliance on-site, including the Environmental Manager and Health and Safety staff. The Environmental Manager provides guidance on operational environmental management, supporting the efforts of the on-site team.

4.11.3 SKILLS DEVELOPMENT, EDUCATION AND TRAINING

The following plans and programs support skill development and environmental awareness within the organization:

- Skills Development Plan: Includes Adult Basic Education and Training (ABET) and a life skills program.
- Career Progression and Mentorship Plans: Provides clearly defined career paths and development routes for employees at all levels.
- Coaching and Mentoring Plan: Offers coaching and mentorship opportunities as part of Talent Management and Personal Development Planning processes.
- Internship and Bursary Plan: Establishes links with secondary and tertiary institutions to promote a continuous flow of skilled learners and advance capabilities within the organization and the broader mining industry.

Environmental awareness training includes participation in environmental seminars, in-house, and on-the-job training on relevant topics. Training is tailored to job-specific environmental impacts, ensuring that employees who perform tasks with significant environmental impact are fully competent through training, education, and experience. This would be inclusive of training the employees of the specific requirements of Environmental Authorisations, EMPr' s etc.

Additionally, environmental awareness is further promoted through celebrations of key environmental events, such as Water Week, Environmental Week, and Arbor Week, engaging both employees and the local community.

4.11.4 INTERNAL AND EXTERNAL COMMUNICATION

4.11.4.1 **INTERNAL COMMUNICATION**

Internal communication is primarily conducted through scheduled meetings. On-site employees participate in daily safety meetings or toolbox talks, while regular environmental feedback meetings provide updates and insights to senior management to support decision-making.

4.11.4.2 **EXTERNAL COMMUNICATION**

Email serves as the primary communication method between offsite consultants, management, and onsite personnel, allowing minor decisions to be made quickly while reserving feedback meetings for more critical issues.

Engagement with surrounding communities and relevant authorities is integral to operations. The General Manager and section heads typically handle communication with authorities, using various methods to address all pertinent matters as needed.

4.11.5 AWARENESS RAISING

The Kelvin Power awareness and competence procedure is set to achieve following the following objectives:

- Ensure that employees, including contractor employees, are trained and competent to correctly perform their duties. Therefore, the probability of incidents occurring that have the potential to negatively impact on product quality, the environment, the health and safety of staff and the community will be reduced.
- Ensure the knowledge, skills and experience levels of employees are assessed against validated performance criteria or relevant nationally accredited Unit Standards for Competency.
- Ensure strategies, systems and programmes that are designed to fill identified gaps in training, awareness and competency are developed and implemented.

These strategies, systems, and programs must align with the power station's requirements. The procedure covers identifying training needs, providing staff development programs, and maintaining systems that enable employees to work in ways that uphold product quality, safeguard health and safety, protect the community, and preserve environmental well-being.

4.11.6 MONITORING AND CONTROL

Surface and groundwater monitoring is conducted as part of the existing operations and include areas associated with the activities included in this WULA application. The following monitoring is undertaken as part of the existing operations.

4.11.6.1 **SURFACE WATER**

The following surface water monitoring points (associated with the existing discharge point to be utilised for this WULA) are monitored at the existing operations.

Table 13: Surface water monitoring points relevant to the Kelvin CCGT Power Plant

Site ID	Description	Biomonitoring Protocols		Coordinates
		Protocol	Frequency	
K1	Upstream (from Kelvin Power Station effluent) site in the Modderfonteinspruit	SASS5 and in-situ water quality	Six-monthly	S 26.119223°, E 28.173504°
		Toxicity (acute screening water)	Quarterly	

Site ID	Description	Biomonitoring Protocols		Coordinates
		Protocol	Frequency	
		Toxicity (direct sediment contact)	Annual	
K2	Downstream (from Kelvin Power Station effluent) site in the Modderfonteinspruit	SASS5 and in-situ water quality	Six-monthly	S 26.109368°, E 28.168706°
		Toxicity (acute screening water)	Quarterly	
		Toxicity (direct sediment contact)	Annual	
K3	Approximately 1 km downstream from site K2, on the Modderfontein golf course in the Modderfonteinspruit	SASS5 and in-situ water quality	Six-monthly	S 26.103367°, E 28.165597°
		Toxicity (acute screening water)	-	
		Toxicity (direct sediment contact)	-	
K4	Approximately 2 km downstream from K3, directly downstream from an instream pollution control dam in the Modderfonteinspruit	SASS5 and in-situ water quality	Six-monthly	S 26.095477°, E 28.151494°
		Toxicity (acute screening water)	-	
		Toxicity (direct sediment contact)	-	
Effluent	Effluent stream within the power station boundary	SASS5 and in-situ water quality	-	S 26.121713°, E 28.183192°
		Toxicity (acute screening water)	Quarterly	
		Toxicity (direct sediment contact)	-	
Effluent Downstream	Effluent stream, downstream from the power station	SASS5 and in-situ water quality	-	S 26.119203°, E 28.174846°
		Toxicity (acute screening water)	Quarterly	
		Toxicity (direct sediment contact)	Annual	

4.11.6.2 **GROUNDWATER**

Kelvin monitors groundwater as a requirement of their existing coal fired power station licenses and/or permits, however the Kelvin CCGT Power Plant is not anticipated to impact on groundwater resources.

4.12 ENVIRONMENTAL IMPACT ASSESSMENT

This section will discuss the methodology and detailed impacts identified during the EIA process. The methodology used in assigning and assessing risk factors is also shown below.

4.12.1 IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for impacts identified.

4.12.2 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$\boldsymbol{C = \frac{(E + D + M + R) * N}{4}}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 14 below.

Table 14: Criteria for Determining Impact Consequence.

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e., limited to the area applicable to the specific activity)
	2	Site (i.e., within the development property boundary),
	3	Local (i.e., the area within 5 km of the site),
	4	Regional (i.e., extends between 5 and 50 km from the site
	5	Provincial / National (i.e., extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),

Aspect	Score	Definition
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 15.

Table 15: Probability Scoring.

Probability	**1**	**Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),**
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER = C x P

Table 16: Determination of Environmental Risk.

Conse quenc	5	5	10	15	20	25

	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 17.

Table 17: Significance Classes.

Environmental Risk Score	
Value	Description
< 9	Low (i.e., where this impact is unlikely to be a significant environmental risk).
≥9 - <17	Medium (i.e., where the impact could have a significant environmental risk),
≥17	High (i.e., where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

4.12.3 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

Cumulative impacts; and

The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 18: Criteria for Determining Prioritisation.

Cumulative Impact (CI)	**Low (1)**	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.

	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 18. The impact priority is therefore determined as follows:

Priority = CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 1.5 (Refer to Table 19).

Table 19: Determination of Prioritisation Factor.

Priority	Ranking	Prioritisation Factor
2	Low	1
3	Medium	1.125
4	Medium	1.25
5	Medium	1.375
6	High	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after

the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 20: Final Environmental Significance Rating.

Significance Rating	Description
<-17	High negative (i.e., where the impact must have an influence on the decision process to develop in the area).
≥-17, ≤-9	Medium negative (i.e., where the impact could influence the decision to develop in the area).
>-9, < 0	Low negative (i.e., where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
>0, <9	Low positive (i.e., where this impact would not have a direct influence on the decision to develop in the area).
≥9, ≤17	Medium positive (i.e., where the impact could influence the decision to develop in the area).
>17	High positive (i.e., where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project. The assessment matrix relating to water and waste impacts can be seen in Table 21.

