ESKOM HOLDINGS SOC (LTD)

KOMATI POWER STATION SOLAR PHOTOVOLTAIC, BATTERY ENERGY STORAGE SYSTEM, WIND ENERGY FACILITIES AND ANCILLARY INFRASTRUCTURE

DRAFT ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT
PART IV – APPENDICES E8 – E14

22 AUGUST 2022 FINAL

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This Draft Environmental Impact Assessment Report (Report) for the Proposed Construction of a Solar Photovoltaic, Battery Energy Storage System and Wind Energy Facility at the Komati Power Station has been prepared by WSP Group Africa (Pty) Ltd (WSP) on behalf and at the request of Eskom Holdings SOC Ltd (Client), as part of the application process for Environmental Authorisation.

Unless otherwise agreed by us in writing, we do not accept responsibility or legal liability to any person other than the Client for the contents of, or any omissions from, this Report.

To prepare this Report, we have reviewed only the documents and information provided to us by the Client or any third parties directed to provide information and documents to us by the Client, as well as the supporting specialist studies. We have not reviewed any other documents in relation to this Report, except where otherwise indicated in the Report.

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PROPOSED KOMATI POWER STATION SOLAR PHOTOVOLTAIC (PV) AND BATTERY ENERGY STORAGE SYSTEM (BESS), MPUMALANGA PROVINCE

VISUAL ASSESSMENT – INPUT FOR SCOPING REPORT

Produced for:

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Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modeling, and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, Environmental Management Frameworks, State of the Environment Reports, Environmental Management Plans, tourism development and environmental awareness projects.

He holds a BA degree in Geography and Anthropology from the University of Pretoria and worked at the GisLAB (Department of Landscape Architecture) from 1990 to 1997. He later became a member of the GisLAB and in 1997, when Q-Data Consulting acquired the GisLAB, worked for GIS Business Solutions for two years as project manager and senior consultant. In 1999 he joined MetroGIS (Pty) Ltd as director and equal partner until December 2015. From January 2016 he worked for SMEC South Africa (Pty) Ltd as a technical specialist until he went independent and began trading as LOGIS in April 2017.

Lourens has received various awards for his work over the past two decades, including EPPIC Awards for ENPAT, a Q-Data Consulting Performance Award and two ESRI (Environmental Systems Research Institute) awards for *Most Analytical* and *Best Cartographic Maps*, at Annual International ESRI User Conferences. He is a co-author of the ENPAT atlas and has had several of his maps published in various tourism, educational and environmental publications.

He is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments.

1. INTRODUCTION

Eskom Holdings SOC (Ltd) (Eskom) is a South African utility that generates, transmits and distributes electricity. Several of Eskom's coal-fired power stations are reaching the end of life. These power stations will go into extended cold reserve and are most likely to be fully decommissioned in the future (2035). Eskom is considering a shutdown, dismantling and repurposing of some of its fleet as it reaches its end of life. Komati Power Station, situated in Mpumalanga will reach its end-of-life expectancy in September 2022.

Eskom is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for the Komati Power Station. The plan is to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS).

The Komati Power Station is situated about 37km from Middelburg, 43km from Bethal and 40km from Emalahleni, via Vandyksdrift in the Mpumalanga Province of South Africa. The power station has a total of 9 units, five 100MW units on the east (Units 1 to 5) and four 125 MW units on the west (Units 6 to 9), with a total installed capacity of 1000 MW. Its units operated on a simple Rankine Cycle without reheat and with a low superheat pressure, resulting in a lower thermodynamic efficiency (efficiency up to 27%). Komati units are small and have a higher operating & maintenance cost per megawatt generated compared to more modern power stations.

The specifications of the Solar PV and BESS project are outlined below:

- The total site area for PV installation is approximately 200-250 hectares to allow for the construction of a PV facility with capacity up to 100 MW and BESS up to 150 MW.

- Solar PV modules, up to a total of approximately 720,000 m^2 that converts solar radiation directly into electricity. The solar PV modules will be elevated above the ground, and will be mounted on either fixed tilt systems or tracking systems (comprised of galvanised steel and aluminium). The Solar PV modules will be placed in rows in such a way that there is allowance for a perimeter road and security fencing along the boundaries, and O&M access roads in between the PV module rows.

- Inverter stations, each occupying a footprint up to approximately 30 m^2, with up to 100 Inverter stations installed on the identified sites. Each Inverter station will contain an inverter step-up transformer, and switchgear. The Inverter stations will be distributed on the site, located alongside its associated Solar PV module arrays. The Inverter station will perform conversion of DC (direct current) to AC (alternating current), and step-up the LV voltage of the inverter to the appropriate voltage to allow the electricity to be fed into the appropriate substation / grid point of connection (PoC). Inverter stations will connect several arrays of Solar PV modules and will be placed along the internal roads for easy accessibility and maintenance.

- Below ground electrical cables with trenching for connecting PV arrays, Inverter stations, O&M buildings, and Combiner Substations.

- Above ground overhead lines for connecting Combiner Substations to grid PoC.

- Adequately designed foundations and mounting structures that will support the Solar PV modules and Inverter stations.

- Access roads that provide access to the Komati PV sites.

- Perimeter roads around the PV sites.

- Internal roads for access to the Inverter stations.

- Internal roads/paths between the Solar PV module rows, to allow access to the Solar PV modules for operations and maintenance activities.

- Infrastructure required for the operation and maintenance of the Komati PV installations:

    - Meteorological Station

    - O&M Building – comprising control room, server room, security equipment room, offices, boardroom, kitchen, and ablution facilities (including water supply and sewage infrastructure)

    - Spares warehouse and workshop

    - Hazardous chemical store – approx. 30 m2

    - Security building

    - Parking areas and roads

- Small diameter water supply pipeline from existing supply infrastructure.

- Fire water supply during construction and operation.

- Sewage interconnection to existing infrastructure.

- Storm water channels.

- Perimeter fencing of the Komati PV sites, with access gates.

- Temporary laydown area, occupying a footprint up to approx. 10 hectares. The laydown area will be used during construction and rehabilitated thereafter.

- Temporary concrete batching plant, occupying a footprint up to approx. 1 hectare. The concrete batching plant area will be used during construction and rehabilitated thereafter.

- Temporary site construction office area, occupying a footprint up to approx. 1 hectare. This area will accommodate the offices for construction contractors during construction and rehabilitated thereafter.

Figure 1: Regional locality of the study area.

The Solar PV Energy Facility and BESS will take up to 12 months to construct. The operational lifespan of the facility is estimated at up to 25 years. The proposed development sites identified for the Solar PV Energy Facility and associated infrastructure are indicated on the maps within this report. Sample images of similar PV technology and Battery Energy Storage System (BESS) facilities are provided below.

Figure 2: Photovoltaic (PV) solar panels. (*Photo: SunPower Solar Power Plant – Prieska)*.

Figure 3: Aerial view of PV arrays. (*Photo: Scatec Solar South Africa*).

Figure 4: Aerial view of a BESS facility (*Photo: Power Engineering International)*.

Figure 5: Close up view of a BESS facility *(Photo: Greenbiz.com).*

2. SCOPE OF WORK

The scope of the work includes a scoping level visual assessment of the issues related to the visual impact. The scoping phase is the process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision-making is expected to focus and to ensure that only key issues and reasonable alternatives are examined.

The study area for the visual assessment encompasses a geographical area of approximately 220km² (the extent of the full-page maps displayed in this report) and includes a minimum 6km buffer zone (area of potential visual influence) from the proposed project infrastructure.

The study area includes predominantly mining and industrial land, farm land and sections of the R35 and R542 arterial roads.

3. METHODOLOGY

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from topographical data provided by the Japan Aerospace Exploration Agency (JAXA), Earth Observation Research Centre, in the form of the ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30) elevation model.

The methodology utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model of the potentially affected environment.

- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc.

- The identification of sensitive environments or receptors upon which the proposed facility could have a potential impact.

- The creation of viewshed analyses from the proposed project sites in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures and activities.

This report (scoping report) sets out to identify the possible visual impacts related to the proposed Komati Power Station Solar PV and BESS from a desktop level.

4. THE AFFECTED ENVIRONMENT

The Komati Power Station is situated about 37km from Middelburg, 43km from Bethal and 40km from Emalahleni within the Highveld region of the Mpumalanga Province. It falls within the Steve Tshwete Local Municipality of the Nkangala District Municipality. The larger region is considered as the power generation hub of South Africa with extensive coal fields that cover almost all of the area, numerous large coal mines and an additional seven coal-fired power stations located within a 60km radius of the Komati Power Station.

These are:

- Kusile
- Kendal
- Duvha
- Hendrina
- Arnot
- Kriel
- Matla

The study area for the VIA is centred on the Komati Power Station and includes a 6km buffer zone (zone of potential visual influence) from the Eskom PV project area. Two PV plant development sites are being considered for the Komati Power Station Solar Facility. Site A is located immediately north of the R542 arterial road, approximately 1.6km south-west of the power station. Site B is located immediately west of the Komati residential area, approximately 1.2km west of the power station. This site includes the Komati airstrip. Both sites are considered for development and they are not considered as alternative developments sites.

The BESS development sites are located within the power station property; in very close proximity to the existing power station infrastructure i.e. the core power plant, cooling towers and substations.

Figure 6: Aerial view of the proposed Solar PV Energy Facility Development Footprints (orange PV Site A and white PV Site B) and BESS (blue).

Topography, hydrology and vegetation

The study area is situated on land that ranges in elevation from approximately 1,530m (in the south-west of the study area) to 1,700m to the east. The project site itself is located at an average elevation of approximately 1,626m above sea level (see **Map 1**). The terrain morphological unit identified for the entire study area is described as *undulating plains*. The most prominent elevated topographical units are the ash dumps, slimes dams and mine dumps surrounding the power station and the Goedehoop Colliery located west of the power station.

There are two perennial rivers in the study area, the Koringspruit River (traversing north of the project site) and the Olifants River to the far south-west. Besides these rivers there are a number of non-perennial rivers or streams feeding into the previously mentioned rivers. The study area is characterised by flat or gently undulating terrain, grasslands and has a tropical or subtropical climate. This area also contains pans. A pan is defined as a large, shallow, flat-floored depression found in arid and semi-arid regions and may be flooded seasonally or permanently. There are also a number of man-made dams either related to the agricultural or mining activities of the region.

The vegetation type for the entire study area is *Eastern Highveld Grassland* within the *Mesic Highveld Grassland Bioregion* of the *Grassland Biome*. It should be noted that most of the natural grassland has been transformed by either agricultural or mining activities. Wetlands occur along the rivers and drainage lines mentioned above. Other than the natural grassland and wetlands there are very limited additional land cover types, such as woodland in places. There are also very limited exotic plantations. These planted trees are generally associated with farm residences or homesteads throughout the region. Refer to **Map 2** for the land cover types and broad land use patterns.

Land use and settlement patterns

The majority of the study area is relatively sparsely populated with a population density of less than approximately 33 people per km^2. Most of these people are located within the towns of Komati (at the power station) or at Blinkpan north of the Goedehoop Colliery. Other than these towns, or residential areas, the rest of the study area is dotted with farm residences or homesteads. These residences are inhabited by the farmers producing mainly maize crops (dryland agriculture) within the region. Other than the agricultural activities the most prominent land use within the area is the mining and the associated power generation activities at the power station.

Some of the homesteads within the study area include[1]:

- Rooiblom
- Welverdiend (1, 2 and 3)
- Broodsnyersplaas
- Blinkpan
- Geluk
- Bultfontein (1 – 8)
- Willmansrust
- Goedehoop (1, 2 and 3)
- Koornfontein

It is uncertain whether all of these farmsteads are inhabited or not. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present. These farmsteads do, however retain the potential to be affected visually should they ever become inhabited again in the future. For this reason, the author of this document operates under the assumption that they are all inhabited.

The R35 and R542 arterial roads provide motorised access to the project site from respectively the N4 and N12 national roads traversing north and north-west of the larger region.

There are no identified tourist attractions of designated protected areas within the study area.[2]

In spite of the overall rural character of the region, there are a large number of power lines and substations in the study area, mostly associated with the Komati Power Station, the coal mines and the railway lines traversing the study area. These include:

- Camden-Duvha 400kV
- Komati-Matla 275kV
- Arnot-Kruispunt 275kV
- Camden-Komati 275kV
- Komati-Kruispunt 275kV

[1] The names listed below are of the homestead or farm dwelling as indicated on the SA 1: 50 000 topographical maps and do not refer to the registered farm name.
[2] Sources: DEAT (ENPAT Mpumalanga), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2018 (ARC/CSIR), REEA_OR_2021_Q1 and SAPAD2021 (DFFE).

- Halfgewonnen-Kudu 88kV
- Kudu-Export 132kV
- Broodsnyersplaas-Spoornet 132kV
- Aberdeen-Gloria Colliery 132kV
- Export-Duvha Colliery 132kV
- Kudu-Nasarete 132kV
- Hendrina-Aberdeen 132kV
- Aberdeen-Kudu 132kV
- Aberdeen-Ysterkop 132kV
- Duvha Colliery-Kudu 132kV
- Abina 132kV Overhead Line
- Kudu-Dorstfontein 88kV
- Komati-Kudu 1 and 2 132kV
- Aberdeen-Spoornet 132kV
- Klicoal-Kudu 132kV
- Aberdeen-Gloria Shaft 132kV

These power lines and substations are indicated on the maps below.

There are no additional solar energy generation plants (or applications) within the study area. The closest approved application is the proposed installation of a solar photovoltaic power plant at the Eskom Duvha Power Station, some 18km north-west of the project site.

The photographs below aid in describing the general environment within the study area and surrounding the proposed project infrastructure.

Figure 7: View of the PV Site A from the R542 arterial road.

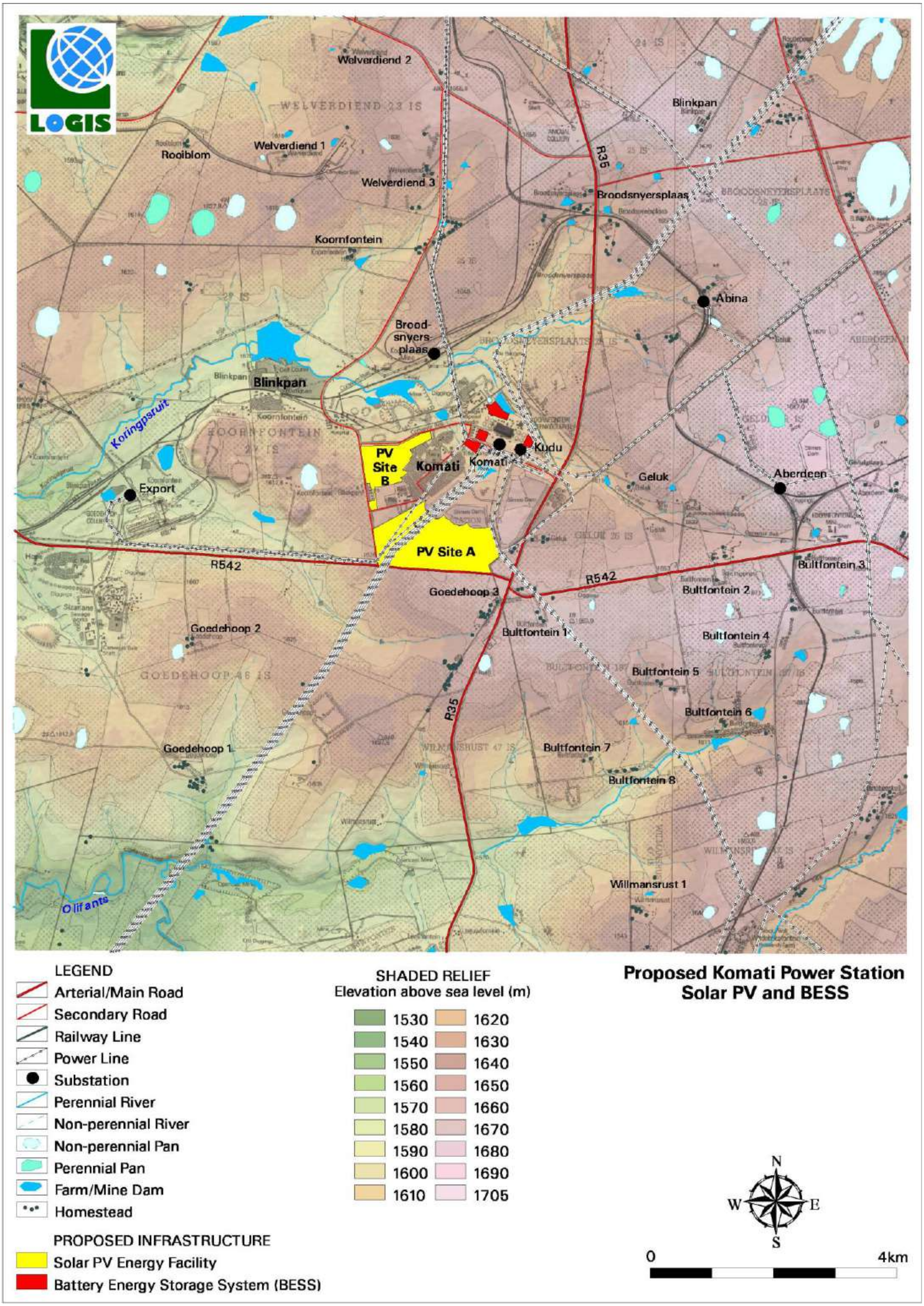
Figure 8: View of the PV Site B from the west.

Figure 9: Typical coal mining activity within the study area.

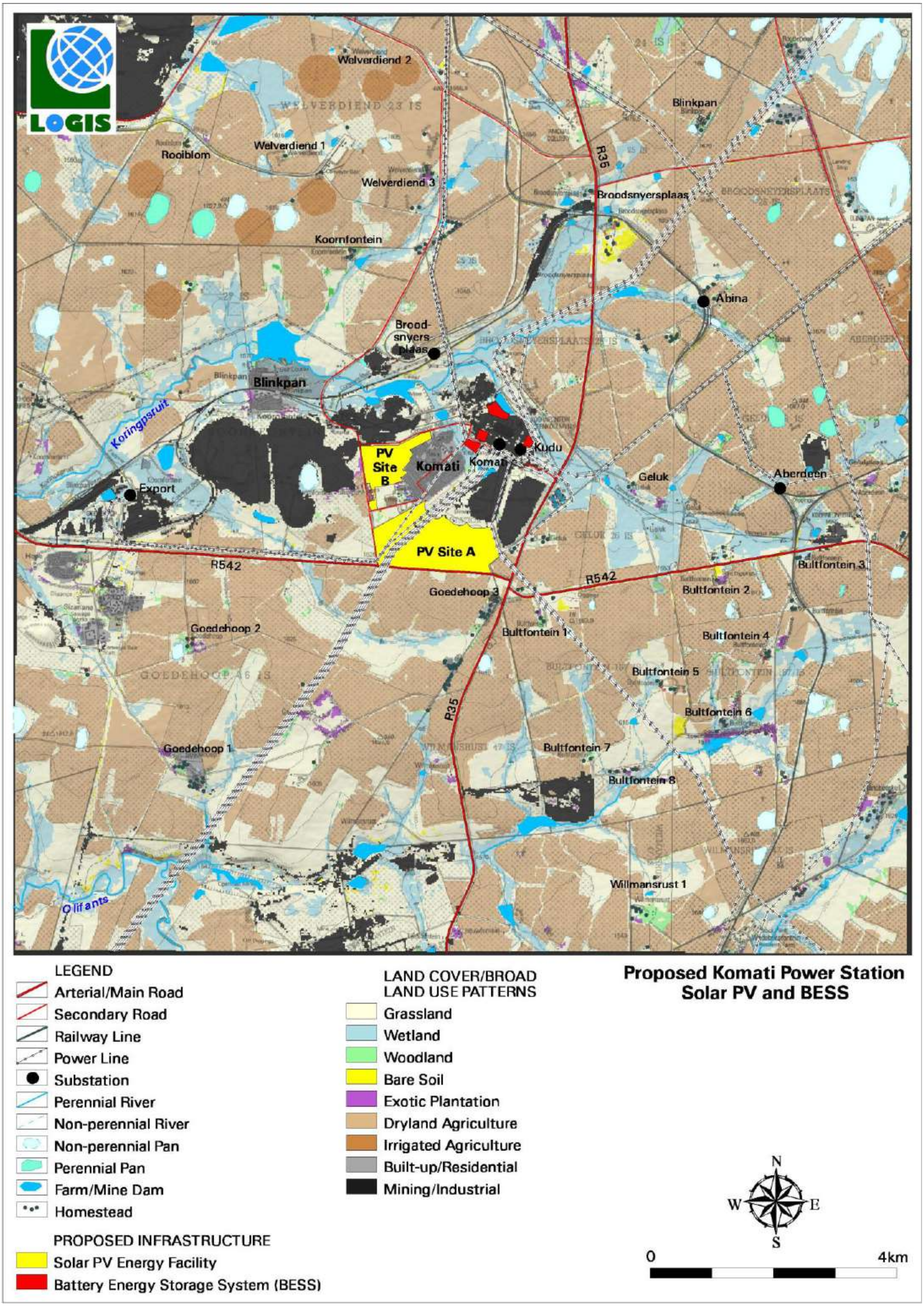
Figure 10: General environment within the study area.

Figure 11: Power lines near the R542 arterial road.

Figure 12: The Komati coal-fired power station and associated infrastructure.



Map 1: Shaded relief map of the Study Area.



Map 2: Land cover and broad land use patterns.

5. VISUAL EXPOSURE/VISIBILITY

The result of the viewshed analysis for the proposed Solar PV Energy Facility is shown on the map below (**Map 3**). The viewshed analysis was undertaken from a representative number of vantage points within the Site A and B development footprints at an offset of 5m above ground level (as a worst-case-scenario). This was done in order to determine the general visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures (PV panels, inverters, BESS, etc.) associated with the proposed project. The visual exposure of the BESS is show on **Map 4**.

It should be noted that the viewshed analysis is based on both the Site A and B project boundaries (in their entirety) as provided and that the results may differ once a final layout, structure positions and dimensions are provided during the EIA phase of the project.

The viewshed analysis will be further refined once a preliminary and/or final layout is completed and will be regenerated for the actual position of the infrastructure on the site and actual proposed infrastructure during the EIA phase of the proposed project.

Map 3 also indicates proximity radii from the development footprints in order to show the viewing distance (scale of observation) of the facilities in relation to their surrounds.

Results – PV facility

The PV facility (both sites) is expected to be visible for up to 6km from the development sites. The visual exposure is relatively scattered due to the undulating nature of the topography, with lower-lying land (e.g. along the Koringspruit and Olifants Rivers) shielded from the infrastructure, and only higher-lying terrain being exposed. It should be noted that the potential visual exposure will not occur in isolation, but rather in conjunction with the existing mining, power line and power station infrastructure in closer proximity to the sites.

The following is evident from the viewshed analyses:

0 – 1km

The PV facility may be highly visible within a 1 km radius. This zone includes the town of Komati where visual exposure is expected from the outlying edges of the built-up areas. The R542 arterial road will be highly exposed to PV Site A where it traverses south of the site. The R35 could similarly be exposed to PV Site A, but from a slightly longer distance. There are a number of homesteads located within a 1km radius of PV Site A, namely the Goedehoop 3 residence and a number of unnamed houses east of the site.

1 – 3km

This zone predominantly falls within mining land, vacant farmland an open space, but does contain sections of the abovementioned roads, some houses further south along the R35, and the Geluk homestead east of the power station and the development sites.

3 - 6km

Within a 3 – 6km radius, the visual exposure will be significantly reduced, especially to the south-east. Exposed residences may include the Bultfontein 2 and 3 homesteads (to the east) and the Broodsnyersplaas and Welverdiend 3 residences to the north.

> 6km

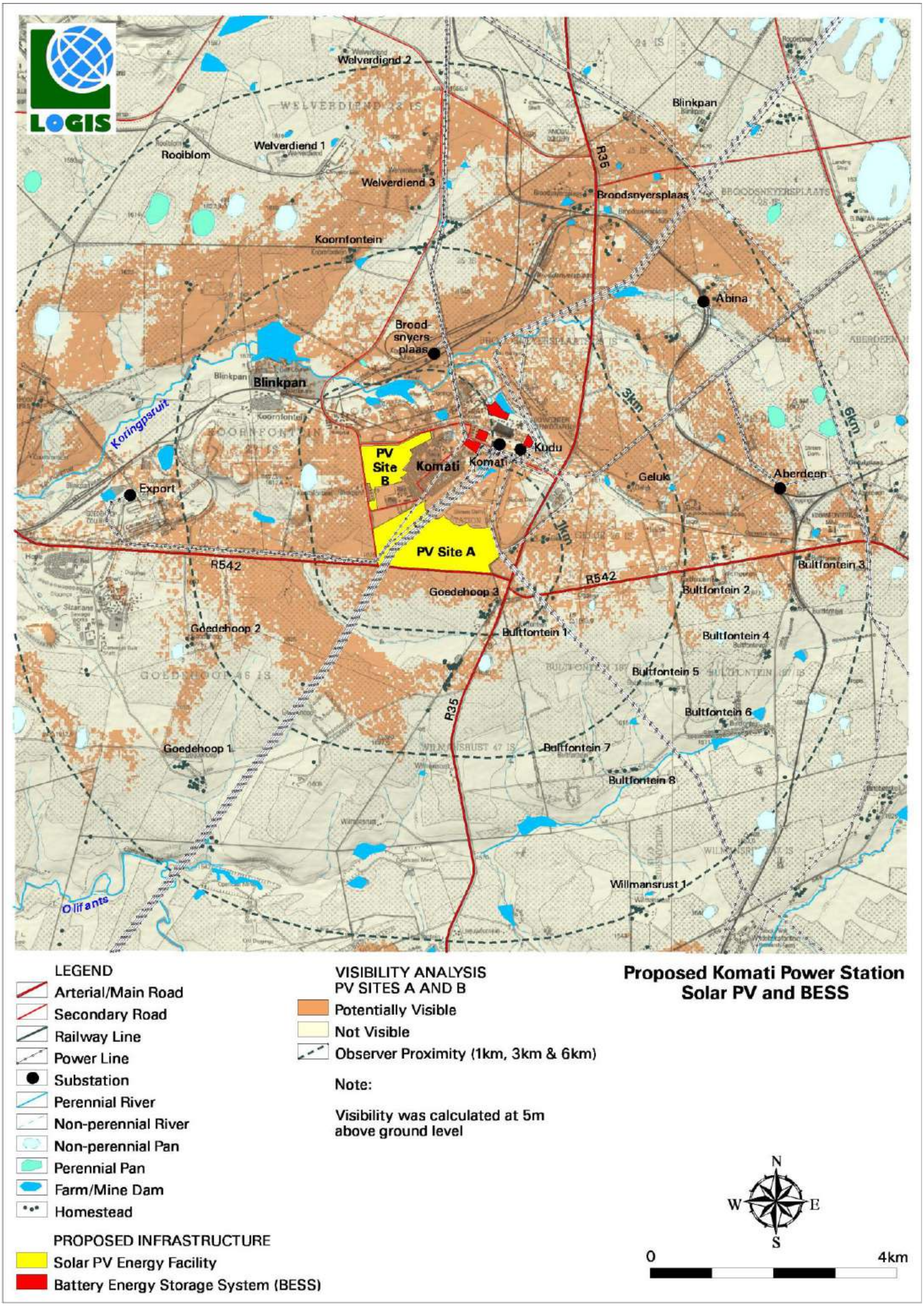
At distances exceeding 6km, the intensity of visual exposure is expected to be very low and highly unlikely due to the distance between the object (Solar PV Energy Facility) and the observer, and the developed and industrial nature in closer proximity to the proposed infrastructure.

Conclusion

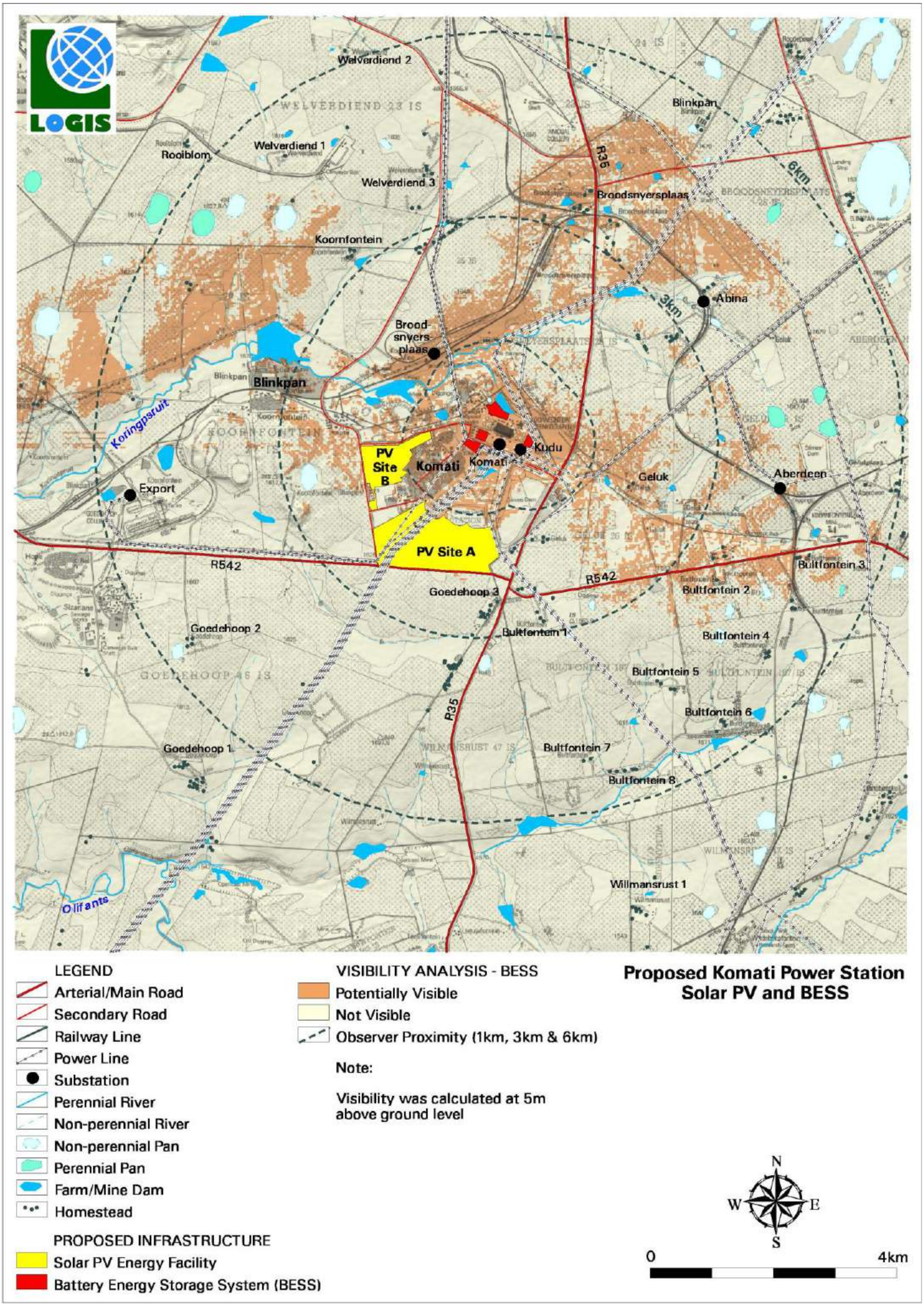
In general terms, it is envisaged that the structures, where visible from shorter distances (e.g. less than 1km and potentially up to 3km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a visual impact. This may include observers travelling along the R542 and R35 arterial roads, residents along the outskirts of the Komati residential area, and the farm residences mentioned above. It should once again be stressed that the visual exposure of the PV facility structures will be in conjunction with the existing visual clutter (power lines, power station and mining infrastructure) within the region.

Results – BESS

The visual exposure of the BESS infrastructure is expected to be very limited, mainly within a 1km radius of the BESS structures. The only potentially affected receptor site within this zone may be a short section of the R35 arterial road where it traverses east of the power station. The location of the BESS structures immediately adjacent to the power station further reduces the potential visual exposure, and ultimately the potential visual impact, due to the fact that the visual amenity has already been compromised at this location.



Map 3: Map indicating the potential (preliminary) visual exposure of the proposed Komati Power Station Solar PV Energy Facility.



Map 4: Map indicating the potential (preliminary) visual exposure of the proposed Komati Power Station BESS.

6. ANTICIPATED ISSUES RELATED TO THE VISUAL IMPACT

Anticipated issues related to the potential visual impact of the proposed Solar PV Energy Facility include the following:

- The visibility of the Solar PV Energy Facility to, and potential visual impact on, observers travelling along the R542 and R35 arterial roads in closer proximity to the proposed infrastructure.
- The visibility of the Solar PV Energy Facility to, and potential visual impact on residents of dwellings within the study area, with specific reference to residents of the Komati residential area and the farm residences in closer proximity to the proposed development.
- The potential visual impact of the Solar PV Energy Facility on the visual character or sense of place of the region.
- The potential visual impact of the Solar PV Energy Facility on tourist routes or tourist destinations/facilities (if present).
- The potential visual impact of the construction of ancillary infrastructure (i.e. internal access roads, buildings, power line, etc.) on observers in close proximity to the facility.
- The visual absorption capacity of the natural vegetation or built structures/mining infrastructure (if applicable).
- Potential cumulative visual impacts (or consolidation of visual impacts), with specific reference to the placement of the Solar PV Energy Facility within a predominantly mining and industrial area.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the Solar PV Energy Facility.
- Potential visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard (if required).
- Potential visual impact of solar glint and glare on static ground-based receptors (residents of homesteads) in close proximity to the Solar PV Energy Facility (if required).
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may potentially constitute a visual impact at a local and/or regional scale. These need to be assessed in greater detail during the EIA phase of the proposed project.

Table 1: Impact table summarising the potential primary visual impacts associated with the proposed Solar PV Energy Facility.