Table 21: Impact Scoring Summary for water and waste related impacts

IMPACT DESCRIPTION			Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Impact	Alternative	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Soil Compaction and Erosion: Movement of heavy machinery and construction activities can lead to soil compaction, reducing permeability and aeration, and increasing the risk of erosion. This can affect the regeneration of indigenous plants and overall soil fertility.	Alternative 1	Construction	-1	2	3	3	3	4	-11	-1	1	3	2	1	3	-5.25	Medium	2	2	1.25	-6.5625
Chemical Spills: The use of construction materials and machinery poses a risk of chemical spills, which can contaminate the soil and affect both soil quality and the organisms that depend on it.	Alternative 1	Construction	-1	3	3	4	3	4	-13	-1	2	3	3	3	3	-8.25	Medium	2	2	1.25	-10.3125
Waste Generation: Construction waste, if not managed properly, can lead to pollution and ingestion hazards for wildlife, including small mammals and birds that might forage in the area.	Alternative 1	Construction	-1	2	3	4	3	3	-9	-1	2	3	3	3	3	-8.25	Medium	2	2	1.25	-10.3125
Clearing of Remaining Vegetation: Additional clearing may be necessary for construction, further reducing local biodiversity and impacting any surviving indigenous plants.	Alternative 1	Construction	-1	2	3	2	2	3	-6.75	-1	1	2	1	1	2	-2.5	Medium	1	1	1.00	-2.5
Dust Deposition: Dust from construction can continue to impact surrounding plant communities by settling on leaves, thereby inhibiting photosynthesis and growth.	Alternative 1	Construction	-1	3	3	4	3	3	-9.75	-1	2	3	3	3	3	-8.25	Medium	2	1	1.13	-9.28125
Introduction of Invasive Species: Construction activities can facilitate the spread of invasive plant species, which can outcompete and displace indigenous vegetation, further altering the local ecosystem.	Alternative 1	Construction	-1	3	3	4	3	3	-9.75	-1	2	3	3	2	2	-6	Medium	2	2	1.25	-8.25
Soil Contamination: Continuous operation can lead to small, cumulative spills of hydrocarbons and other chemicals that can seep into the soil, potentially affecting soil health and microorganism populations.	Alternative 1	Operation	-1	3	4	3	4	4	-14	-1	2	3	2	3	3	-7.5	Medium	2	2	1.25	-9.375
Altered Hydrology: The operation of the power station might alter local hydrology, especially if water is used for cooling processes. This can impact the availability of water for local plant communities, leading to stress or changes in species composition.	Alternative 1	Operation	-1	3	4	3	4	3	-10.5	-1	2	4	2	3	2	-5.5	Medium	2	1	1.13	-6.1875
Environmental nuisance	Alternative 1	Construction	-1	3	2	2	2	5	-11.25	-1	3	2	2	2	4	-6	High	2	2	1.25	-11.25
Impacts on existing infrastructure and services	Alternative 1	Planning	-1	2	3	3	3	3	-8.25	-1	2	3	3	3	1	-2.75	Medium	1	2	1.13	-3.09375
Impacts on soil and agruculture	Alternative 1	Construction	-1	2	4	2	3	2	-5.5	-1	2	2	1	2	2	-3.5	Medium	1	1	1.00	-3.5
Waste Management Impacts	Alternative 1	Operation	-1	2	4	3	3	3	-9	-1	2	4	2	3	3	-8.25	Medium	1	1	1.00	-8.25
Waste Management Impacts	Alternative 1	Decommissionin	-1	2	2	3	3	3	-7.5	-1	2	2	2	3	3	-6.75	Medium	2	2	1.25	-8.4375

4.12.4 CONSTRUCTION PHASE IMPACTS

This section describes the potential construction phase impacts.

4.12.4.1 **IMPACTS ON SOILS AND SURFACE WATER**

The impact on soil during construction is considered to be low negative before and after mitigation. The location of the site is within the existing Kelvin Power Station area and is almost entirely surrounded by existing infrastructure. Therefore it is not feasible for the site to be used for agricultural purposes while the power station is still in operation. However, the removal of vegetation during the construction of infrastructure, stripping/disturbance of topsoil and construction of the Kelvin CCGT Power Plant area may increase the erodibility of soils which implies a higher silt loading of water running over exposed soil.

The probability that surface water quality may be negatively impacted is likely to occur during the removal of vegetation and topsoil and construction of surface infrastructure:

- Sedimentation caused by runoff from cleared areas;
- Sedimentation caused by dust deposition. And;
- Increase in erosion due to stormwater runoff.

4.12.4.2 **WASTE MANAGEMENT IMPACTS:**

Waste management impacts were rated as having a medium negative significance before and after mitigation. Domestic waste, construction waste and sewage are all waste types that need to be considered during construction.

4.12.5 OPERATIONAL PHASE IMPACTS

During the operational phase the activities that are to be undertaken include but are not limited to:

- Treatment and discharge of cooling tower water;
- Water treatment plant for process water and fire fighting purposes;
- Electricity generation; and
- Discharge of treated effluent.

4.12.5.1 **WASTE MANAGEMENT IMPACTS**

Waste management impacts were rated as having a low negative significance before and after mitigation. Hazardous wastes, Domestic waste and sewage are waste types that need to be considered during operation. Very little waste material is generated by a gas fired CCGT plant. Waste would generally fall into the following categories:

- Used gas turbine air intake filters (typically replaced annually);
- Used ion exchange resins (typically replaced at 5 year intervals);
- Used Reverse Osmosis membranes (if an RO plant is used);
- Separated oil / sludge from oil / water separators;
- Used lubricating oil;
- Treated effluent/wastewater
- Used oil or chemical containers; and
- General office waste.

4.12.5.2 IMPACTS ON STORMWATER

Stormwater runoff after a rainfall event needs to be managed on site. This impacted was rated as medium negative before mitigation and low negative after mitigation.

4.12.5.3 IMPACT ON TERRESTRIAL AND AQUATIC BIODIVERSITY

Operation of the CCGT could have impacts on terrestrial biodiversity. Soil contamination, heat emissions, noise, light pollution, collision risks and air pollution. The overall significance of these impacts is considered to be of medium to low significance because the area has been altered from its original state however the project can still affect species in the surrounding area. The surrounding area is also industrial / commercial with no agriculture and little undeveloped space.

4.12.6 DECOMMISSIONING AND REHABILITATION

Please note that the License Holder, if granted, will have to apply for a separate EA for the decommissioning phase as required under **Listing Notice 1, Activity 31 of the NEMA as amended and the decommissioning impacts will be assessed once all decommissioning activities are understood.** This will necessitate the need to reassess and consider any additionally identified impacts at such time when decommissioning is considered. A detailed decommissioning and rehabilitation plan must be developed prior to decommissioning the CCGT gas fired power plant and associated infrastructure. This plan should include, but not be limited to, management of socio-economic aspects such as employment loss, removal, re-use and recycling of materials and vegetative rehabilitation to prevent erosion.