Impact Visual impact of the facility on observers in close proximity to the proposed Solar PV Energy Facility infrastructure and activities. Potential sensitive visual receptors

include:

- Residents of Komati and farm dwellings (if present in closer proximity to the facility)
- Observers travelling along the R542 and R35 arterial roads

Issue	Nature of Impact	Extent of Impact	No-Go Areas
The viewing of the PV facility infrastructure and activities	The potential negative experience of viewing the infrastructure and activities	Primarily observers situated within a 1km (and potentially up to 3km) radius of the facility	N.A.

Description of expected significance of impact

Extent: Local
Duration: Long term
Magnitude: Moderate
Probability: Probable
Significance: Moderate
Status (positive, neutral or negative): Negative
Reversibility: Recoverable
Irreplaceable loss of resources: No
Can impacts be mitigated: Yes

Gaps in knowledge & recommendations for further study

A preliminary and/or final layout of the Solar PV Energy Facility and ancillary infrastructure is required for further analysis. This includes the provision of the dimensions of the proposed structures and ancillary equipment.

Additional spatial analyses are required in order to create a visual impact index that will include the following criteria:

- Visual exposure
- Visual distance/observer proximity to the structures/activities
- Viewer incidence/viewer perception (sensitive visual receptors)
- Visual absorption capacity of the environment surrounding the infrastructure and activities

Additional activities:

- Identify potential cumulative visual impacts
- Undertake a site visit
- Recommend mitigation measures and/or infrastructure placement alternatives

Refer to the Plan of Study for the EIA phase of the project below.

7. CONCLUSION AND RECOMMENDATIONS

The fact that some components of the proposed Komati Power Station Solar PV Energy Facility and associated infrastructure may be visible does not necessarily imply a high visual impact. Sensitive visual receptors within (but not restricted to) a 3km buffer zone from the facility need to be identified and the severity of the visual impact assessed within the EIA phase of the proposed project.

It is recommended that additional spatial analyses be undertaken in order to create a visual impact index that will further aid in determining potential areas of visual impact. This exercise should be undertaken for the core PV infrastructure (solar field) as well as for the ancillary infrastructure, as these structures (e.g. the BESS structures and power line) are envisaged to have varying levels of visual impact at a more localised scale. The site-specific issues (as mentioned earlier in the report) and potential sensitive visual receptors should be measured against this visual impact index and be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact.

This recommended work must be undertaken during the EIA Phase of reporting for this proposed project. In this respect, the Plan of Study for the EIA is as follows:

Visual Impact Assessment (VIA)

The VIA is determined according to the nature, extent, duration, intensity or magnitude, probability and significance of the potential visual impacts, and will propose management actions and/or monitoring programs and may include recommendations related to the solar energy facility layout.

The visual impact is determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e. different seasons, weather conditions, etc.) are not considered.

The VIA considers potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region.

The following VIA-specific tasks must be undertaken:

- **Determine potential visual exposure**

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if (or where) the proposed project and associated infrastructure were not visible, no impact would occur.

The viewshed analyses of the proposed project and the related infrastructure are based on a detailed digital terrain model of the study area.

The first step in determining the visual impact of the proposed project is to identify the areas from which the structures would be visible. The type of structures, the dimensions, the extent of operations and their support infrastructure are taken into account.

- **Determine visual distance/observer proximity to the proposed Project**

In order to refine the visual exposure of the proposed project on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for this type of structure.

Proximity radii for the proposed infrastructure are created in order to indicate the scale and viewing distance of the proposed project and to determine the prominence of the structures in relation to their environment.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly (anticipated) negative visual perception of the proposed facility.

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

The next layer of information is the identification of areas of high viewer incidence (i.e. main roads, residential areas, settlements, etc.) that may be exposed to the Project infrastructure.

This is done in order to focus attention on areas where the perceived visual impact of the proposed project will be the highest and where the perception of affected observers will be negative.

Related to this data set, is a land use character map, that further aids in identifying sensitive areas and possible critical features (i.e. tourist facilities, protected areas, etc.), that should be addressed.

- **Determine the visual absorption capacity (VAC) of the landscape**

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed project. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing, sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and structure decreases.

- **Calculate the visual impact index**

The results of the above analyses are merged in order to determine the areas of likely visual impact and where the viewer perception would be negative. An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This focusses the attention to the critical areas of potential impact and determines the potential **magnitude** of the visual impact.

Geographical Information Systems (GIS) software is used to perform all the analyses and to overlay relevant geographical data sets in order to generate a visual impact index.

- **Determine impact significance**

The potential visual impacts are quantified in their respective geographical locations in order to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section are displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

The preferred alternative (or a possible permutation of the alternatives) will be based on its potential to reduce the visual impact. Additional general or site-specific mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the proposed Project.

- **Reporting and map display**

All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in the VIA report.

- **Site visit**

Undertake a site visit in order to collect a photographic record of the affected environment, to verify the results of the spatial analyses and to identify any additional site-specific issues that may need to be addressed in the VIA report.

8. REFERENCES/DATA SOURCES

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APPENDIX

E-9 *AQUATIC BIODIVERSITY*

REPORT

Eskom Komati - Aquatic Biodiversity (riparian and wetland systems) Specialist Assessment - Scoping Report

Eskom Holdings SOC Ltd

Submitted to:

Eskom Holdings SOC Ltd

Submitted by:

Golder Associates Africa (Pty) Ltd.

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Distribution List

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Executive Summary

Eskom Holdings SOC (Ltd) (Eskom) is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for Komati Power Station. Eskom plans to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS), for which authorisation at a national level, and financing at the international level, must be sought, supported by an Environmental and Social Impact Assessment (ESIA) that is aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Golder Associates Africa (Pty) (Ltd), now a member of WSP (Golder), was appointed to undertake the necessary aquatic biodiversity baseline specialist studies and impact assessments, in support of the scoping, baseline and impact assessment phases of the environmental regulatory process required to authorise development-related activities.

This report describes the baseline aquatic (riparian and wetland) ecology of areas that will be impacted by the proposed infrastructure developments at Eskom Komati Power Station, and documents the scoping-level assessment of the potential impacts of the proposed Project on aquatic ecosystems and biodiversity, i.e. riparian and wetland ecosystems, and associated species. The report also provides recommended measures for the mitigation of any negative impacts for inclusion in the updated EMPr for the Project, as well as guidance on any additional baseline data gathering needs for the ESIA.

The proposed study area is located within the B11B quaternary sub-catchment of the upper Olifants Water Management Area. An unnamed tributary of the Koringspruit passes immediately north of the study area while a small drainage line runs through the center of the study area, eventually reporting to the Koornfontein River via the Gras Dam, and ultimately draining into the Olifants River. Based on the National Web-based Environmental Screening Tool, the study area is located within an area classified as having a Very High Sensitivity in terms of the Aquatic Biodiversity Theme.

The study area is located within the Eskom Power Station facility and is boarded by a number of land uses such as crop farming, residential setting (both informal and formal) and mining activities. Four Wetland HGM units (Channel valley bottom, two seep wetlands and a depression wetland) were identified and mapped within the study area. These wetlands were considered Largely Modified in terms of their Present Ecological State and are of low/marginal ecological importance. The channeled valley bottom wetland was however assessed as having Moderate importance in terms of its Ecological Importance and Sensitivity as well as having a Moderately high importance in terms of ecosystem services, on account of biodiversity maintenance.

The proposed project is likely to have Medium impact significant on wetland systems, with the exception of one potentially high impact significance associated with the loss of wetland habitat. With the implementation of recommended mitigation measures the potential impacts are expected to be of low significance.

DETAILS OF THE SPECIALIST

Table 1: Details of specialist

Specialist Information	
Name:	Lufuno Nemakhavhani
Phone number:	+27 72 718 9952
Email:	Lufuno.nemakhavhani@wsp.com
SACNASP Registration Number	116461
Curriculum Vitae	See APPENDIX B

Declaration of Independence by Specialist

I, Lufuno Nemakhavhani declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed project.
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan, or document.

ACRONYMS AND ABBREVIATIONS

Abbreviation	Explanation
AC	Alternating Current
BESS	Battery Energy Storage System
CARA	Conservation if Agricultural Resources Act
CVB	Channel Valley Bottom
DC	Direct Current
DSD	Dead Stop Date
EA	Environmental Authorisation
EHSG	Environmental, Health and Safety Guidelines
EIA	Environmental Impact Assessment
EIS	Ecological Importance Sensitivity
EMPr	Environmental Management Programme
ESIA	Environmental Social Impact Assessment
ESS6	Environmental Social Services 6
FEPA	Freshwater Ecosystem Priority Areas
GIIP	Good International Industry Practices
IFC	International Finance Corporation
LSA	Local Study Area
MBSP	Mpumalanga Biodiversity Sector Plan
MRA	Mining Rights Area
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NFEPA	Freshwater Ecosystem Priority Areas
NG	Net Gain
NNL	No Net Loss
NPAES	National Protected Area Expansion Strategy
NWM5	National Wetland Map 5
PES	Present Ecological State
PoC	Point of Connection
PV	Photovoltaics
SANBI	South African National Biodiversity Institute
WBG	World Bank Group

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APPENDICES

1.0 INTRODUCTION AND BACKGROUND

Eskom Holdings SOC (Ltd) (Eskom) is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for Komati Power Station, which is situated in Mpumalanga, about halfway between Middelburg and Bethal (Figure 1).

Eskom plans to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS), for which authorisation at a national level, and financing at the international level, must be sought, supported by an Environmental and Social Impact Assessment (ESIA) that is aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Golder Associates Africa (Pty) (Ltd), now a member of WSP (Golder), was appointed to undertake the necessary ecological baseline studies and impact assessments, in support of the scoping, baseline and impact assessment phases of the environmental regulatory process required to authorise development-related activities.

1.1 Purpose of the report

This report describes the baseline aquatic biodiversity (riparian and wetland systems) of areas that will be impacted by the proposed infrastructure developments at Komati Power Station and documents the results of the scoping-level screening of the potential impacts of the proposed Project on riparian and wetland ecosystems and species.

The report also provides a preliminary set of recommended measures for the mitigation of any negative impacts for inclusion in the updated EMPr for the Project, to ensure that the lender objectives of No Net Loss (NNL) of Natural Habitats, and Net Gain (NG) of Critical habitats, as well as South African biodiversity legislation and policy requirements, are satisfactorily met.

2.0 PROJECT LOCATION AND EXTENT

The Komati Power Station is situated about 37 km from Middelburg, 43 km from Bethal and 40 km from Witbank, via Vandyksdrift in the Mpumalanga Province of South Africa (Figure 1).

2.1 Current Operation

The station has a total of nine units, five 100MW units on the east (Units 1 to 5) and four 125 MW units on the west (Units 6 to 9), with a total installed capacity of 1000 MW. Komati Power Station will reach its end-of-life expectancy in September 2022 when Unit 9 will have reached its dead stop date (DSD). Units 1 to 8 have already reached its DSD.

2.2 Proposed Infrastructure and Activities

Eskom is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for Komati Power Station. The plan is to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS). The parcels of land in Komati for the proposed development are owned by Eskom. The proposed infrastructure that are the subject of the current application process are illustrated in Figure 2.

2.2.1 Project Components

The specifications of the Solar PV and BESS project including aspects of construction and operation are outlined below:

- The total site area for PV installation is approximately 200-250 hectares to allow for the construction of a PV facility with capacity up to 100 MW and BESS up to 150 MW.
- Solar PV modules, up to a total of approximately 720,000 m^2, that convert solar radiation directly into electricity. The solar PV modules will be elevated above the ground and will be mounted on either fixed tilt systems or tracking systems (comprised of galvanised steel and aluminium). The Solar PV modules will be placed in rows in such a way that there is allowance for a perimeter road and security fencing along the boundaries, and O&M access roads in between the PV module rows.
- Inverter stations, each occupying a footprint up to approximately 30 m^2, with up to 100 Inverter stations installed on the identified sites. Each Inverter station will contain an inverter step-up transformer, and switchgear. The Inverter stations will be distributed on the site, located alongside its associated Solar PV module arrays. The Inverter station will perform conversion of DC (direct current) to AC (alternating current), and step-up the LV voltage of the inverter to the appropriate voltage to allow the electricity to be fed into the appropriate substation / grid point of connection (PoC). Inverter stations will connect several arrays of Solar PV modules and will be placed along the internal roads for easy accessibility and maintenance.
- Below ground electrical cables with trenching for connecting PV arrays, Inverter stations, O&M buildings, and Combiner Substations.
- Above ground overhead lines for connecting Combiner Substations to grid PoC.
- Adequately designed foundations and mounting structures that will support the Solar PV modules and Inverter stations.
- Access roads that provide access to the Komati PV sites.
- Perimeter roads around the PV sites.
- Internal roads for access to the Inverter stations.
- Internal roads/paths between the Solar PV module rows, to allow access to the Solar PV modules for operations and maintenance activities.
- Infrastructure required for the operation and maintenance of the Komati PV installations: -
  - Meteorological Station
  - O&M Building – comprising control room, server room, security equipment room, offices, boardroom, kitchen, and ablution facilities (including water supply and sewage infrastructure)
  - Spares Warehouse and Workshop
  - Hazardous Chemical Store – approx. 30 m^2
  - Security Building
  - Parking areas and roads
- Small diameter water supply pipeline from existing supply infrastructure.
- Fire water supply during Construction and Operation.

- Sewage interconnection to existing infrastructure.
- Stormwater channels.
- Perimeter fencing of the Komati PV sites, with access gates.
- Temporary laydown area, occupying a footprint up to approx. 10 hectares. The laydown area will be used during construction and rehabilitated thereafter.
- Temporary concrete batching plant, occupying a footprint up to approx. 1 hectare. The concrete batching plant area will be used during construction and rehabilitated thereafter.
- Temporary site construction office area, occupying a footprint up to approx. 1 hectare. This area will accommodate the offices for construction contractors during construction and rehabilitated thereafter.

2.2.2 Solar PV Construction

It is estimated that approximately 200-300 construction workers will be required on the site. During the construction phase of the project the following activities are anticipated:

- Site Preparation - Vegetation and topsoil will be cleared for the footprint of the infrastructure as well as for the access roads to the solar PV site, internal roads and the laydown yard, etc. The topsoil removed will need to be stored for rehabilitation purposes of the site.
- Transportation of Equipment - All equipment to site will be transported by means of national, provincial and district roads. This includes but is not limited to, transformers, solar PV modules, inverters, excavators, graders, trucks, compacting equipment, construction material, etc.
- Site Establishment Works - The site will have temporary laydown areas and offices for the construction contractors. This will include the contractor’s chosen electricity supply infrastructure e.g. use of generators and fuel storage that will be required to conform to acceptable measures to ensure no harm to the environment. The laydown area will also be used for assembling of solar PV modules and structures. A concrete batching plant may also be required as part of the site establishment works.
- Construction of the Solar PV Facility
  - Trenches would need to be excavated for underground cabling to connect Solar PV arrays, Inverter stations, and Combiner Substations.
  - Foundations for the solar PV array mounting structures and Inverter stations may need to be excavated, with the final extent depending on the geotechnical studies that will be conducted. The geotechnical studies will determine the type of foundations that can be utilised at the PV site.
  - Construction of access, perimeter, and internal gravel roads may require material to be imported from outside the site, from a permitted quarry.
- Water consumption during construction phase - The water consumption during the construction phase is estimated as 15,000 kilolitres (total for construction period estimated as 24 months).
- Construction of Electrical Interconnection Line - Construction and installation of overhead electrical interconnection lines, connecting the Solar PV facilities to the grid PoC.
- Storage of diesel and oil for construction activities.
- Once all the construction activities are completed the site will be rehabilitated where possible and practical. All temporal structures and facilities will be removed from site and the area rehabilitated.

- Solar glare reflection – proximity to air strip.
- End of life waste management for both solar panels and batteries.

2.2.3 Solar PV Operation

The solar PV plant has a minimum design life of 25 years.

- During the life of the Solar PV facility, there will be normal maintenance of all electrical and mechanical components of the plant.
- In addition, there will be periodic cleaning and washing of the solar PV modules. This PV module cleaning will be performed when required, and it is estimated to occur 2-4 times a year.
- The water consumption during operation - estimated water required per year during operation is 10,000 kilolitres (total per year for design life of plant).