4.12.6.1 WASTE MANAGEMENT IMPACTS

The removal of infrastructure is likely to negatively impact on surface water through contamination of clean water runoff from leakage or seepage of removed waste material, and hydrocarbon contamination from vehicular activity. Domestic waste, construction waste and sewage are all waste types that need to be considered during decommissioning

4.12.7 PROPOSED MITIGATION MEASURES

Development will have an impact on the surrounding environment irrespective of the nature of the project. The protection of water resources therefore is an essential consideration when assessing the impacts that may be relevant to any project. As such, the following measures have been recommended to protect water resources during all phases of the Kelvin CCGT Power project.

4.12.7.1 IMPACTS ON SOILS AND SURFACE WATER (CONSTRUCTION)

Measures which are recommended to mitigate the erosion of soils as much as possible during construction and activities are:

- All servicing/ maintenance of construction vehicles that could cause harm to the environment must be done off-site. No servicing of construction vehicles is allowed on site, except for minor repairs to prevent further environmental pollution or damage.
- All working fronts must be provided with a spill containment kit to contain and collect spills.
- Any evidence of erosion, scouring, sedimentation, and/or undercutting must be rectified and rehabilitated immediately.
- If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.
- A detailed Stormwater Management Plan (SWMP) needs to be prepared.
- Land clearing and preparation may only be undertaken immediately prior to construction activities and within authorised areas.
- Adequate stormwater drainage and management is required to prevent soil erosion.

4.12.7.2 WASTE MANAGEMENT IMPACTS (CONSTRUCTUION AND DECOMMISSIONING PHASES)

Measures which are recommended to mitigate the erosion of soils as much as possible during operation and rehabilitation activities are:

- The Contractor should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities.
- No waste releases into the environment should be permitted.
- The toilets shall be of a neat construction and shall be provided with doors and locks and shall be secured to prevent them from falling over.
- The contractor shall always supply toilet paper at all toilets. Toilet paper dispensers shall be provided in all toilets.
- A dedicated waste collection and storage facility must be prepared, and this should be emptied and collected wastes disposed of on a regular basis. Wastes must be disposed of at suitably licensed waste disposal facilities.
- Contaminated water, must be prevented from entering the local environment (soil and water), adequately stored in protected and where necessary bunded areas, and disposed of at a suitably licensed disposal facility.
- Vermin / weatherproof bins must be provided in enough numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- Each active site must be checked daily to ensure that the site is free from litter and unnecessary wastes.
- Hazardous substances, if applicable, must be stored in a secure location, isolated from direct contact with the soils and covered where necessary.
- No waste is to be left on site whether it is biodegradable or not. Unutilised materials are to be removed once construction has ended.

4.12.7.3 WASTE MANAGEMENT IMPACTS (OPERATION)

Water is a finite resource and should be protected at all costs. Surface water as the most accessible form of water therefore should be protected and kept free of pollutants. With specific reference to the Operational Phase of the Kelvin CCGT Power Plant, the following measures are proposed:

- No unauthorised waste releases into the environment should be permitted.
- A dedicated waste collection and storage facility must be prepared, and this should be emptied and collected wastes disposed of on a regular basis. Wastes must be disposed of at suitably licensed waste disposal facilities.
- Contaminated water, and effluents must be prevented from entering the local environment (soil and water), adequately stored in protected and where necessary bunded areas, and disposed of at a suitably licensed disposal facility.
- Treated effluent to be discharged into the Modderfontein spruit at the licensed discharge point
- Vermin / weatherproof bins must be provided in enough numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- All cooling water from the CCGT power plant must be treated to meet the standards stipulated in the relevant Water Use License (WUL) or General Authorisation before being discharged into the environment. The treatment process should include appropriate filtration, chemical neutralization, and temperature regulation to ensure compliance with regulatory water quality parameters, such as pH,

temperature, dissolved oxygen, and contaminant levels. Regular audits and maintenance of the treatment facilities should be conducted to ensure consistent compliance.

- A comprehensive water quality monitoring program must be established to continuously assess the quality of cooling water both before and after treatment, as well as at the discharge point into the environment. Monitoring should include parameters specified in the WUL or General Authorisation, such as pH, temperature, dissolved oxygen, and specific contaminants. The results should be recorded and reported to the relevant authorities regularly, and any deviations from compliance should trigger immediate corrective actions.
- Each active area must be checked daily to ensure that the site is free from litter and unnecessary wastes.
- Fuel storage tanks and permanent fuel storage tanks must be bunded (110% of total capacity of storage tank) in order to contain any possible spills and to prevent any infiltration of fuel into the ground.
- Hazardous substances must be stored in a secure location, isolated from direct contact with the soils and covered where necessary.

4.12.7.4 STORMWATER IMPACTS (OPERATION)

The operational phases of the Kelvin CCGT project will likely constitute the longest phases of the project and is anticipated to have stormwater impacts, as such, a detailed stormwater management plan has to be prepared to ensure dirty water and clean water separation.

4.12.7.5 IMPACTS ON TERRESTRIAL AND AQUATIC BIODIVERSITY

Operation of the CCGT could have impacts on terrestrial biodiversity. Soil contamination, heat emissions, noise, light pollution, collision risks and air pollution. Although the site exists in a largely modified state, it is important that existing terrestrial and aquatic life is preserved. To achieve this goal, the following measures may be implemented:

- To manage heat emissions from a gas turbine power plant, and vegetative buffer zones is recommended. These measures, along with the use of reflective materials and heat recovery systems, help to reduce ambient temperature, stabilize soil conditions, and improve local vegetation health. Regular monitoring and stakeholder engagement ensure the effectiveness and adaptability of these strategies.
- The clearing of indigenous vegetation must be minimized where possible. Clearing of AIP vegetation, which dominated the project area, is advocated. All activities must be restricted to within the authorized areas.
- Materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by alien invasive plant species. All grazing mammals must be kept out of the areas that have recently been re-planted, however these animals are highly unlikely to be present within this project area. Grazing animals will be prevented from entering the site by fencing.
- A habitat rehabilitation plan must be implemented, and areas of bare ground must be revegetated with species indigenous to the region. This must also apply to areas below the panels.
- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession

of an emergency spill kit that must always be complete and available on site. During operation, an oily water separation facility will be installed for drainage water from all areas likely to be contaminated by hydrocarbons.

- Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.
- No servicing of equipment on site unless necessary.
- All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.
- Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.
- Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.
- All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.
- It must be made an offence for any staff member to remove any indigenous plant species from the project area or bring any alien species in. This is to prevent the spread of exotic or alien species or the illegal collection of plants.
- A fire management plan needs to be compiled and implemented to restrict the impact fire would have on the surrounding areas.
- The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.
- Noise must be reduced where possible in the early evenings and at night to minimise possible disturbances to reptile species and nocturnal mammals and avifauna (birds). This would be relative the phase of operation and based on respective regulations for the site locality.
- No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.
- Outside lighting should be limited where possible, and designed to minimise impacts on fauna, particularly nocturnal birds which may frequent the area. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.
- Any holes/deep excavations must be demarked and, where possible, properly covered temporarily to ensure that no small fauna species fall in. Holes must be subsequently inspected daily for trapped fauna, prior to backfilling.
- An Alien Invasive Plant (AIP) Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition.
- The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths.
- A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.

- Quantities of water discharged must be in consideration of the ecological reserve and hydrological regimes.

5 STAKEHOLDER ENGAGEMENT

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered, and a record included in the reports submitted to the Authorities. The process ensures that all stakeholders are provided this opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

5.1 PRE-CONSULTATION WITH THE COMPETENT AUTHORITY

A pre-application meeting with the competent authority (DWS) was requested by the EAP and was held on the 10th of July 2024. The purpose of the pre-consultation was to provide the authorities with background information of the proposed project, confirm NWA triggered listed activities, the process to be followed and details to be included in the WULA such as specialist studies.

5.2 GENERAL APPROACH TO PUBLIC PARTICIPATION

The PPP for the proposed project has been undertaken in accordance with the requirements of the MPRDA and NEMA EIA Regulations (2014), and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

An initial I&AP database has been compiled based on known key I&AP's, Windeed searches, and stakeholder databases provided by Kelvin. The I&AP database includes amongst others, landowners, communities, regulatory authorities and other special interest groups.

5.2.1 LIST OF PRE-IDENTIFIED ORGANS OF STATE/ KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

Government Authorities and other key I&APs were notified of the proposed project and include:

- AfriForum
- Air Traffic and Navigation Service (ATNS)

- Airports Company South Africa (ACSA)
- BirdLife South Africa
- Botanical Society
- Centre for Environmental Rights (CER)
- City of Ekurhuleni Metropolitan Municipality
- City of Johannesburg Metropolitan Municipality
- City Power
- Conservation South Africa (CSA)
- Council for Geoscience (CGS)
- Department of Employment & Labour
- Department of Public Works, Roads and Transport (DPWR) (National)
- Department of Road and Transport
- Earth Life Africa
- Endangered Wildlife Trust (EWT)
- Eskom Holdings SOC Limited
- Federation of Sustainable Environment (FSE)
- Gauteng Department of Agriculture, Rural Development and Environment
- Gauteng Department of Co-operative Governance and Traditional Affairs
- Gauteng Department of Economic Development
- Gauteng Department of Human Settlements
- Gauteng Department of Roads and Transport
- Gauteng Department of Social Development
- Gauteng Provincial Government
- Gauteng Provincial Government - Department of Community Safety
- Gauteng Provincial Government - Department of Health
- Gauteng Provincial Government - Department of Infrastructure Development
- Gauteng Provincial Government - Department of Roads and Transport
- Gauteng Provincial Government - Department of Sport, Arts, Culture and Recreation
- Gauteng Tourism Authority
- Gauteng Wetland Forum
- Gautrain Management Agency
- Kelvin Estate Club House
- Kelvin Homeowners Association
- Kelvin Power Station
- Kempton Park Golf Club
- Modderfontein Reserve
- National Department Of Agriculture, Land Reform And Rural Development
- National Department of Forestry, Fisheries and Environment (DFFE)
- National Department of Human Settlements
- National Department of Mineral Resources & Energy (DMRE)
- National Department of Tourism
- National Department of Transport
- National Department of Water and Sanitation (DWS)
- National Energy Regulator of South Africa (NERSA)
- National House of Traditional Leaders
- Natural Justice
- Petroleum Agency SA
- PetroSA
- Presidential Climate Commission
- Provincial Heritage Resources Authority Gauteng (PHRAG)

- Rand Water
- Sasol
- South African Civil Aviation Authority
- South African Heritage Resource Agency (SAHRA)
- South African National Biodiversity Institute
- South African National Parks
- South African National Road Agency (SANRAL)
- The Green Connection
- Transnet
- Ward councillors African Conservation Trust
- Wildlife and Environment Society of South Africa (WESSA)

5.2.2 INITIAL NOTIFICATION

The PPP commenced on the 14th of February 2024 with an initial notification and call to register for a period of 30-days. The notification was given in the manner described in the sub-sections below.

5.2.2.1 REGISTERED LETTERS, FAXES AND EMAILS

Notification letters in English and isiZulu were distributed to pre-identified I&APs through either faxes, registered letters and/or emails.

The notification documents included the following information:

- List of anticipated activities to be authorised;
- Sufficient detail of the proposed development to enable I&APs to assess/surmise what impact the development will have on them or on the use of their land;
- The purpose of the proposed project;
- Details of the application processes associated with proposed activities;
- Details of the affected properties (including a locality map);
- Details of the South African environmental legislation that must be adhered to.

5.2.2.2 NEWSPAPER ADVERTISEMENTS / GOVERNMENT GAZETTE

Advertisements describing the proposed project and Environmental Impact Assessment (EIA) process were placed in newspapers in the vicinity of the study area, namely the Bedfordview and Edenvale News Newspaper (in English) on the 21st of February 2024, as well as the Kempton Express Newspaper (in English and isiZulu) on the 22nd of February 2024. A Gazette Notices (in English and isiZulu) were also placed in the Gauteng Provincial Gazette with publication on the 6th of March 2024. The newspaper advert included the following information:

- Project name;
- Applicant name;
- Project location;
- Nature of the activity and application
- Availability of Scoping Report; and
- Relevant EIMS contact person for the project.

5.2.2.3 SITE NOTICE PLACEMENT

Sixteen (16) A1 Correx site notices and one (1) A3 poster (in English and isiZulu) were placed at 17 locations along and surrounding the perimeter of the proposed project study area on the 14th of February 2024. The on-site notices included the following information:

- Project name;
- Applicant name;
- Project location;
- Map of proposed project area;
- Project description;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

5.2.3 PUBLIC PARTICIPATION PROGRESS

Comments raised to date have been addressed in a transparent manner and included in the Public Participation Report. To date, summary of comments relating to water and waste issues received are as follows:

- I&AP registrations.
- Declared interest from nearby residents in the risk assessment and mitigation factors; the health of the stream and catchment; potential impacts on business and the surroundings.
- Rand Water:
    - Request for shapefiles/KMZ files, locality map and application from Rand Water.
    - Confirmation from Rand Water that Rand Water is not affected by the proposal.
    - Notification regarding wayleave application processing. The I&AP was informed that the intention of the Draft EIA Report and Open Day notification was not for a wayleave application, rather to inform the I&AP of the opportunity to review and comment on the report.
- Acknowledgement from the Department of Water and Sanitation (DWS) of receipt of the initial notification.
- Requests for more information about the project:
    - General/ further information about the project
    - Stated interest in the health of the stream and catchment.
- Acknowledgement from the DWS of receipt of the Draft Scoping Report and Public Open Day notification as well as the Draft EIA Report and Public Open Day notification.

I&APs were provided with an opportunity to submit their comments during the Environmental Impact Assessment (EIA) process of the project. A separate public review period will be allowed for the IWWMP.

5.2.3.1 **PROPOSED PUBLIC REVIEW TIMEFRAMES FOR THE IWWMP**

The Integrated Waste and Water Management Plan will be made available to all I&APs for 60 days. The public will be notified regarding the availability of the Integrate Waste and Water Management Plan for review. Comments raised by I&APs will be used to create an issues table which will then further inform the IWWMP action plan (Section 7) included in the Integrated Waste and Water Management Plan.

5.3 MATTERS REQUIRING ATTENTION/PROBLEM STATEMENT

No audits for the CCGT project have yet occurred, as such this section is not applicable. No additional matters have been identified at this stage.

6 WATER AND WASTE MANAGEMENT

The following section describes water and waste aspects for the Kelvin CCGT Plant, as well as the related operational processes.