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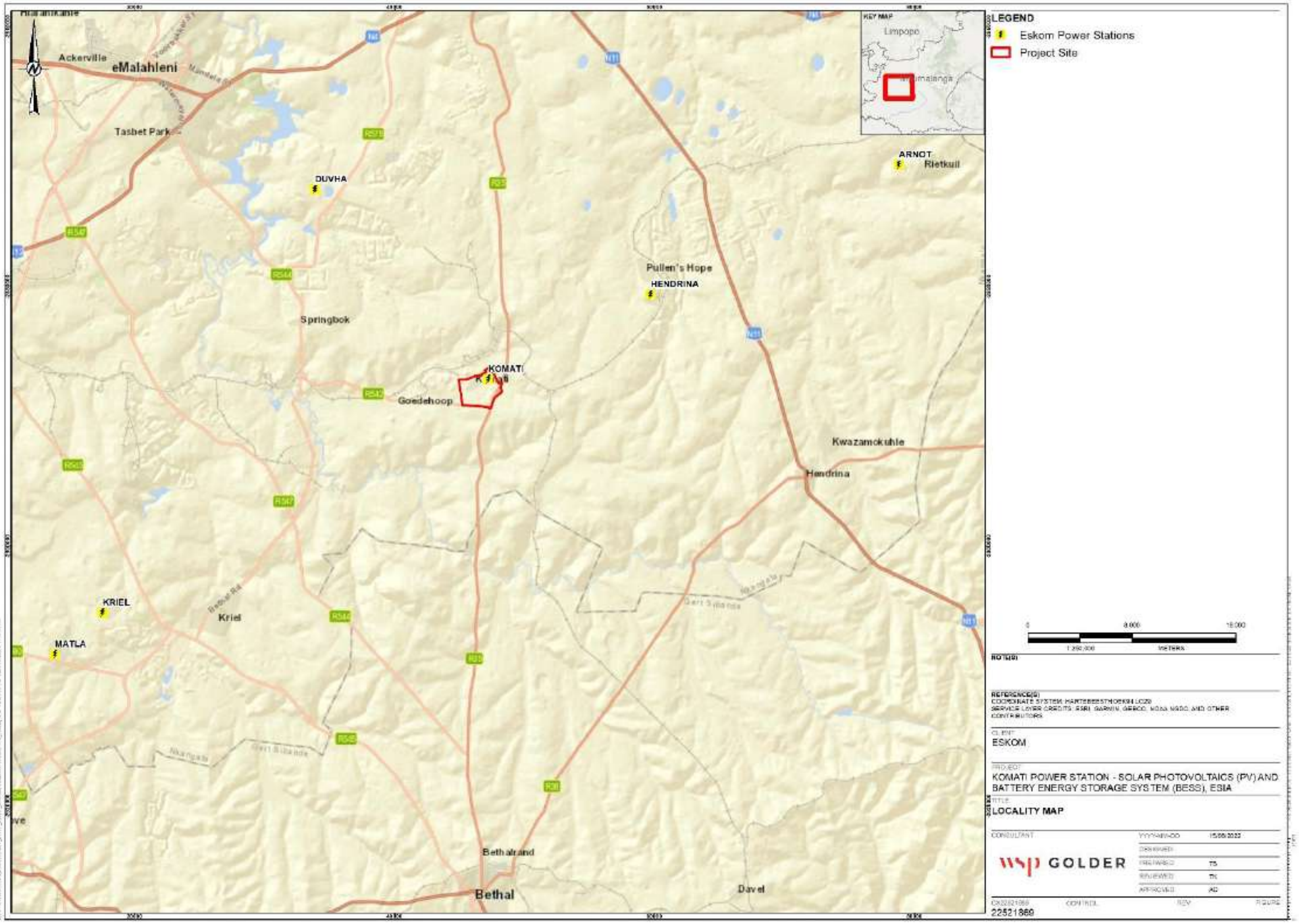

Figure 1: Locality Map- Eskom Komati Power Station

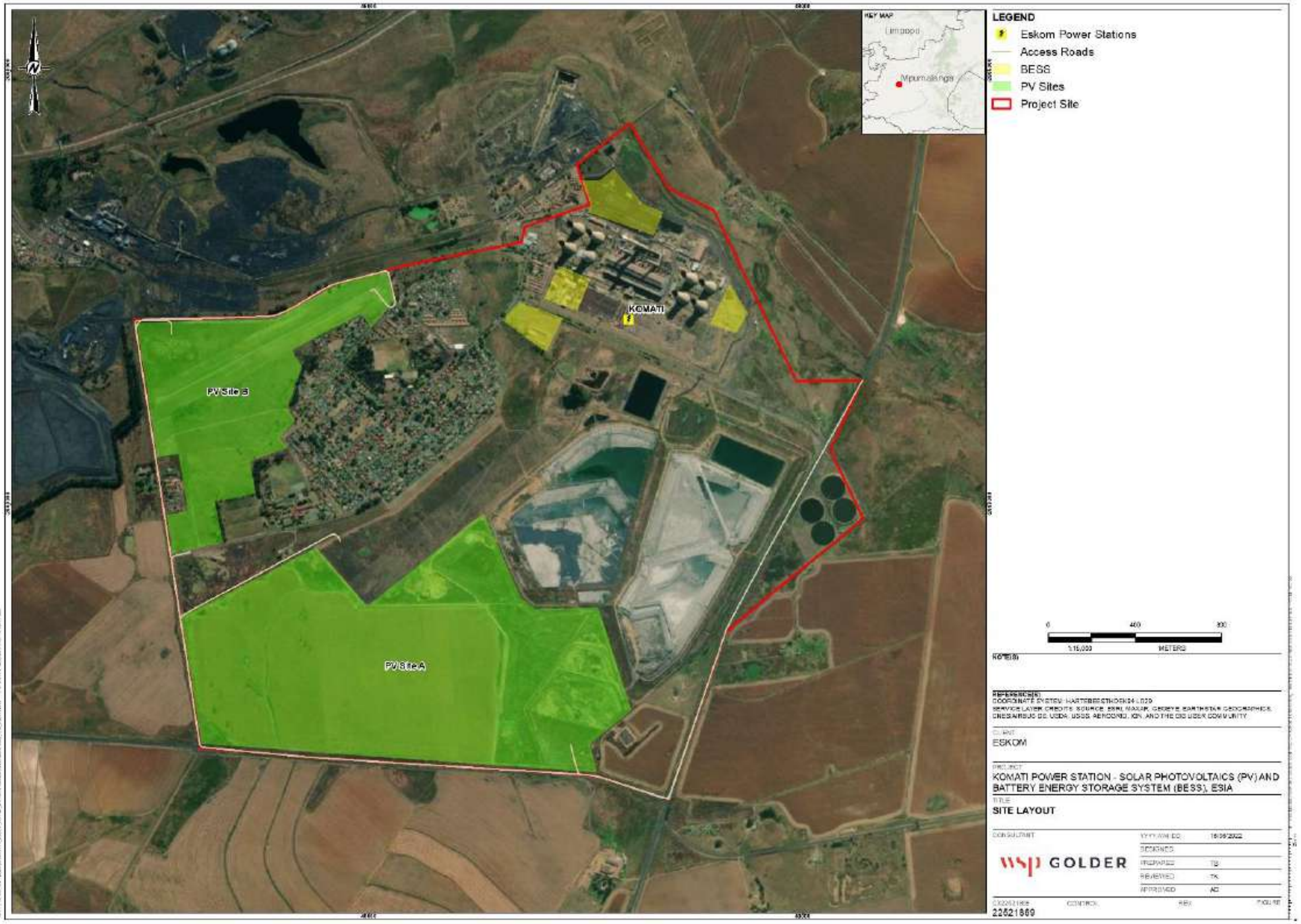

Figure 2: Proposed infrastructure overview

3.0 APPLICABLE LEGISLATION, POLICY AND STANDARDS

The ESIA must be aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; and Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Biodiversity-related South African legislation and policy, and international lender standard requirements that were used to guide this scoping assessment are summarized as follows.

3.1 South African Legislation and Policy

Applicable national and provincial legislation, associated regulations and policies that are pertinent to wetlands, which were used to guide the EIA, include:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998) including Section 24, concerning Procedures for the assessment and minimum criteria for reporting on identified themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA, when applying for environmental authorisation;
  - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity;
- National Water Act (Act No. 36 of 1998);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998);
- Mpumalanga Biodiversity Sector Plan (Lötter, 2015).
- National Protected Area Expansion Strategy (2016).

3.2 Lender requirements

The ESIA must be aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; and Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Biodiversity-related South African legislation and policy, and international lender standard requirements that were used to guide this scoping assessment are summarised as follows.

3.2.1 World Bank Environmental and Social Standard 6

The World Bank's (WB) Environmental and Social Standard 6 (ESS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources (World Bank, 2016) separates habitat into four categories for the purposes of implementing a differentiated risk management approach to habitats based on their sensitivity and values. The categories include 'Modified habitat', 'Natural habitat', 'Critical Habitat' and 'Legally protected and internationally and regionally recognized areas of biodiversity value'; each of which have varying levels of Borrower obligation in terms of biodiversity mitigation and management, and offset requirements.

Whilst the assessment of Modified and Natural habitats is largely based on the establishment of the ecological condition of mapped habitat/vegetation units, and the boundaries of legally protected and/or internationally recognised areas of high biodiversity value are generally defined; the identification and assessment of Critical Habitat requires additional, focussed effort – usually focussed on the presence of Critically Endangered, Endangered, range-restricted or migratory/congregatory species in significant numbers.

3.2.2 International Finance Corporation's Performance Standard 6

- The IFC's Performance Standard 6 also sets specific biodiversity protection and conservation standards relating to potential project impact; that are largely aligned with the ESS6 requirements. The specific requirements are separated according to the following categories:
- Modified Habitat: areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. PS6 relates to areas of modified habitat that have significant biodiversity value and requires that impacts on such biodiversity must be minimised, and mitigation measures implemented as appropriate.
- Natural Habitat: viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. In such areas, the conservation outcome required by PS6 is no-net-loss of biodiversity value achieved using the "like-for-like" or better principle of biodiversity offsets, where feasible.
- Critical Habitat: areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. When a project occurs in critical habitat supporting exceptional biodiversity value, a net gain in biodiversity value is required by PS6. This is achievable through appropriate biodiversity offsets.
- Legally Protected and Internationally Recognised Areas: such areas often have high biodiversity value; when this is the case these areas are likely to qualify as critical habitat. As such, the conservation outcome required by PS6 is also a net gain in biodiversity value, as well as obtaining the relevant legal permits, following standard governmental regulatory procedures, and engagement of affected communities and other stakeholders.
- Invasive Alien Species: the development project should not intentionally introduce any new alien species (unless carried out within the appropriate regulatory permits) and should not deliberate any alien species with a high risk of invasive behaviour under any circumstance. PS6 requires that any introduction of alien species be the subject of a risk assessment for potential invasive behaviour, and that the project should implement measures to avoid the potential for accidental or unintended introductions

3.3 Good International Industry Practices (GIIP)

Best practice guidelines that were taken into consideration in the development of the scoping report are listed below. These guidelines are generally accepted as the best practice standards for usage in wetland and riparian habitat assessment in South Africa:

- A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas", DWAF (2005) and updated by DWAF (2008),
- WET-Health Version 2.0: A refined suite of tools for assessing the present ecological state of wetland ecosystems- technical guide. Report No. TT 820/20 (Macfarlane, *et al*., 2008)
- WET-EcoServices Version 2.0: A technique for rapidly assessing ecosystem services supplied by wetlands and riparian areas. WRC Report No. TT 833/20. Water Research Commission, Pretoria, South Africa (Kotze, D., Macfarlane *et al*., 2020)

- Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0). WRC Report No. 1788/1/13. Water Research Commission, Pretoria (Rountree *et al*., 2013).

4.0 METHODOLOGY

The aquatic biodiversity baseline description and preliminary impact assessment took cognisance of Government Notice No. 320, published in 2020 under the National Environmental Management Act (1998) concerning ‘Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Theme in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (1998), when applying for Environmental Authorisation’.

In line with the assessment and reporting requirements set out in the protocol, the aquatic ecology assessment included two main study components; a desktop literature review, supplemented by a wetland delineation and assessment field survey conducted on the 31st of May and the 01st of June 2022. The objectives and tasks associated with these components are described below.

4.1 Study Area

The study area for the Aquatic Specialist Assessment was defined at two levels:

- Local study area: The proposed development footprint plus a 500 m buffer, so that the project interaction with any watercourses and their ‘regulated zone’ as defined by the National Water Act can be identified, since this is the area within which direct impacts on biodiversity receptors (i.e. wetlands / aquatic ecosystems) could occur (Figure 3);
- Regional study area: The catchment within which the proposed development is situated, which is considered to be an ecologically appropriate area of analysis within which indirect impacts on aquatic receptors (e.g. downstream water quality deterioration, alteration of sub-catchment hydrology, soil erosion, hydrological changes) could occur (Figure 4).

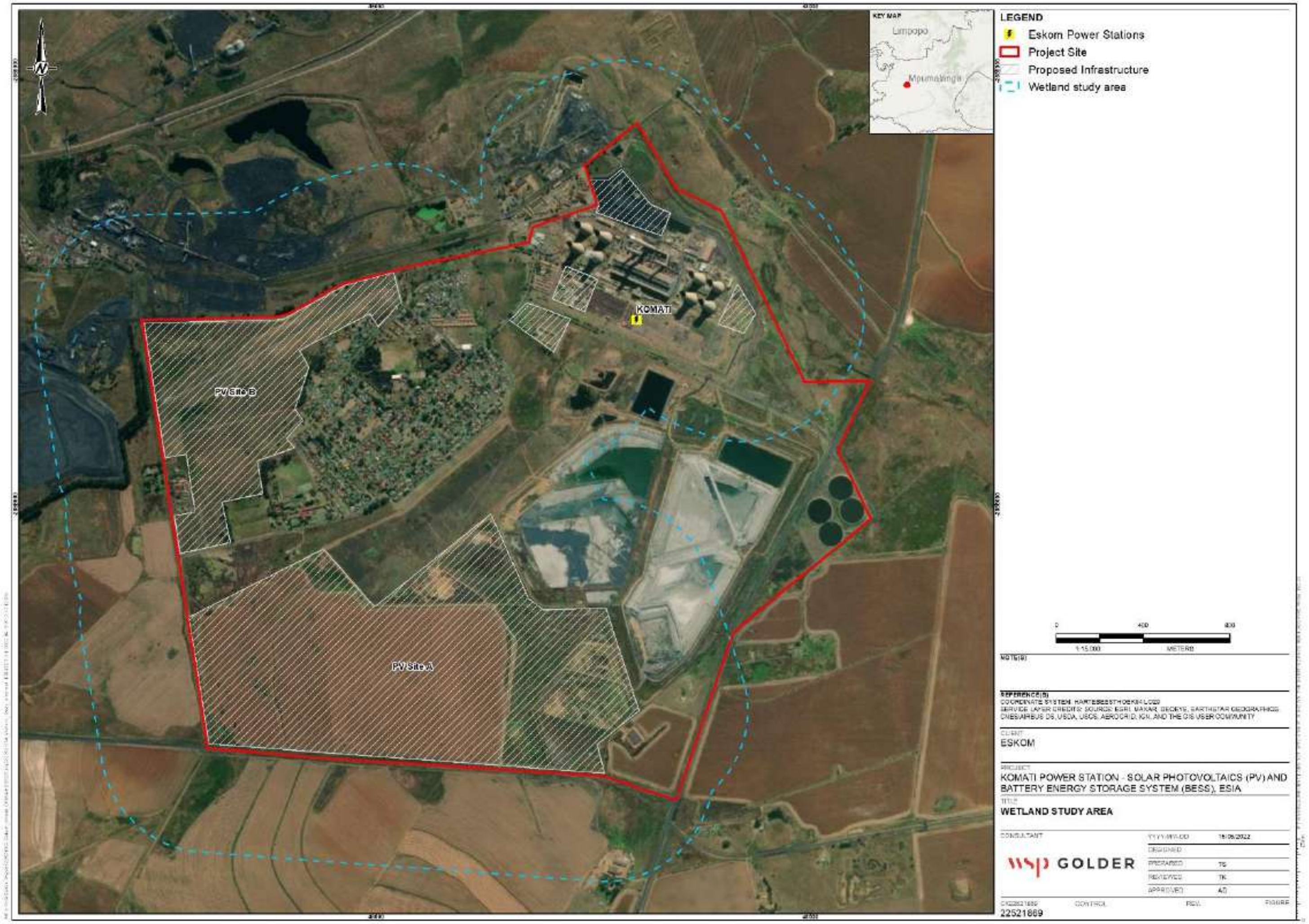

Figure 3: Aquatic biodiversity local study area

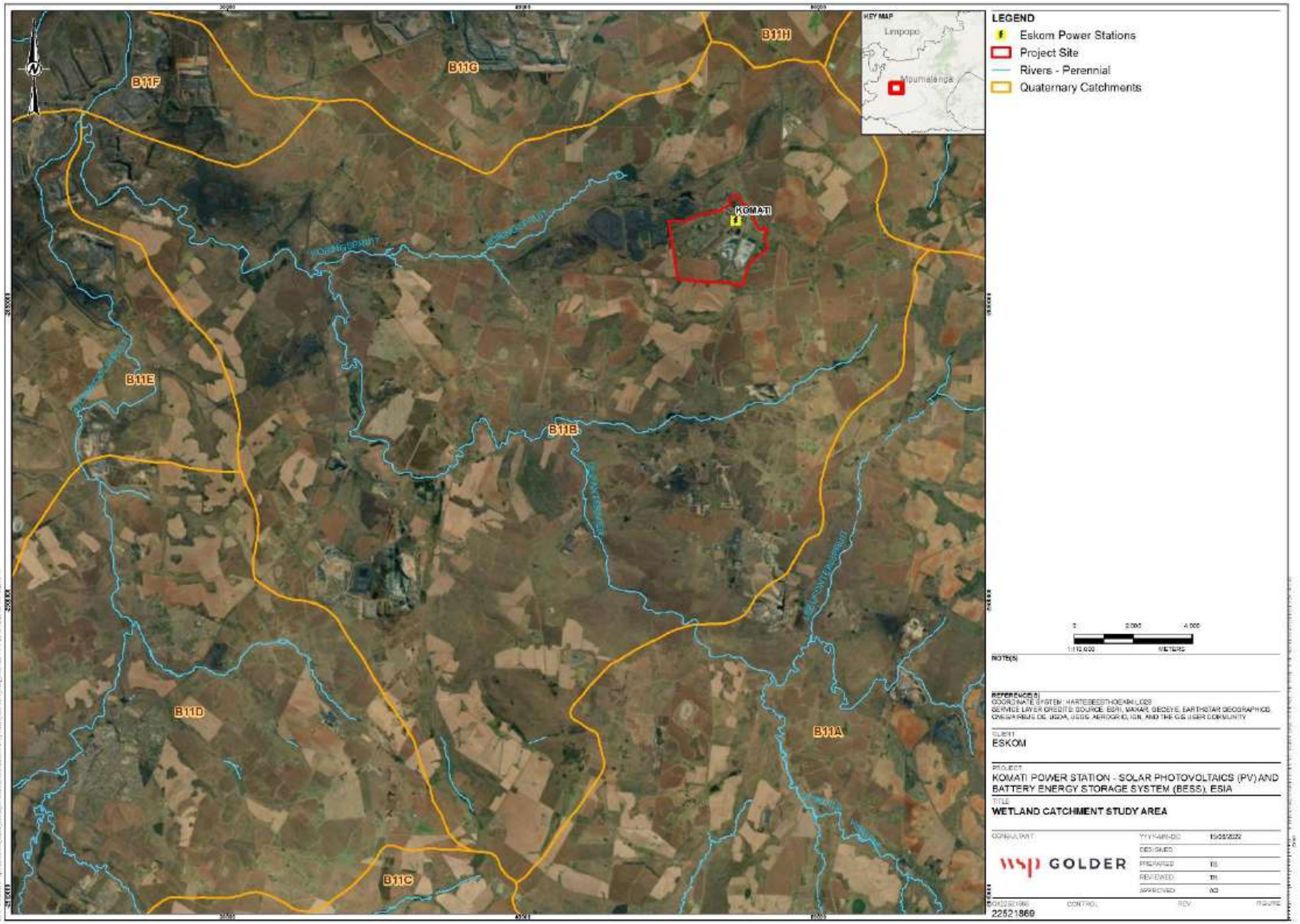

Figure 4: Aquatic biodiversity regional study area as defined by the quaternary catchment B11B

4.2 Literature Review

The aim of the desktop literature review component was to collate and review the extensive available ecological information related to important aquatic biodiversity features in the Eskom Komati power station area of influence, key wetland processes and function, and the likely composition and structure of local riparian and wetland communities.

The existing comprehensive specialist reports that were reviewed and consolidated to assess aquatic biodiversity include:

1) Komati Power Station Hydrological & Geohydrological Baseline Study December 2008 (GHT Consulting Services, 2009)

2) Construction and Operation of Ash Dam Extension 3 & The Deviation Of Transmission And Distribution Lines At Komati Power Station, Mpumalanga (Synergistics Environmental Services 2008).

Other sources that were also used in the description of the regional aquatic resources included:

1) Nationally-available datasets which were consulted to inform the site sensitivity verification for wetland and riparian habitat include the South African National Wetland Map version 5 (NWM5) (Van Deventer *et al.*, 2019), and the National Freshwater Ecosystem Priority Area database; and

2) The formal conservation context of the region at a provincial and national level was established based on the Mpumalanga Biodiversity Sector Plan (2019), the National List of Threatened Ecosystems (NEMBA Threatened Ecosystems, 2011), the South African Protected Areas Database (SAPAD), the South African Conservation Areas Database (SACAD) and the national protected area expansion strategy;

3) National spatial planning datasets, namely the Mpumalanga Biodiversity Sector Plan (freshwater), National Freshwater Ecological Priority Areas (NFEPA), National Wetland Map version 5 (NWM5), National Environmental Management Biodiversity Act (Act No 10 of 2004)) (NEMBA), Threatened Ecosystems, and national protected area expansion strategy, provide a regional/national context for assessing the biodiversity significance of the site.

4.3 Wetland Baseline Assessment

A field survey to identify and delineate the wetlands within 500 m of the proposed Project infrastructure footprint was conducted on 31 May and 01 June 2022. The methods used in the identification, delineation, classification and assessment of wetlands in the study area are described in the sections that follow.

4.3.1 Wetland Delineation

The delineation procedure originally set out in "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas", DWAF (2005) and updated by DWAF (2008), describes the following four indicators of wetland presence that can be used to define the boundary of a wetland:

1) The position in the landscape, which helps identify those parts of the landscape where wetlands are more likely to occur;

2) The type of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;

3) The presence of wetland vegetation species, and

4) The presence of redoxymorphic soil features, which are morphological signatures that appear in soils with prolonged periods of saturation (due to the anaerobic conditions which result).

These indicators were used in the field to delineate the outer boundary of wetland systems encountered within the study area.

4.3.2 Wetland Classification

To allow for the differentiation between wetland systems and the prioritisation of systems either for conservation or management purposes, the wetlands were classified in accordance with each hydrogeomorphic (HGM) unit for assessment purposes according to (Kotze et al., 2008). Six major inland HGM types are recognised for the purposes of wetland classification (Table 2), and these criteria were applied to the current assessment.

Table 2: Wetland Hydrogeomorphic Units (after Kotze *et al*., 2008)

Wetland Hydro-geomorphic type	Description	Source of water maintaining the wetland1	
		Surface	Sub-surface
Floodplain	Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Channelled valley bottom	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/***
Unchannelled valley bottom	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/***
Hillslope seepage with channelled outflow	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Hillslope seepage without channelled outflow	Slopes on hillsides, which are characterized by the colluvial movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes pans)	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/***	*/***

1 Precipitation is an important water source and evapotranspiration an important output in all of the above settings.
*Water source: * Contribution usually small; *** Contribution usually large; **** Contribution may be small or important depending on the local circumstances*

4.3.3 Present Ecological State (PES)

WET-Health (Macfarlane *et al*., 2020) provides an appropriate framework for undertaking an assessment to indicate the ecological integrity of each of the wetland systems being assessed. The outcome of the assessment also highlights specific impacts, therefore highlighting issues that should be addressed through mitigation and rehabilitation interventions. A level 2 Wet-Health approach was applied for this study, which assesses wetlands using four characteristics, namely hydrology, geomorphology, vegetation and water quality. Each of these modules follows a broadly similar approach and is used to evaluate the extent to which anthropogenic changes have an impact on wetland functioning or condition.

The purpose of WET-Health is to aid users in understanding the ecological condition of the wetland and to identify the causes of degradation. The four drivers are assessed by taking into account the extent, intensity and magnitude of an impact which then produces a health score. Evaluation scores within each driver are then combined to produce an overall impact of activities on the wetland system which corresponds to a Present State health category that provides an impact score scale of 0-10 and associated health category (ecological state) from A-F (Table 3).

Table 3: Impact scores and categories of Present Ecological State used by WET-Health for describing the integrity of wetlands (Macfarlane *et al.*, 2020)

Impact Category	Description	Impact Score Range	Present Ecological State Category
None	Unmodified, or approximates natural condition	0 – 0.9	A
Small	Largely natural with few modifications, but with some loss of natural habitats	1 – 1.9	B
Moderate	Moderately modified, but with some loss of natural habitats	2 – 3.9	C
Large	Largely modified. A large loss of natural habitat and basic ecosystem function has occurred	4 – 5.9	D
Serious	Seriously modified. The losses of natural habitat and ecosystem functions are extensive	6 – 7.9	E
Critical	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat	8 – 10.0	F

4.3.4 Wetland Ecosystem Services

Wetlands are specialised systems that perform ecological functions vital for human welfare and environmental sustainability. The WET – Ecoservices tool (Kotze *et al*., 2020), a technique for rapidly assessing ecosystem services supplied by wetlands, was used to determine the key ecological services provided by each wetland in the study area. The rapid field assessment (version 2) approach was applied, and the following services were examined and rated:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Toxicant assimilation;
- Carbon storage;
- Biodiversity maintenance;
- Food for livestock;
- Cultivated foods;
- Tourism and recreation;

- Erosion control;
- Phosphate assimilation;
- Nitrate assimilation;
- Water supply for human use;
- Harvestable resources;
- Education and research; and
- Cultural & spiritual significance.

Each of the above-listed services was scored according to the following general level of service provided.

Table 4: Ecosystem services classes and descriptions (Kotze *et al*., 2020).

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

4.3.5 Ecological Importance and Sensitivity

The EIS was determined using the methodology developed by Rountree *et al.* (2013). It is a rapid scoring system to evaluate:

- Ecological Importance and Sensitivity;
- Hydrological Functions; and
- Direct Human Benefits.

The scoring assessment incorporates:

- EIS score derived using aspects of the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999);
- Hydro-function importance score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2020); and
- Direct human benefits score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2020).

The highest score of the three derived scores (each with range 0 – 4) was then used to indicate the overall importance category of the wetland (Table 5).

Table 5: Ecological importance and sensitivity categories

Ecological Importance and Sensitivity Category Description	Range of EIS score
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	> 3 and ≤ 4
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	> 2 and ≤ 3
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers	> 1 and ≤ 2
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	> 0 and ≤ 1

4.4 Scoping Level Screening of Impacts and Mitigation

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase (Table 6). The screening tool is based on two criteria; namely probability (Table 7) and consequence (Table 8), where the latter is based on general consideration to the intensity, extent, and duration.

Table 6: Significance screening tool

	CONSEQUENCE SCALE				
PROBABILITY SCALE		1	2	3	4
	1	Very Low	Very Low	Low	Medium
	2	Very Low	Low	Medium	Medium
	3	Low	Medium	Medium	High
	4	Medium	Medium	High	High

Table 7: Probability scores and descriptors

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur

1	**Improbable:** The possibility of the impact occurring is very low

Table 8: Consequence score descriptions

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (Table 9) has been applied according to the nature and significance of the identified impacts.

Table 9: Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	**Negligible**
Very Low	**Very Low**
Low	**Low**
Medium	**Medium**

Negative Impacts (-ve)	Positive Impacts (+ve)
High	**High**

4.5 Study Assumptions and Limitations

4.5.1 Data used for Specialist Assessments

- The field survey for the aquatic biodiversity assessment was conducted on 31 May – 01 June 2022, which coincides with the dry season period; however, following a summer of exceptional rainfall, flows in the channelled valley bottom wetland remained high, and dominant wetland vegetation was discernible.
- This scoping report was prepared on the basis of the site sensitivity verification process undertaken in response to the national web-based screening report. The site sensitivity verification was completed via desktop analysis of the existing baseline knowledge of riparian or wetlands systems in the study area, supplemented by the findings of the field survey conducted on 31 May – 01 June 2022.
- It is therefore considered that there are no sampling or information limitations pertaining to riparian or wetlands systems impacting on this assessment and the recommendations contained in this report.

4.5.2 Assumptions, uncertainties, or gaps in knowledge

- The results of the analysis of the diatom samples gathered on 31 May – 01 June 2022 were not yet available at the time of writing; these will be included in the updated baseline report at ESIA stage.
- Since the watercourses in the study area are wetland systems, no assessment of macroinvertebrates or fish is included in the baseline description.

5.0 BASELINE DESCRIPTION

This section summarises the baseline biodiversity environment of the local and regional study areas. It draws upon existing studies, published information, local knowledge and scoping site visits.

5.1 Regional Biodiversity Context

The study area is located within the B11B quaternary sub-catchment of the upper Olifants Water Management Area (WMA) (Figure 4). An unnamed tributary of the Koringspruit passes immediately to the north of the study area, while a small drainage line runs through the centre of the study area, eventually reporting to the Koornfontein River via the Gras Dam, and ultimately draining into the Olifants River (Synergistics Environmental Services, 2008).

5.1.1 Environmental Screening Tool

The proposed infrastructure footprint was assessed at desktop level using the National Web-based Environmental Screening Tool. According to the Tool, the Aquatic Biodiversity Theme for the study area is rated 'Very High Sensitivity' due to the presence of wetlands features in and around the study area (Figure 5). Since the watercourses in the study area are wetland systems, no assessment of macroinvertebrates or fish is included in the baseline description.

5.1.2 Freshwater Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

The proposed development site was compared to available relevant spatial biodiversity planning datasets in order to assess the local and regional biodiversity context of the site. The following datasets were considered:

1) Mpumalanga Biodiversity Sector Plan Freshwater Assessment (2011).

The MBSP (2011) freshwater assessment spatial dataset includes various areas mapped as ‘other natural areas’ throughout the local study area (Figure 6), as well as part of the channelled valley bottom wetland associated with the Koringspruit which was classified as ‘Ecological Sensitivity Area (ESA): wetland’.

It is important to note that the MPSBP freshwater assessment was based largely on remotely sensed imagery, and thus some wetlands are not included (e.g. historic wetlands lost through drainage or ploughing); similarly, some features have been mapped as wetlands, which, once examined in the field, are not defined as wetlands. The most up-to-date spatial dataset at the national level is now considered to be the National Wetland Map 5 (see Figure 9), which displays a more accurate representation of actual wetland conditions on site.

5.1.3 Strategic Water Source Areas (SWSAs)

No strategic water source areas occur in the region of the proposed development footprint; as such these are not included as receptors for the current scoping impact assessment or considered further here.

5.1.4 Freshwater Ecosystem Priority Area (FEPA) sub-catchments

The proposed development footprint in relation to FEPA sub-catchments and mapped National Freshwater Ecosystem Priority Areas (NFEPA) wetlands is illustrated on Figure 7 and Figure 8 respectively. As mentioned above, the National Wetland Map version 5 (NWM5) (Van Deventer *et al.*, 2019), is the most up-to-date and accurate representation of spatial extent and type of inland wetland ecosystem types at desktop level in South Africa. The NWM5 dataset indicates the presence of channelled valley bottom and seep wetland habitat within the LSA (Figure 9); these systems were prioritised for confirmation of delineation, and assessment of wetland health and ecological importance, during the wetland field survey.

Figure 5: Map of relative Aquatic Biodiversity Theme Sensitivity (Environmental Screening Tool, 2022)

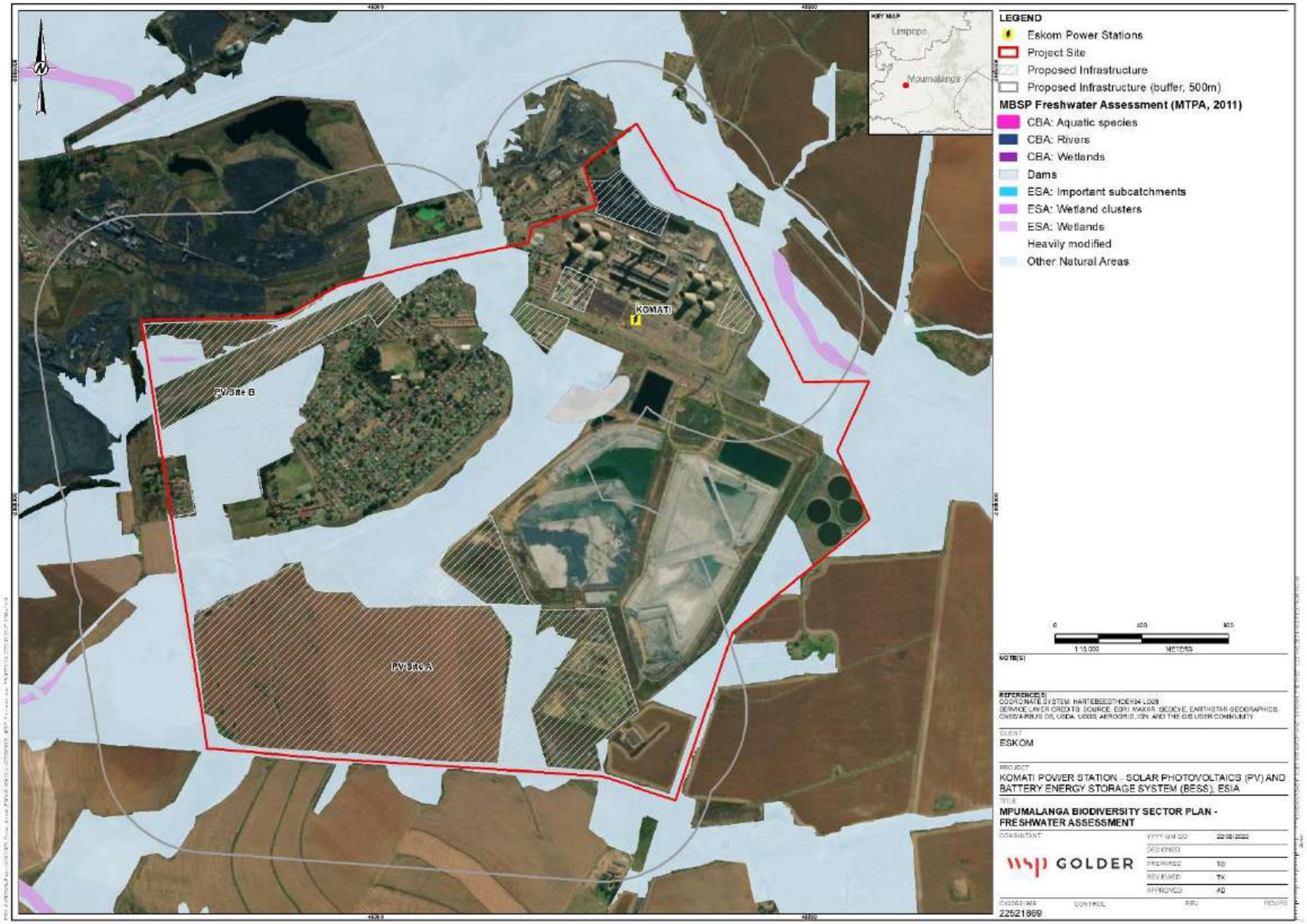

Figure 6: MBSP Freshwater Assessment (MTPA, 2011)