6.1 WATER AND WASTE MANAGEMENT PHILOSOPHY (PROCESS WATER, STORM WATER, GROUNDWATER, WASTE)

6.1.1 PROCESS WATER

Kelvin receives water from two sources, namely the Rand Water Board (RWB) and the Northern Wastewater Treatment Works (NWWTW) (Diepsloot). Kelvin intends to continue receiving water from these two sources for the CCGT facility. Wherein, treated wastewater from the Diepsloot Wastewater Treatment Works, brought in through an existing pipeline network, will be treated at the proposed CCGT Power Plant's water treatment plant and will be reticulated for use throughout the plant.

6.1.2 GROUNDWATER

Kelvin recognizes that water is a scarce and valuable resource. Contamination of groundwater impairs its beneficial use for everyone. Although no impacts on groundwater have been identified with the Kelvin CCGT Project, Kelvin is committed to monitoring the situation and consulting with specialists to determine the extent of any potential impact on the groundwater resource. If necessary, Kelvin will implement the recommendations provided.

6.1.3 SENSITIVE LANDSCAPES (WETLANDS AND RIVER RIPARIAN AREAS)

Kelvin recognises the importance of wetlands and riparian areas and the role that they play to the environment. Kelvin is committed in keeping affected and clean water systems separate. Kelvin is also committed to the continual monitoring of surface water resources both upstream and downstream of Kelvin Power Station Discharge point. It is, however, noteworthy that no wetlands and water resources are to be directly affected/impacted by the Kelvin CCGT project except for the Modderfonteinspruit which the treated water will be discharged into.

6.1.4 WASTE

Effective waste management is the responsibility of all employees and aims to reduce, re-use and recycle waste wherever possible. Key waste streams will be identified, characterised and classified and the collection, handling and disposal will be in accordance with the respective waste stream classification and legislation.

6.2 STRATEGIES (PROCESS WATER, STORM WATER, GROUNDWATER AND WASTE)

6.2.1 PROCESS WATER AND STORMWATER

Kelvin Power Station acknowledges that water is a valuable and limited resource, critical to both local ecosystems and communities. To protect water quality, Kelvin is committed to strategies that expand clean water zones and reduce dirty water areas, directing clean runoff into natural watercourses and minimizing retention to prevent groundwater contamination. Contained dirty water will be reused, and discharge of contaminated water into the environment will be strictly avoided. Disturbed areas will be rehabilitated to limit erosion, protect watercourses, and increase clean water zones. Regular monitoring of water quality and quantity within the site's management systems and affected water bodies will guide ongoing adjustments to support sustainable water stewardship.

Furthermore, the rigorous maintenance of Kelvin's process water reticulation infrastructure is essential to ensuring effective water management and environmental compliance. Measures include preventing leakages and spillages within process water systems and maintaining detailed records of water usage at each facility.

Regular updates to the water balance will be conducted using recorded water flow data to support informed decision-making.

6.2.2 GROUNDWATER

Implementation of all mitigation measures of the EMPr will ensure that the impacts on the groundwater systems are prevented, minimized and/or managed.

6.2.3 SENSITIVE LANDSCAPES

No additional sensitive landscape strategies are proposed for the water uses included in this application, over and above the mitigation measures proposed as part of the risk assessment conducted for this project.

6.3 PERFORMANCE OBJECTIVE GOALS

The following key objectives have been identified for the Kelvin CCGT project as stated in Table 22.

Table 22: Performance Objectives

Theme	Objectives
Surface Water	Clean and dirty water separation.
	Containment of dirty water run-off.
	Prevent pollution of surface water resources.
	Protect watercourses against erosion, especially at watercourse crossings.
Groundwater	Prevent impact on groundwater availability to neighbouring users.
Process Water	Maximise the re-use of process water.
	An up-to-date water balances.
Sensitive landscapes	Minimise impact on soils and stormwater.
Waste	Minimise waste generation
	Re-use and recycle waste as far as possible.

6.4 PROJECT ALTERNATIVES

In terms of GNR 267 (2017) which provides guidance for water use license applications and appeals regulations, it is outlined that an IWWMP requires an alternatives analysis for the project. This was also done as part of the EIA studies for the project as required by the NEMA.

In accordance with the principles stipulated in NEMA it is required that various alternatives be investigated when considering a development which may impact significantly on the environment, in order to implement the best practical environmental option. This means that the options will be assessed in such a manner that the alternative which has the most benefit or causes the least environmental damage to the natural environment is chosen. This option also needs to be of such a nature that the capital and social cost incurred will be of an acceptable nature to society. Biophysical and socio-economic aspects are considered when investigating alternatives.

- Property on which or location where it is proposed to undertake the activity;

- Type of activity to be undertaken;
- Scheduling alternatives;
- Design or layout of the activity;
- Technology to be used in the activity;
- The option of not implementing the activity (No-go alternative)

For the purposes of this project, the identification of alternatives was a key aspect of the success of the environmental Scoping Phase. All reasonable and feasible alternatives were identified and screened to determine the most suitable alternatives. There are, however, some significant constraints that have to be considered when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed as part of the evaluation of the alternatives for this project. Alternatives can typically be identified according to:

- Location alternatives (including design and layout);
- Process alternatives;
- Technology alternatives; and
- Activity alternatives (including the No-Go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. The need for the proposed project includes the following key drivers:

- Loadshedding Mitigation: The CCGT plant offers stable, consistent, flexible, state of the art, power generation technology available 24/7 and quick adaptability to demand changes, reducing the risk of load shedding.
- Energy Security: Adding CCGT capacity diversifies the energy mix, reducing reliance on coal and enhancing energy security, contributing to a more resilient power system.
- Economic Advantages: The CCGT plant provides efficient, cost-effective energy production and creates employment opportunities, benefiting the local economy.
- Environmental Considerations: The CCGT plant produces lower emissions compared to coal-fired plants and supports a sustainable energy transition.
- International Competitiveness: Establishing modern CCGT infrastructure enhances the reliability of the electricity network which thus enhances South Africa's attractiveness for foreign investment and aligns with global energy standards.

In this section the various alternatives considered are described and their advantages and disadvantages are presented where applicable. Furthermore, the feasibility of the considered alternatives, from both a technical as well as environmental perspective, is determined and the result thereof are the alternatives that have been investigated in the EIA, towards the selection of preferred alternatives. Essentially, alternatives represent different means of meeting the general purpose and need of the proposed project through the identification of the most appropriate and feasible method of development, all of which are discussed below.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process. Incremental alternatives typically arise during the EIA or design process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives.

6.4.1 LOCATION OR PROPERTY ALTERNATIVES

Location alternatives are normally a major consideration when developing a new facility to assess the various benefits and impacts of the proposed site. However, in this case the proposed new CCGT Plant can be constructed within land already designated suitable for Power Plant generation and furthermore can piggyback onto existing approved systems negating many of the approvals needed for a virgin land development. Kelvin Power made the strategic decision to locate the proposed CCGT development in the City of Ekurhuleni within the Gauteng Province where Kelvin owns the property on which the development is proposed. The property currently has an existing operational power plant, Kelvin B station and a decommissioned plant, Kelvin A station. The property has existing spatial area to accommodate the individual components of the proposed developments (e.g. the location of the CCGT and associated infrastructure within the study.