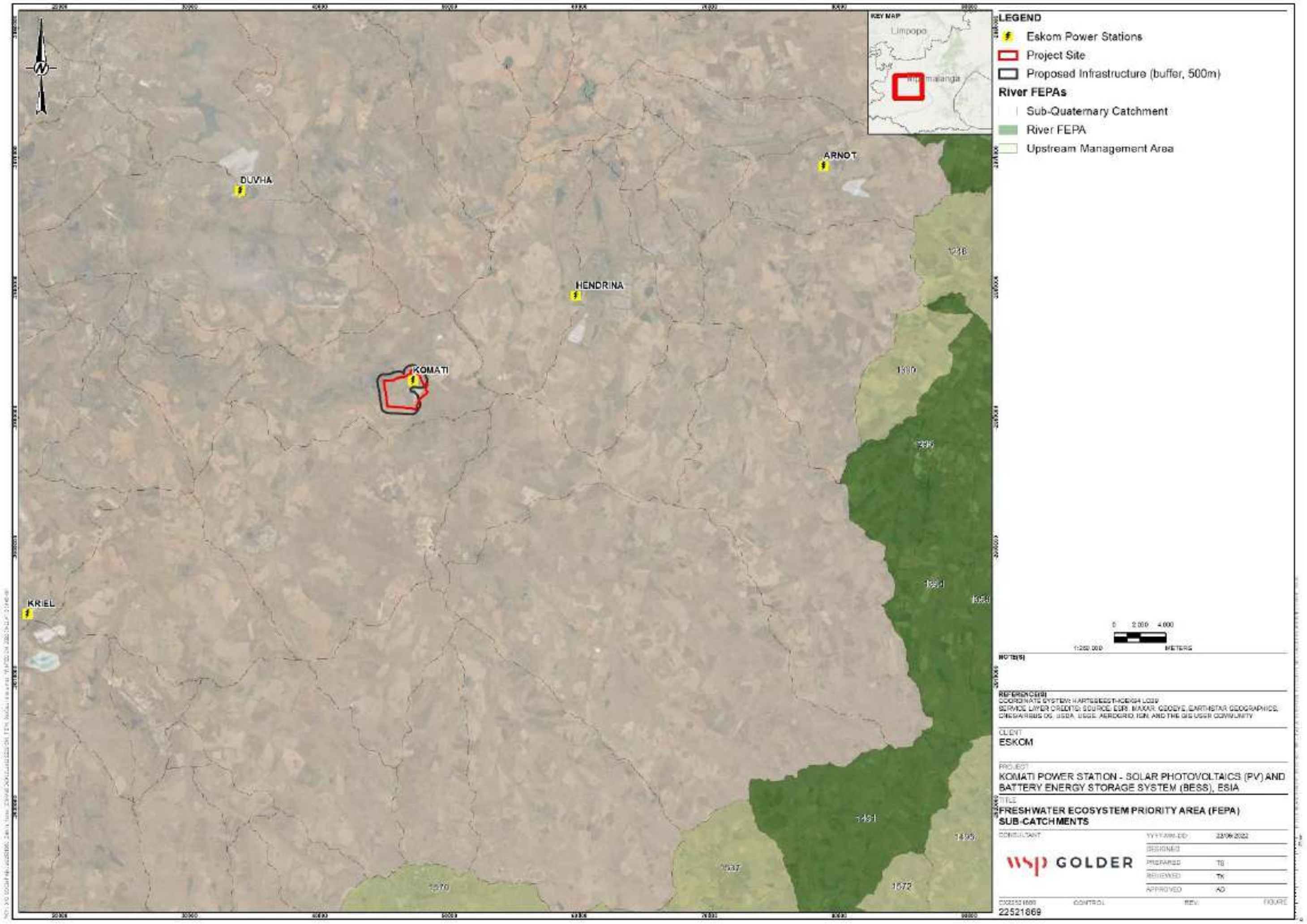

Figure 7: Study area in relation to FEPA sub-catchments

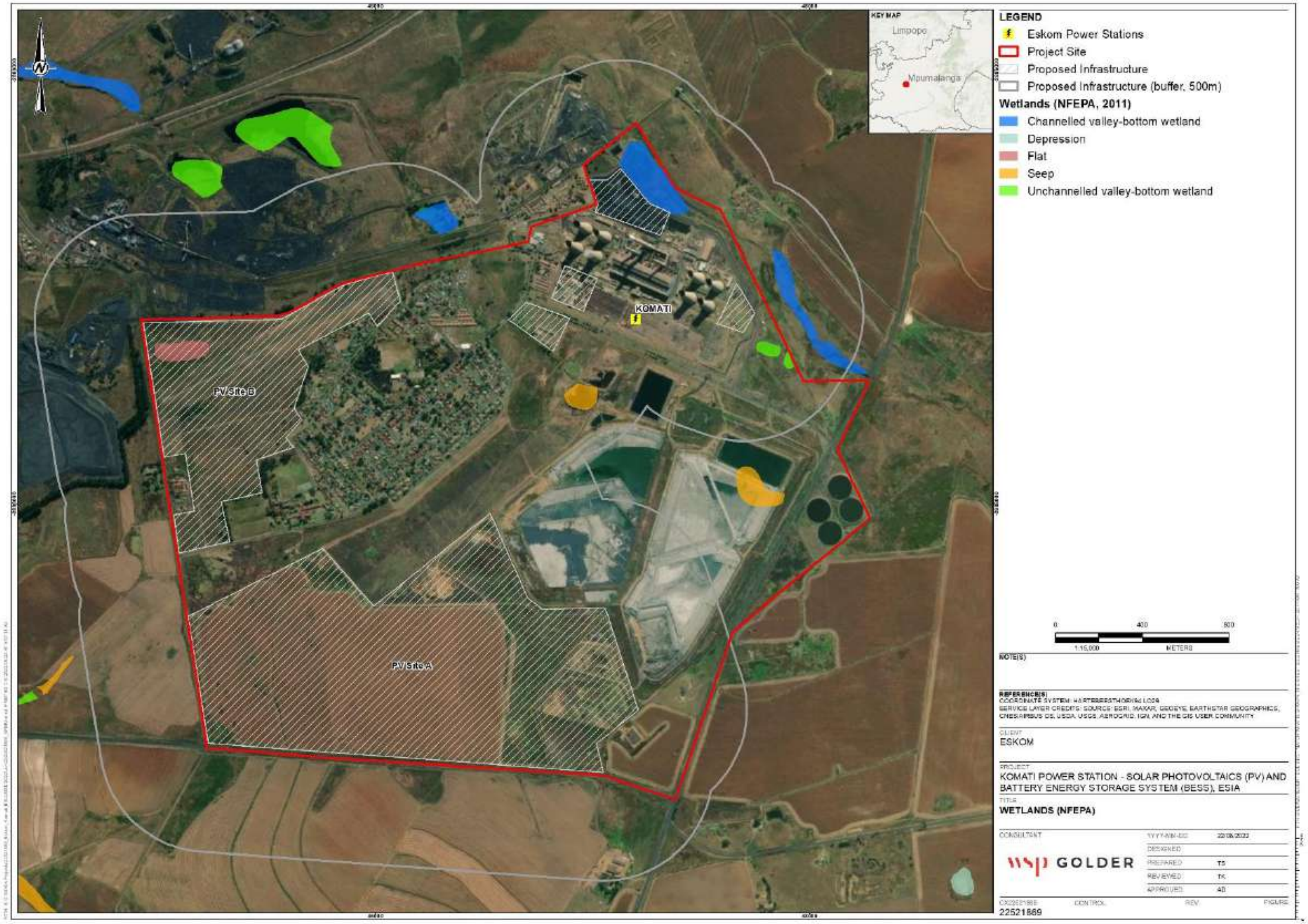

Figure 8: Proposed development in relation to NFEPA wetlands (2011)

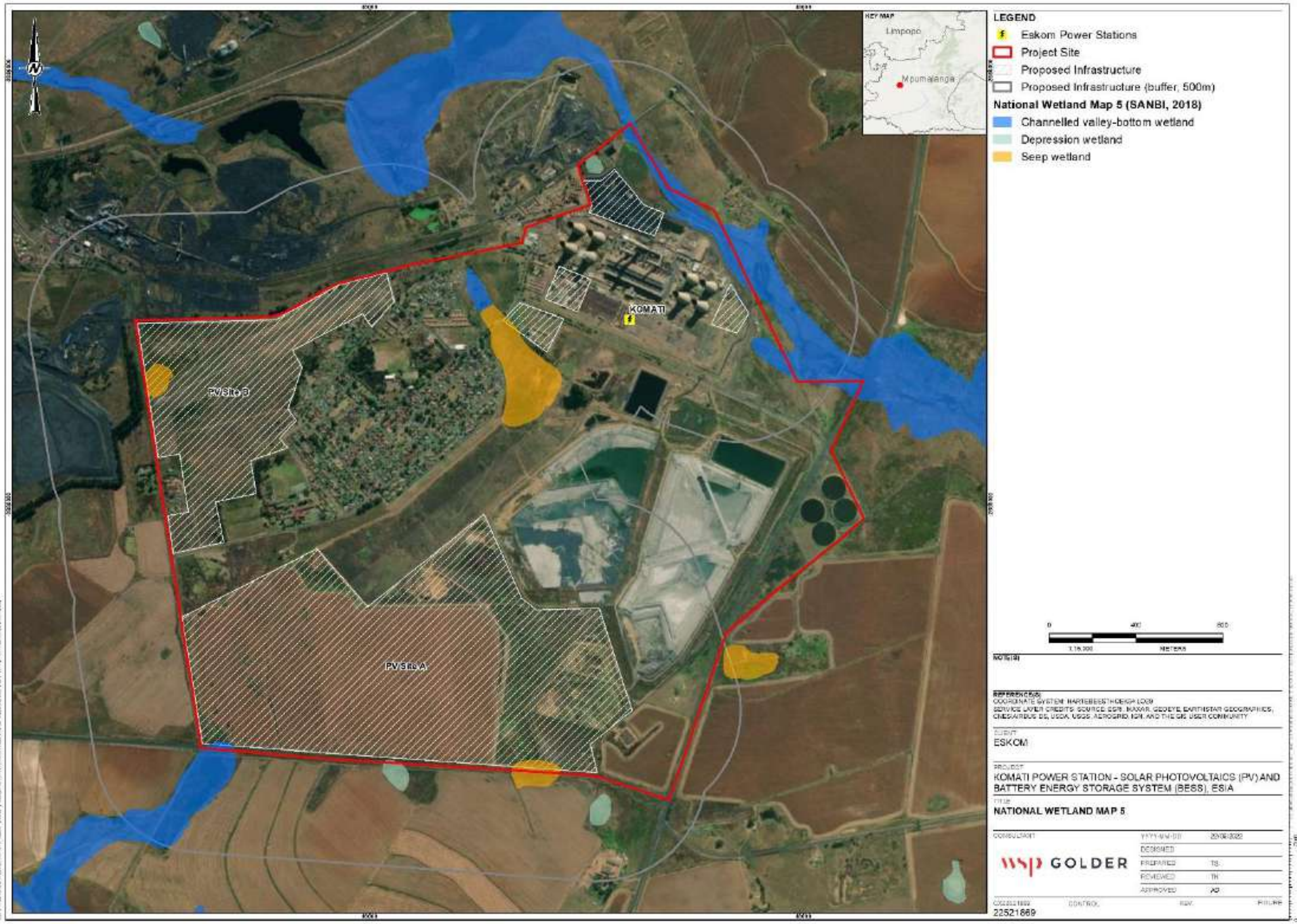

Figure 9: Proposed development in relation to NWM5 wetlands (2019)

5.2 Wetlands

5.2.1 Delineation and classification

Four wetlands have been identified to occur within a 500m of the proposed Project development (Figure 15). The infield sampling of soil and vegetation in conjunction with the recording of diagnostic topographical /terrain indicators and features, enabled the delineation of the following distinct watercourse units:

- A Channelled valley bottom wetland (CVB),
- Two isolated seepage wetlands (Seep 1 and Seep 2), and
- Depression wetland

Several areas of highly disturbed grassland were also identified within the study area. Excavations and earthworks in these areas have resulted in high levels of disturbance of the soil profile, with some ephemeral accumulation of water during periods of high rainfall enabling *Imperata cyclindrica* (which although it occurs in wetlands, is not a reliable wetland indicator, since it can proliferate in disturbed terrestrial areas with high rainfall) to proliferate; however water is not retained in these disturbed soils for long enough to sustain hydrophytic plant species, or soil form indicators to develop, These areas were therefore not classified as wetland habitat

5.2.1.1 Channelled Valley Bottom wetland

A channelled valley bottom wetland associated with the Koringspruit occurs within the study area (Figure 10 and Figure 15). Channelled valley bottoms wetlands (CVB) are characterised by having a well-defined stream channel but lacking characteristic floodplain features, which was the case for the CVB wetland on site. These systems receive water inputs from the main channel and from adjacent slopes (Kotze *et al*., 2008). The CVB wetland was dominated by permanent and seasonal wetland plant species including *Typha capensis, Phragmites australis, Schoenoplectus paludicola,* and *Cyperus latifolius* as well as hygrophilous grassland community such as *Eragrostis rotife*r. The wetland was also characterised by temporary and seasonal hydromorphic soil characteristics (Figure 11), indicating brown wetland soils.

The wetland is highly impacted and appears to receive effluent discharge from the Power Station. The wetland channel shows signs of extensive flows during large storm events and also lateral inputs from surrounding land uses. The CVB is situated adjacent to the proposed Battery Energy Storage System (BESS) footprint.

Figure 10: An overview of the Channelled valley Bottom wetland (upstream and downstream)

Figure 11: Soil Sample taken at 50-60 cm in the seasonal zone of the wetland

5.2.1.2 Seep 1

A seep wetland of approximately 24.5 ha traverses the eastern extent of the proposed PV site A footprint. The wetland is bordered by the Ash dam facility towards the north-east and crop fields to the south-west (Figure 15). The hydrology of the seep wetland is largely impacted by flow input from surrounding activities, particularly the seepage from the Ash dam, as evidenced by the soil sample taken at the permanent zone of the wetland (Figure 12). Furthermore, a dam which has been excavated in the wetland HGM, which has resulted in impounding and pooling of water in the wetland (Figure 12). Dominant wetland vegetation at this site includes *Typha capensis, Phragmites australis* which dominated the permanent wet area and *Imperata cylindrica,* which dominated much of the seasonal zone.

Figure 12: a) An overview of Seep 1 wetland and pooling of water at dam, b) Soil sample taken in the permanent zone of the seep wetland indicating signs of soil contamination from the ash dam

5.2.1.3 Seep 2

A second seep wetland of approximately 20 ha in extent was identified in the northern extent of the study area (Figure 15). This wetland is located downslope of Eskom's pollution control dams and is bordered by the Komati village to the west. The wetland is dominated by seasonal to permanent hydromorphic soil characteristics (Figure 14), with sedges and obligate wetland vegetation including *Typha capensis, Phragmites australis and Cyperus latifolius* occurring in the permanent zone, and *I. cylindrica* occurring in temporary-seasonally wet areas. Evidence of significant levels of disturbance in the form of small drains and berms diverting the water from the Eskom property into the receiving environment was observed in the seep.

Figure 13: An overview of the seep wetland: upstream and downstream view

Figure 14: Soil sample taken at the permanent zone of the wetland

5.2.1.4 Depression

A shallow depression wetland is located within a crop field in the southern extent of the study area, outside of the Project site boundary. The wetland is approximately 3 ha in extent and is cut off from the Project site by the tarred R542 (Figure 15). The wetland appears to be geomorphologically intact (other than loss likely sustained to the R542 construction) and driven entirely by rainfall accumulation. The wetland considered to be ephemeral in nature.