Kelvin owns the remainder of portion 391 (RE/391) of farm Zuurfontein (33) on which the proposed development is proposed. The proposed CCGT plant is to be located where the coal fired A-station, currently undergoing a decommissioning process, is located as this property was previously used for power generation and is continuously generating power with the currently operational B-station. As such, no alternative properties were considered for this development. Furthermore, the proposed site is located within the South African load centre where demand for power is at its highest thus negating the need for extensive transmission line infrastructure that would be required to evacuate the power to Gauteng should the plant be located remote from the load centre.

6.4.2 ACTIVITY ALTERNATIVES

These are sometimes referred to as project alternatives, although the term activity can be used in a broad sense to embrace policies, plans and programmes as well as projects. Consideration of such alternatives requires a change in the nature of the proposed activity. This would entail a process where a different project is proposed instead of the power generating plant. Kelvin is a company in the power generating industry, whose main business is power generation and as such no alternative activities were identified and evaluated.

6.4.3 SCHEDULING ALTERNATIVES

Scheduling alternatives are sometimes known as sequencing or phasing alternatives. In this case an activity may comprise several components, which can be scheduled in a different order or at different times and as such produce different impacts. The project is being considered at this time in response to a Request for Proposals from the DMRE for gas fired power generation. No scheduling alternatives were identified for this project.

6.4.4 DESIGN AND LAYOUT ALTERNATIVES

Design and layout alternatives ensure the consideration of different design and spatial configurations of the proposed development within a specific location, in order to enhance the positive impacts and to reduce the negative impacts. During the prefeasibility studies a layout alternatives analysis was undertaken for the proposed CCGT plant. The layout alternative analysis took into consideration two main factors, namely, available land and equipment layout.

The assessment for the optimum location for the proposed development considered many aspects such as the decommissioning and demolition of the A-station infrastructure including the three cooling towers and location of existing servitudes, environmental, social, health and safety aspects and requirements both during construction and operational activities, as well as the need for temporary laydown areas, traffic, access and egress and optimisation and utilisation of existing infrastructure. The area coloured in dark green below was assessed as the optimum location for siting the CCGT facility. An overview of the available land assessment is represented in Figure 33 (WSP, 2023) below.

Figure 33: Available land analysis (WSP, 2023)

It was noted that the decommissioning of the A-station building including stacks could potentially take longer than the targeted construction start date of the proposed CCGT plant due to removal of asbestos in A-station. As such the A-station building area has been considered unavailable land and will be avoided by the layout, thus locating the proposed CCGT plant at the location on which the A-station cooling towers, workshop, coal store and conveyor belts, East and West wagon tipplers track hopper and weigh bridge sites that are undergoing decommissioning/demolition activities as part of the redevelopment programme. The identified available land (shaded green in Figure 33) was considered for the placement of the plant. Following consideration of the various layout designs being proposed i.e., demolition, construction, commissioning, operational, maintenance, environmental, social, health and safety as well as access during these phases. Having identified the optimum configuration for CCGT plant layout, additional cognisance was considered for the placement of cooling towers downstream of prevailing winds, minor adjustments to the substation and evacuation transmission line's location, as well as the proximity of gas turbine and cooling tower to neighbours. See layout mapping below. refer to **Figure 4** for a map showing the CCGT layout map.

A short powerline connection of approximately 250m of overhead transmission lines will be required to connect the proposed CCGT plant to the electricity transmission and distribution grid infrastructure. The proposed powerline start, midpoint and endpoint coordinates are shown in Figure 4 above.

A connection to the Sasol gas pipeline infrastructure will be required. The gas pipeline is expected to follow the existing Kelvin Power servitudes into the proposed plant. The proposed gas pipeline start, midpoint and endpoint coordinates are shown in Figure 4.

6.4.5 TECHNOLOGY ALTERNATIVES

The selection of the technology to be adopted for the proposed power generation facility has considered the available technological and equipment alternatives. This report considers various technology alternatives that can be utilised for the generation of power at the Kelvin power plant. The purpose of considering such alternatives is to include the option of achieving the same goal by using a different method or process. Various system technologies and turbine options.

6.4.6 SYSTEM TECHNOLOGY ALTERNATIVES

A gas turbine is a type of internal combustion engine that can convert natural gas or other fuel gas into mechanical rotational energy which drives a generator that produces electrical energy. Two (2) types of technologies are currently in place for power generating gas turbines, namely, Open Cycle Gas Turbines (OCGT) and Combined Cycle Gas Turbines (CCGT). Both options are discussed further below.

6.4.6.1 **OPEN CYCLE GAS TURBINES (OCGT)**

OCGTs are described in International Association of Oil & Gas Producers (IOGP) (2022) as the simplest application of gas combustion for power/electricity generation. OCGTs consist of only a gas turbine and do not recover any waste heat released during the combustion process. OCGTs are thus deemed as less efficient compared to technologies that utilises the extra heat for heating or extra power production. IOGP (2022) highlights that due to the decreased efficiency of an OCGT turbine, more fuel is required per unit power output. The use of OCGT turbines therefore tends to result in increased GHG emissions.

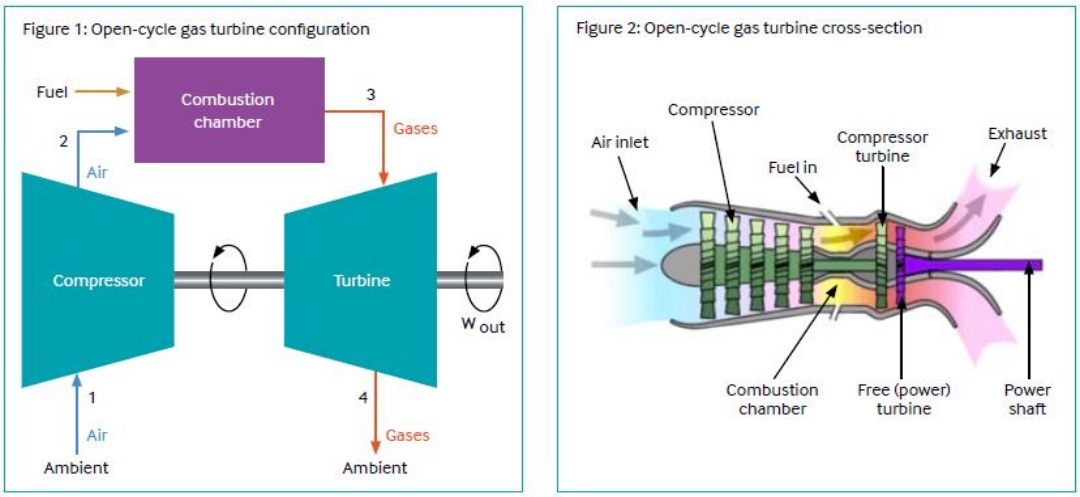


Figure 34: OCGT configuration (Left) OCGT cross section (Right) (Source: IOGP, 2022)

6.4.6.2 **COMBINED CYCLE GAS TURBINE**

CCGT power plants refer to a gas turbine system with an additional component known as a heat recovery steam generator (HRSG) for cogeneration. IOGP (2022) defines cogeneration as a process where waste heat recovered from the gas turbine exhaust to power a steam engine for the generation of power. CCGT are noted to be more efficient than OCGTs as they can produce more power from less fuel, thus contributing to lower GHG emissions per unit of power produced. The European Commission (2009) highlights that electricity production efficiencies varies according to the to the fuel and technology, however, cogeneration in CCGTs can have 85% total efficiency for electricity where some of the steam is used for process or district heating purposes. Refer to Figure 35 for a schematic flow diagram and configuration drawing of a typical CCGT.

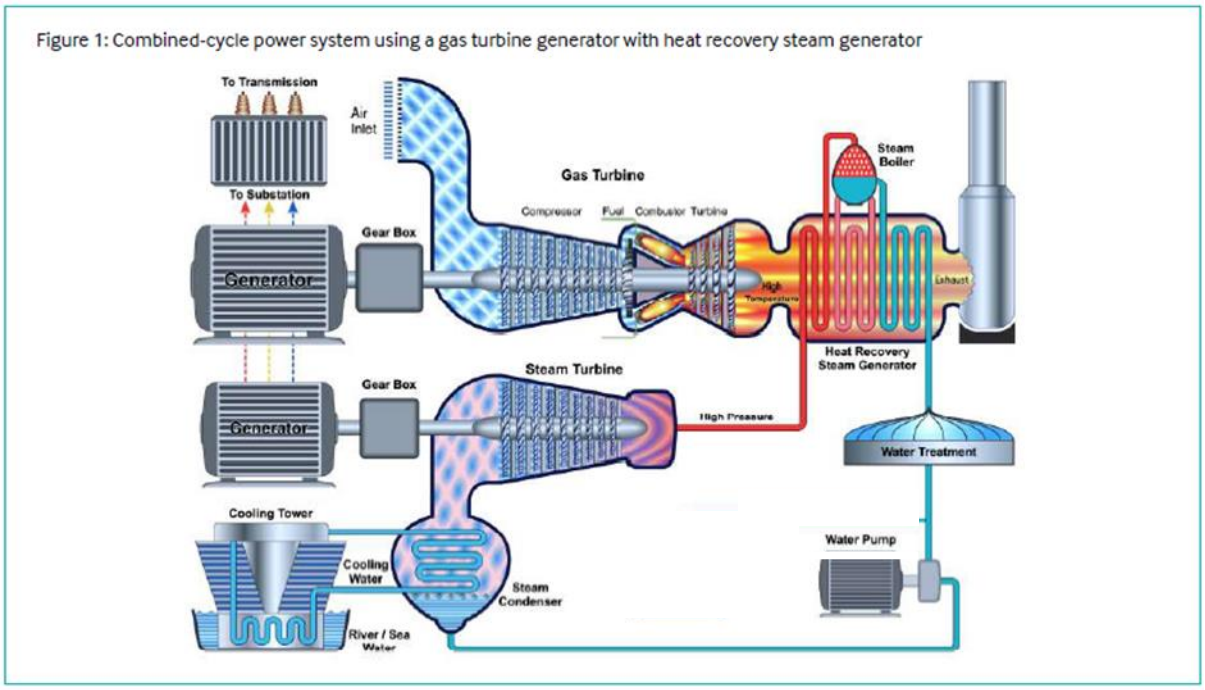


Figure 35: CCGT schematic drawing (Source: IOGT, 2022)

6.4.7 TURBINE OPTIONS

Gas turbine technologies are typically classified by letter designation to identify their technologies which is differentiated by the by volumetric air flow, its compressor pressure ratio, and most importantly the turbine inlet firing temperature (Zachary, 2008 cited in Mondol and Carr, 2017).Mondol and Carr (2017) further add that progression in turbine technologies has been noted with D and E class engines dominating in the 1980's, F-class engines in the 1990's and the more advanced GT class (G, H and J) being the most recently developed engine types. The various engine types generally have varying firing temperatures, cooling technologies and materials with the more recently developed engines being able to reach higher firing temperatures and having been noted to be more efficient technologies, refer to Figure 36 below for a progression of gas turbine technologies and efficiencies.

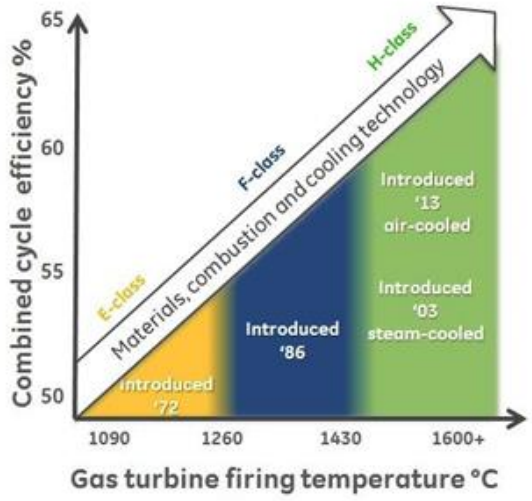


Figure 36: Progression of Gas Turbine Technologies and Efficiencies (Source: Vanderfort *et al.*, 2016)

A pre-feasibility study was undertaken for the development of a gas power plant with a power output of up to 600 MW. Various gas turbine technologies and configurations were considered. The gas turbine technologies

that were considered included the F, H and J class gas turbines. A recommendation on the type of engine to be utilised for the CCGT was made based on high power outputs and efficiency.

6.4.8 COOLING TECHNOLOGIES

Cooling methods in a CCGT power plant are critical for managing the heat generated during power production. The choice of cooling technology can significantly impact the plant's efficiency, water usage, and environmental footprint. Three options were investigated for the Kelvin CCGT power plant, namely, Wet Cooling, Dry Cooling and Mechanical Cooling (preferred alternative). These cooling technologies are discussed in the subsequent subsections.

6.4.8.1 **WET COOLING**

Wet cooling systems are the most common due to their high efficiency in heat transfer. These systems use water to absorb heat from the plant's exhaust steam in the condenser. The heat is transferred to the water, which then evaporates, dissipating heat into the atmosphere. This process typically involves cooling towers, where water is sprayed over fill material to increase the surface area for evaporation. As the water evaporates, it cools the remaining water, which is then recirculated through the system. The main advantages of wet cooling are its efficiency and lower capital costs compared to other methods. However, it consumes large quantities of water, making it less suitable for water-scarce areas, and can have environmental impacts such as thermal pollution in local water bodies.

6.4.8.2 **DRY COOLING**

Dry cooling systems, in contrast, do not use water for heat dissipation. Instead, they rely on air to cool the steam or hot air from the turbines. These systems use large, air-cooled heat exchangers or condensers to dissipate heat directly into the atmosphere. The absence of water usage makes dry cooling ideal for regions where water is scarce, and it reduces environmental impacts like thermal pollution. However, dry cooling is less efficient than wet cooling, particularly in hot climates, because air has a lower heat capacity than water. Additionally, dry cooling systems generally involve higher capital and maintenance costs.