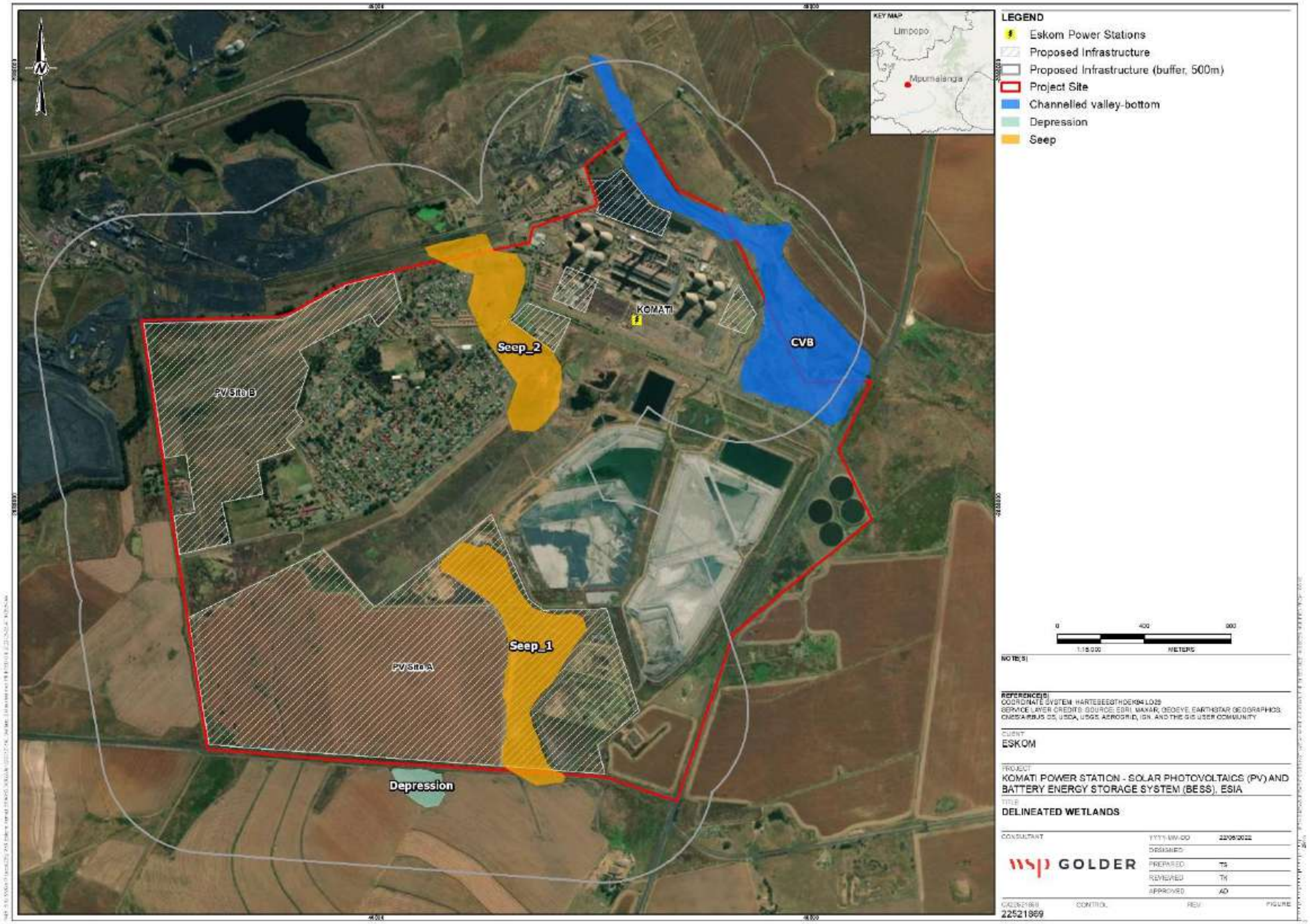

Figure 15: Wetland delineation and classification

5.2.2 Present Ecological State

The most significant drivers of change currently present in the study area include industrial operations (seepage from ash dam, increased water inflow from Eskom operations) impoundment of water at dams, road crossings, mining operations in the catchments, spread of alien invasive species as well formal and informal settlements within the wetland’s catchment. The Present Ecological State (PES) score for the wetlands in the study area are presented in Table 10, and discussed in greater detail in the paragraphs that follow.

Table 10: Summary of Impact Scores and PES Class

Unit	Hydrology Impact Rating	Geomorphology Impact Rating	Water Quality Impact Score	Vegetation Impact Score	Overall PES Score & Class	
CVB	4.8	3.8	6.0	4.0	4.6	D
Seep 1	5.0	3.9	6.0	3.5	4.6	D
Seep 2	5.0	4.2	5.8	5.0	5	D
Depression	3.0	3.0	4.6	4.0	3.5	C

5.2.2.1 Channelled Valley Bottom

Major impacts identified within the channelled valley bottom wetland include head cut erosion, impoundment of flow in dams and at road crossings, cattle farming and crop farming, and effluent discharge from industrial operations (Power Station). These impacts resulted in a Largely Modified Impact category (PES D), with the hydrology and water quality component contributing substantially to the modified state of the wetland.

Figure 16: Impacts: a) Soil Erosion at CVB main channel; b) pooling of water in dam; c)effluent discharge into the wetland; d) crop farming and cattle grazing in wetland

5.2.2.2 Seep 1

The Present Ecological Status of the Seep 1 wetland was considered Largely Modified (PES D), on account of the hydrological state and the water quality of the wetland. The wetland appears to be substantially impacted by the adjacent infrastructure and activities, particularly the ash dam facility. As seen in Figure 12 the wetland soils are contaminated by sediment inputs from the ash dam. Furthermore, the increased surface water input from the ash dam facility and the impoundment of flow in the excavated dam (Figure 17) have changed the hydrological regime of the wetland.

Figure 17: Ash dam facility and pooling of water at dam

5.2.2.3 Seep 2

Major impacts identified in the Seep 2 wetland include increased water inputs into the wetland system from the PCD, spread of alien invasive species, impoundment of flow along roads and dams, and the presence of drains and trenches. These disturbances, together with the likely impact on water quality as a result of seepage from the PCDs, have contributed to the Largely Modified state (PES Category D) of the wetland.

Figure 18: Impacts: a) pooling of water at dam; b) trenches and berms in wetland; c) effluent discharge into the wetland from a leaking pipe; d) impoundment of water at roads in wetland

5.2.2.4 Depression

The present ecological state of the depression wetland was considered Moderately modified (PES category C). although the wetland is considered to sustain impacts from the surrounding crop farming and the tarred R542 road, the wetland was still considered moderately modified, due to the fact that depression wetlands are mostly rainfall driven and may also receive sub-surface water, therefore the presence of the R542 and crop fields may not have a substantial impact on the hydrology of the wetland.

5.2.3 Ecological Importance and Sensitivity

All wetlands in the study area were assessed as being of Low /Marginal EIS, with the exception of the CVB wetland which was assessed as being of Moderate EIS (Table 11). The moderate EIS of the CVB was attributed to its hydrological functional importance as this wetland performs a role in landscape connectivity at the regional level, providing regulating and supporting benefits such as streamflow regulation and flood attenuation.

Table 11: Summary of wetland EIS scores and ratings.

Wetland Unit	Ecological Importance and Sensitivity Score	Hydrological Functions Score	Direct Human Benefits Score	Integrated EIS Score	Integrated EIS Rating
CVB	1.2	1.0	0.0	1.2	Moderate
Seep 1	0.8	0.9	0.0	0.9	Low/Marginal
Seep 2	0.8	0.9	0.0	0.9	Low/Marginal
Depression	0.8	0.9	0.0	0.9	Low/Marginal

5.2.4 Ecoservices

The importance scores for the ecosystem services provided by wetlands within the study area are illustrated in the spider diagrams presented in Figure 19, Figure 20 and Figure 21. The majority of the ecosystem services were rated as very low in terms of their overall importance. Regulating and supporting services such as sediment trapping, phosphate assimilation, nitrate assimilation and toxicant assimilation were determined as moderate, particularly for the CVB wetland which is also important in terms of streamflow regulation and flood attenuation.

The CVB was also assessed as having a Moderately High importance in terms of the biodiversity maintenance (Figure 19). This was attributed to the likelihood of the African Grass Owl (*Tyto capensis*) to occur on site based on the result of the national screening tool as well as the avifauna survey undertaken on 17 June 2022 to confirm habitat suitability for the Grass Owl to occur. Furthermore, based on the MBSP freshwater (2011), the CVB was mapped as biodiversity ecological support area.

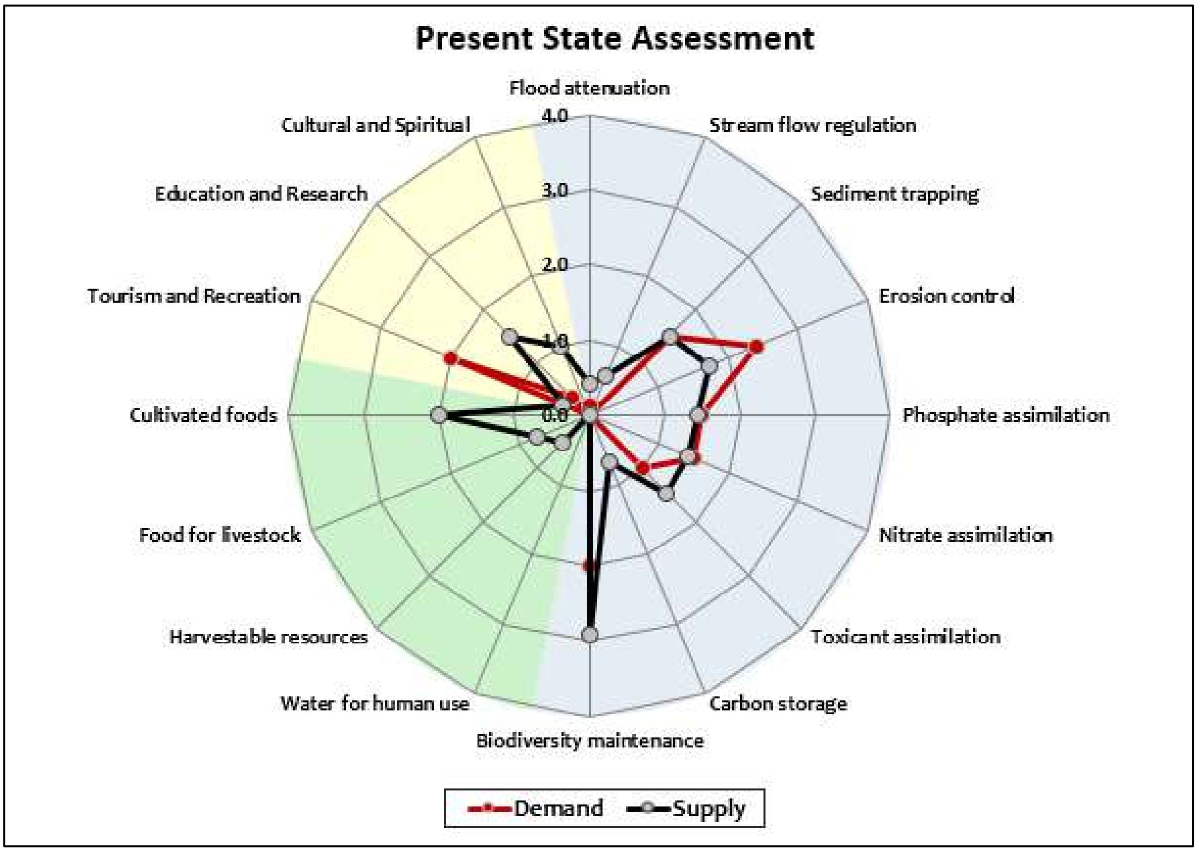

Figure 19: Ecosystem Services supplied by/demanded from the CVB wetland.

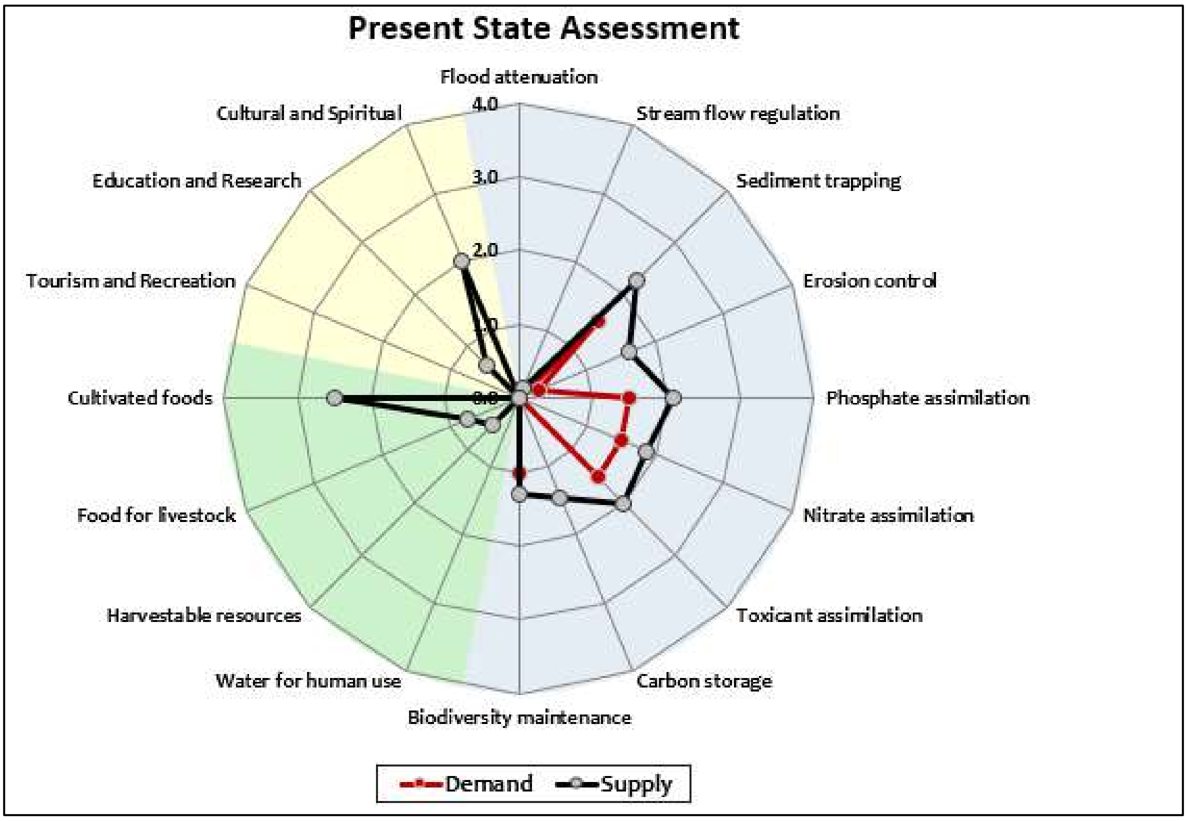

Figure 20: Ecosystem Services supplied by/demanded from seep wetlands

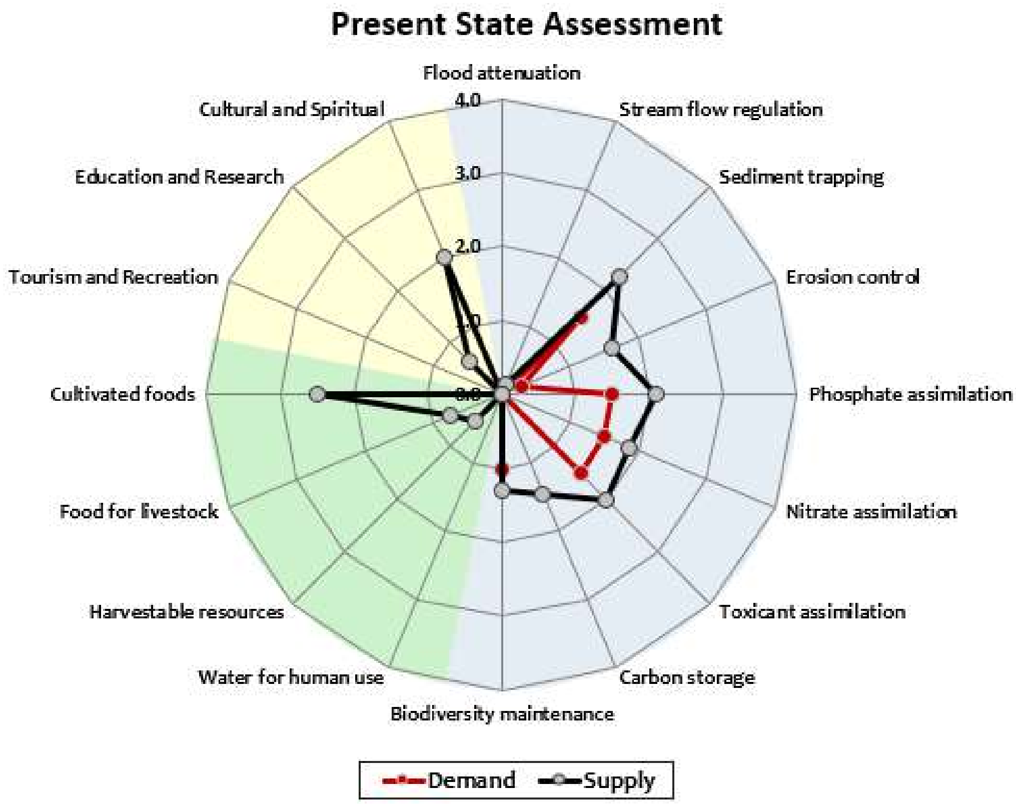

Figure 21: Ecosystem Services supplied by/demanded from Depression wetland

5.3 Existing Impacts on Biodiversity and Drivers of Change

The proposed project infrastructure will be situated in close proximity to the existing power generation facilities and activities. All areas visited are currently experiencing some level of impact from the surrounding agricultural activities primarily through habitat transformation, and disturbance arising from power generation facilities and activities.

The presence of the existing facilities within close proximity to the proposed development footprint is expected to have an established impact on the interruption of surface hydrology in wetlands and potentially exacerbate erosion in the study area due to increased surface water runoff as a result of increased hardened surfaces in the study area.