6.4.8.3 **MECHANICAL COOLING (PREFERRED)**

Mechanical cooling refers to systems that use mechanical devices like fans or pumps to circulate cooling fluids or air to dissipate heat. Both wet and dry cooling systems can incorporate mechanical cooling components to enhance their performance. For instance, cooling towers with mechanical draft use large fans to increase airflow over the water in wet cooling systems, enhancing evaporation and cooling. In dry cooling systems, air-cooled heat exchangers with fans blow air over the working fluid to facilitate heat removal. Mechanical cooling systems offer greater control and flexibility, allowing for adjustments based on operational needs. However, they consume additional energy to operate fans and pumps, slightly reducing overall plant efficiency and potentially generating noise, which may require mitigation measures. Mechanical cooling also uses less water than wet cooling. The proposed Kelvin CCGT power plant cooling towers will be fitted with fans to increase airflow over the water cooling systems.

6.4.9 NO-GO ALTERNATIVE

The "No Go" or "No Action" alternative refers to the alternative of not undertaking the proposed project at all. This alternative would imply that the current status quo without the proposed Kelvin Power CCGT plant project would remain (i.e. current land use only). It is important to note that the No Go alternative is the baseline against which all other alternatives and the development proposal are assessed.

When considering the No Go alternative, the impacts (both positive and negative) associated with any other specific alternative, or the current project proposal would not occur and in effect the impacts of the No Go alternative are therefore inadvertently assessed by assessing the other alternatives (i.e. the change caused by the project from baseline current conditions). The proposed development is located on the previous A-station coal fired plant that is currently undergoing decommissioning, not constructing the proposed CCGT plant would mean that this land would have to be rehabilitated and left vacant. The proposed development is located on a

Zone 5 GPEMF zone surrounded by residential and industrial land uses, not implementing the proposed development would mean that the current land use of the property would not be continued with. It is further noteworthy that all identified positive and negative impacts associated with the proposed project would not occur.

6.5 MEASURES TO ACHIEVE AND SUSTAIN PERFORMANCE OBJECTIVES

Achievement of the objectives can be made certain by the following measures:

- Conduct water quality monitoring upstream, downstream and of the water discharged into the environment;
- Environmental Management Programme Performance Assessment Audits to be undertaken to ensure the implementation of commitments made in the EMPr; and
- Water Use License Audits to be undertaken to ensure compliance with the conditions of the license.

7 IWWMP ACTION PLAN

The IWWMP action plan for the Kelvin CCGT Plant is indicated in Table 23. This table outlines the impacts, objectives, performance indicators and mitigation measures that need to be implemented.

The action plan is not however a static framework and should be updated and improved as new possible action items are identified and implemented.

Table 23: IWWMP action plan

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Performance Indicator	Responsible Person
Site establishment **Construction** **Operation**	Erosion	Biodiversity Soils Air Quality	Construction Operation Decommissioning	Minimise potential for soil erosion. Avoid and control through preventative measures (storm water infrastructure, erosion control and monitoring) Awareness training for all personnel	• ECO report	Applicant, Contractor
Site establishment **Construction** **Operation**	Soil Pollution/Contamination	Biodiversity Soils	Construction Operation Decommissioning	Avoid pollution through preventative measures (e.g. bunding, spill kits) Remedy through clean-up and waste disposal	• ECO audit • ECO report	Applicant, Contractor
Site establishment **Construction** **Operations** **General decommissioning activities**	Damage/Disruption of Ecosystem Services	Land Use Biodiversity	Construction Operation Decommissioning	Prevent unnecessary disturbance Control through implementation of EMPr mitigation measures (e.g. limit area of disturbance, training, prevent damage caused by pipe leaks) Prevent proliferation of alien species.	• ECO reports • EMPr Performance Audits	Contractor, Applicant
Site establishment **Construction** **Operation** **General decommissioning activities**	Direct and indirect mortality of flora and fauna	Biodiversity	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Control through implementation of EMPr mitigation measures (e.g. limit area of disturbance, training, prevent damage caused by pipe leaks)	• ECO reports • EO Reports	Contractor, Applicant, EO

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Performance Indicator	Responsible Person
Water management						
General decommissioning activities	General Environmental Pollution	Environmental Pollution	Decommissioning Rehabilitation and Closure	Avoid pollution caused by fuel spillages and improper storage of materials. Avoid and control through implementation of EMPr mitigation measures (e.g. Spill prevention, Hydrocarbon Storage)	• ECO reports	Contractor, Applicant
Discharge of Treated Water	Impacts on water sources	Environmental Pollution Ecological Disturbance	Operation	The CCGT plant water uses for the discharge must be authorised, and the following applies: Qualities must be in line with general wastewater limits set out in the General Authorization regulations; and Quantities must be in consideration of the ecological reserve and hydrological regimes.	• WUL • Water Monitoring Reports	Applicant
Site establishment **Operations** **Post Closure Monitoring and Maintenance** **Water management**	Hydrocarbon spills/contamination	Environmental Pollution	Planning and Design Construction Operation Decommissioning	Avoid pollution caused by fuel spillages and improper storage of materials Avoid through preventative measures (e.g. bunding, spill kits) Remedy through cleanup and waste disposal	• EO report • ECO report	Contractor, Applicant

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Performance Indicator	Responsible Person
Construction **Operations** **General decommissioning activities**	Health and safety Impacts	Health and Safety	Construction Operation Decommissioning	Ensure safety of property, workers and people living in the vicinity Check through implementation of mitigation measures	• Health and Safety Audits • Site inspections • EMPr Performance Audits • Air Quality Monitoring	Contractor, Applicant, Health and Safety Manager

8 CONTROL AND MONITORING

This section will discuss measures to be implemented for the monitoring and control where necessary to ensure that the project does not prove detrimental to the baseline environment.

8.1 MONITORING OF CHANGE IN BASELINE INFORMATION

Kelvin has implemented a surface water monitoring programme for their licensed discharge point for water from the coal fired power station as described in Section 4.11.6. The current monitoring network is seen as being sufficient in the goal of monitoring and control for the additional discharge of treated water used for cooling the turbines and treated process water/effluent. Annual reports are to be submitted to the authorities at the stipulated time interval in the IWUL. The detailed environmental monitoring schedule has been developed in the EMPr and is also detailed in this report, the social and environmental aspects that act as environmental indicators and are most common have been considered.

8.2 AUDIT AND REPORT ON PERFORMANCE MEASURES

The applicant shall undertake annual EMPr audit performance assessments (NEMA Environmental Audits). Kelvin will further undertake internal and external audits on compliance with the conditions of the WUL, once issued, and in line with the frequency required by the WUL (i.e., on an annual basis).

8.3 AUDIT AND REPORT ON RELEVANCE OF IWWMP ACTION PLAN

The WUL will require that the efficiency of the measures proposed as part of the action plan be reviewed and updated where required. As such, the IWWMP action plan will be reviewed and updated in line with the frequency required by the WUL (i.e., on an annual basis).

9 CONCLUSION

This section provides the concluding statements relating to the regulatory status of the activity, the motivation of the activity in terms of Section 27 of the NWA (Appendix 3) and the proposed WULA.

9.1 REGULATORY STATUS OF ACTIVITY

The Kelvin CCGT Power Plant Project is a new project and at the moment concurrent EIA and WUL application processes are underway. An application for an EA is being conducted by EIMS.

9.2 KEY COMMITMENTS

Kelvin is committed to implementing and reviewing the IWWMP action plan included in this document based on any new information where required (Refer to Section 7 above).

10 REFERENCES

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Appendices

Appendix 1: Aquatics Compliance Statement for CCGT project

Appendix 2: Soils Compliance Statement for CCGT project

Appendix 3: Section 27 Motivation Report