5.4 Natural, Modified and Critical Habitats

The study area is dominated by agricultural cultivation, power station infrastructure and residential/industrial areas, interspersed with some remnant wetland habitat. While some very disturbed wetland habitat has been identified in the eastern extent of PV Site A, it is no longer considered to constitute 'Natural' habitat as defined by WB ESS6 or IFC PS6, due to its heavily degraded state and loss of ecological function. The channelled valley bottom wetland to the north east of the site, and the seep wetland that crosses the northern boundary of the site, while moderately modified/disturbed, still support biodiversity and deliver ecological services to an extent that enables them both to be considered 'Natural' habitat (Figure 22) as defined by the lender standards.

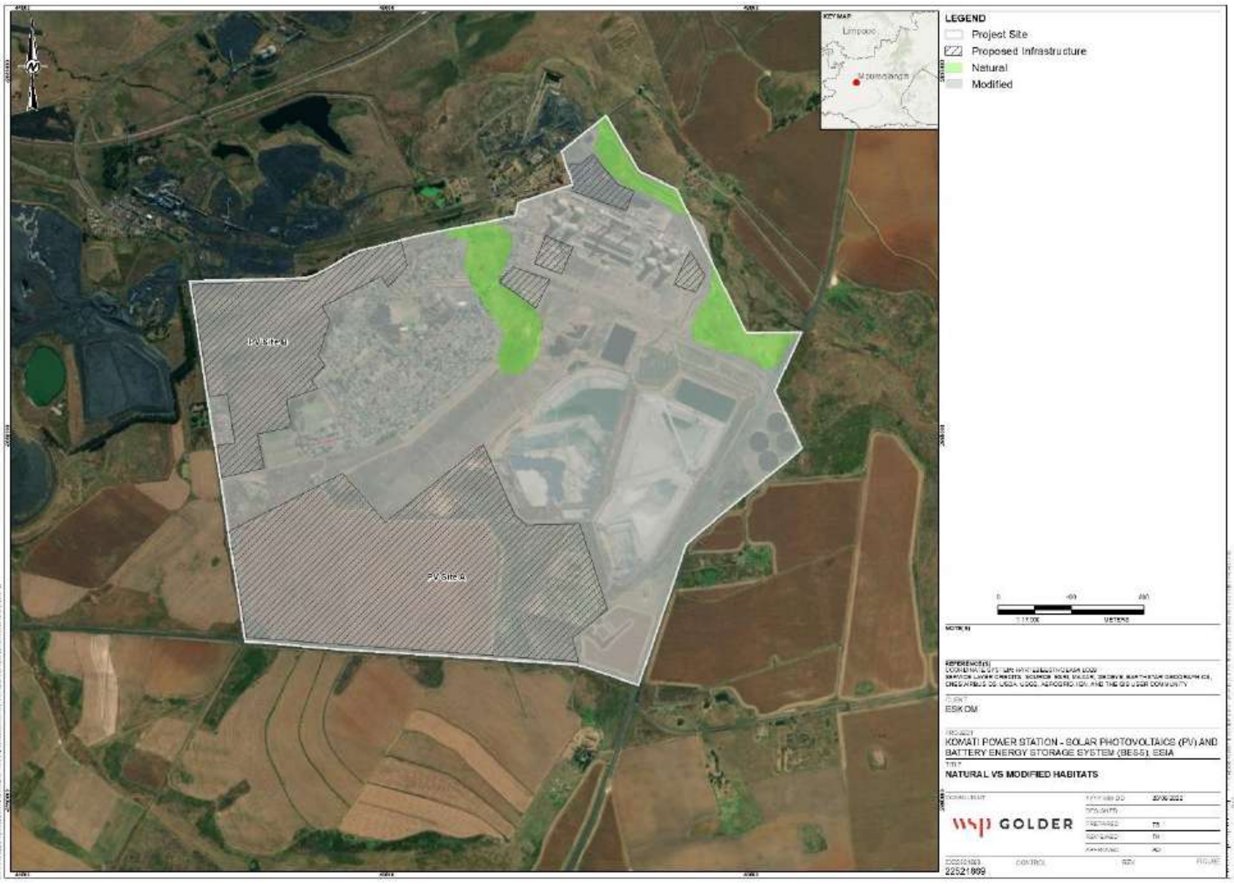

Figure 22: Natural, modified and critical habitat

At present, no areas of potentially Critical Habitat, as defined by IFC and WB standards, have been identified within the study area.

6.0 SCREENING OF POTENTIAL IMPACTS

The construction and operation of the proposed new infrastructure is anticipated to result in the following key impacts on wetland receptors:

1) Direct impacts through clearing of land and resultant loss of associated biodiversity.

2) Loss of wetland habitat

3) Interruption to surface hydrology.

4) Establishment and spread of alien and invasive species.

5) Increased sediment movement into wetlands

6) Increased potential for erosion in wetlands.

The outcomes of the screening of the potential impacts are summarised in Table 12 and described in detail in the following sections.

6.1 Construction Phase

Construction phase impacts on aquatic (wetland and riparian systems) largely arise as a result of direct impacts on the receiving environment due to clearing of land within wetlands or their immediate catchments in advance of project development, and resultant loss of wetland habitat. The earthworks and activities involved during the construction phase of the Project can potentially exert negative impacts on sensitive ecosystems including loss of wetland habitat, catchment landcover changes resulting in increased sediment entry to downstream systems, construction of wetland/riparian system crossings causing impoundments/barriers to movement for aquatic species, contamination of water bodies by construction materials / vehicles (hydrocarbons etc), increased potential of erosion due to surface runoff and soil disturbances and the establishment and spread of alien and invasive species (AIS).

The preliminary list of predicted construction phase impacts are outlined in the sections that follow, and summarised on Table 12.

6.1.1 Loss of wetland habitat

Site establishment and construction of the proposed project infrastructure, particularly PV Site A which overlaps with Seep 1, could lead to the permanent loss of wetland habitat within the project footprint. This impact has a high probability of occurrence and a high impact consequence. The impact significance is of High significance prior to the implementation of mitigation measures and can be reduced to a Medium significance with the application of recommended mitigation measures. Significant residual impacts (Medium/High) will need to be addressed via modification of the final layout to ensure that wetland loss is avoided, or design of an appropriate offset for unavoidable habitat loss.

6.1.2 Changes in wetland health/functioning

Bulk earthworks involved in site development in the immediate catchment of wetlands have the potential to cause indirect impacts on wetland habitat through compaction/removal of recharge or interflow soils, as well as increased sediment deposition to downslope wetland ecosystems in stormwater runoff. If not carefully managed, the potential impact could be moderately severe, and the likelihood highly probable, resulting in an impact of Medium significance. Mitigation measures to address the potentially reduced wetland functioning, such as diffuse distribution of clean stormwater runoff around the PV and BESS foundations and road crossing to affected downslope wetland systems could reduce the consequence of the potential impacts and likelihood of occurrence of the potential impact.

6.1.3 Contamination of riparian systems

Stripping of topsoil and civil works activities, resulting in a decrease in water quality due to erosion, sedimentation and the alteration in the distribution and quantity of surface water runoff, is considered highly probable during the construction phase, and could be moderately severe, resulting in an impact of Medium significance. The residual impact can be reduced to Low significance with the application of the recommended mitigation measures, since the likelihood of the impact occurring as predicted would be reduced.

6.1.4 Soil erosion

The removal of wetland vegetation for the construction of the proposed development could result in an increase of bare soil/surfaces in the study area which could lead to increased runoff, ultimately resulting in soil erosion. The occurrence of soil erosion is considered moderately probable during construction and could have a moderate consequence on wetland soil, resulting in a Medium impact significance without mitigation. With the implementation of mitigation measures it is anticipated that the probability and consequence of this impact can be reduced, ultimately resulting in a residual impact of Low significance.

6.1.5 Establishment and spread of alien invasive species

Disturbances caused by vegetation clearing and earth works during construction will exacerbate the establishment and spread of alien invasive vegetation. Alien plant infestations can spread exponentially, suppressing, or replacing indigenous vegetation. This may result in a breakdown of ecosystem functioning and a loss of wetland wbiodiversity. Consequently, the potential impact is considered moderately severe, while the possibility of the impact occurring is highly probable, amounting to a potential impact of Medium significance.

With the development of an auditable AIS Management Plan for the project, and the strict implementation of the recommended active control and monitoring measures throughout the construction phase, the probability of the impact occurring can be reduced, resulting in a residual impact of Low significance

6.2 Operational Phase

Operational phase impacts relate to the possible exacerbation of the construction-phase impacts, including soil erosion, surface water and soil contamination and ongoing risk of spread of the alien and invasive plant species that may have colonised new areas during the construction phase.

6.2.1 Spread of alien and invasive species

The potential establishment of alien invasive species in, and immediately adjacent to, wetlands in the vicinity of the proposed development footprint will continue to be an impact of concern during the operational phase. Without mitigation, the consequence of the potential impact is considered moderately severe, while the possibility of the impact occurring is highly probable, amounting to a potential impact of Medium significance.

With the development of an auditable AIS Management Plan for the project, and the strict implementation of the recommended active control and monitoring measures throughout the operational phase, the probability of the impact occurring can be reduced, resulting in a residual impact of Low significance.

6.2.2 Soil Erosion

The increased presence of hardened surfaces in the study area could potentially exacerbate soil erosion, through increased and concentrated surface run off. This impact is assessed as having a medium probability of occurrence with a medium impact severity resulting in an impact of Medium significance prior to mitigation. With the implementation of the recommended mitigation measures, this impact may have a residual impact of Low significance on wetland soils.

6.2.3 Water quality deterioration and contamination of wetland soils

Quarterly washing and maintenance of the PV panels could potentially have a negative impact on water quality and wetland soils, due to inputs of detergents, and possible erosion paths forming in the soils of adjacent wetland areas, should large amounts of water be discharged to the environment. The probability of the impact occurring during operation is considered medium, with a medium consequence, which could result in an impact of Medium significance prior to the application of the recommended mitigation measures. The application of proposed mitigation measures could reduce both the probability of the impact occurring as well as the likely consequence, amounting to a residual impact of Low significance.

Table 12: Wetland Impact Assessment summary

ACTIVITY	POTENTIAL IMPACT	AFFECTED RECEPTORS	PHASE In which impact is anticipated	Probability	Consequence	Significance without Mitigation	Probability	Consequence	Significance with Mitigation
Bulk earthworks and clearance of vegetation in construction footprint	Direct loss of wetland habitat	Wetland habitats	Construction	4	4	High	2	4	Medium
	Erosion	Wetland soils	Construction	3	3	Medium	2	2	Low
	Establishment and spread of AIS	Wetland habitat	Construction	3	2	Medium	2	2	Low
	Catchment land use changes and activities	Changes in wetland health/ functioning	Construction, operation	3	3	Medium	2	2	Low
		Contamination of riparian systems	Construction, operation	3	3	Medium	2	2	Low
Indirect loss/disturbance of natural habitat	Habitat quality reductions due to stormwater runoff, land use changes	Wetland habitat	Operation	3	2	Medium	2	2	Low
Quarterly washing of PV panels	Spread of AIS	Wetland habitat	Operation	3	3	Medium	2	2	Low
	Increased run-off, Erosion	Wetland soils	Operation	3	3	Medium	1	2	Low
	Water quality deterioration and contamination of wetland soils	Wetland soils and water quality	Operation	3	3	Medium	2	2	Low

6.3 Mitigation Measures

Mitigation measures that are designed to avoid and minimise the loss and degradation of the wetland habitat and function on the site are summarised in the sections that follow.

6.3.1 Identification of areas to be avoided (including buffers)

- Areas of undisturbed, natural grassland and wetland habitat should be avoided to the extent possible. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required.
- A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction works and the outer boundary of wetlands and riparian zones

6.3.2 Minimisation

- To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas.
- The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible.
- Locate all stockpiles, laydown areas and temporary construction infrastructure at least 50 m from the edge of delineated wetlands.
- Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e. no impoundment upstream of crossings, or flow concentration downstream of crossings.
- Ideally construction activities within wetlands should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams might be required.
- Install erosion prevention measures prior to the onset of construction activities. Measures should include low berms on approach and departure slopes to crossings to prevent flow concentration, sediment barriers along the lower edge of bare soil areas, placement of hay bales around the within wetland construction areas, and re-vegetation of disturbed areas as soon as possible

6.3.3 Alien and Invasive Species Management

- An alien and invasive species management plan should be developed for the Project, which includes details of strategies and procedures that must be implemented on site to control the spread of alien and invasive species. A combined approach using both chemical and mechanical control methods, with periodic follow-up treatments informed by regular monitoring, is recommended.

6.3.4 Biodiversity Management Plan

- Specific provision for biodiversity conservation, including details of any required offsets, should be made in the project BMP/BAP, in alignment with the objectives of the MBSP (2011).
- Inclusion of a practical framework and schedule, details of key performance indicators, and recommended monitoring protocols for the delivery of existing and currently recommended mitigation measures in the BMP is recommended.

6.4 Monitoring Requirements

The following monitoring requirements are anticipated:

- Monitoring of wetland health to be conducted within one year of completion of construction, to measure any changes to the baseline status and ensure that recommended mitigation measures are sufficient to address any significant impacts.
- Follow up monitoring of wetland health PES/EIS every three years throughout the operating period.

6.5 Cumulative Impacts

The landscape within which the proposed infrastructure is located is almost completely modified and fragmented as a consequence of the existing surrounding land uses (i.e., power station, mining, agricultural practices, residential areas, and informal settlement).

While the currently proposed project infrastructure largely avoids the loss of significant areas of natural habitat due to active avoidance of these areas as part of the ongoing planning process, vegetation clearing would result in loss of additional 24.5 ha of moderately/largely modified seep habitats (Seep 1), contributing to cumulative impacts in terms of direct loss of seep wetlands at the landscape level.

7.0 ADDITIONAL PLANNED STUDIES TO BE COMPLETED DURING ESIA

Additional baseline data gathering surveys and impact assessments that will be conducted at ESIA phase will include the following:

- Aquatic Biodiversity Specialist Assessment:
  - Update of the wetland baseline description with scientifically-determined buffer zones, and revision of the EIS scores in the context of the completed flora and fauna study findings, as required
  - Diatom sample results and analysis.
  - Updated impact assessment, using NEMA-prescribed methods.
  - Finalised mitigation measures for inclusion in the Project EMPr.

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APPENDIX A

Document Limitations

APPENDIX B

Specialist CV

APPENDIX

E-10 *TRAFFIC*

Komati Power Station Repurposing

Transport Impact Assessment – Scoping Report

Scoping Report

WSP Group Africa

June 2022

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SUMMARY SHEET

Report Type	Transport Impact Assessment – Scoping Report
Title	Komati Power Station Repurposing
Location	Steve Tshwete Local Municipality
Client	WSP Group Africa
Reference Number	ITS 4484
Project Team	Nico Jonker Pr. Eng
	Maruis Brand
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Contact Details	Tel: 012 394 1664
Date	June 2022
Report Status	Draft
File Name	Y:\4484_Komati Power Station TIA\12. Reports\Drafts\4484_Komati Power Station_Scoping Study_Rev1_ReviewNJ_2022-06-24.docx

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1 INTRODUCTION

The proposed development consists of Photovoltaic (PV) solar energy facilities (SEF) with ancillary Battery Energy Storage Systems (BESS), to generate a total of 150 MW of energy, located on various Eskom owned land parcels surrounding the existing Komati Power Station, Middelburg, Mpumalanga, refer to **Annexure A, Figure A1** for the locality map. Komati Power Station is located approximately 40 km south of Middelburg within the Steve Tshwete Local Municipality.

In this TIA, the impact of the additional traffic of the proposed developments on the road network will be investigated and mitigation measures will be proposed if required. The transportation activities will include transportation activities during the construction phase as well as transportation activities during the operational phase.

2 PROPOSED DEVELOPMENT AND LAND USE

The proposed development is located on Eskom property and is currently zoned for various land uses including mining and an airstrip. Permission for the applicable land use rights will have to be obtained from the relevant authorities through a town planning process.

The proposed 150 MW PV facilities are proposed to be spread over two sites shown in the development layout as PV Site A and PV Site B.

3 TRIP GENERATION

The trip generation of the proposed developments will be calculated based on the estimated number of person trips and truck trips during the construction of the different sites. The operational phase of each site will also develop a certain number of person trips.

The estimated number of person trips will be converted into vehicle trips for the phases and sites. It is expected that the trip generation of the proposed sites will be low to medium during the construction and low to very low during the operational phase.

The expected number of person trips based on the employment opportunities for the developments is 1 285 during the construction phase and 150 person trips during the operational phase. The number of vehicle trips will be adjusted for public transport usage.

The trip assignment of the proposed developments will be calculated based on the land use and traffic patterns once the relevant information has been finalised.

4 EXISTING ROAD NETWORK

The roads in the vicinity of the proposed development are as follows:

- **R543:** Is a Class 3 provincial road and is located to the south of the proposed PV Site A and the town of Komati. This road serves as an East-West link between the R544 and the R35.
- **R35:** Is a Class 3 provincial road and is located to the northeast of the proposed developments and the town of Komati. This road serves as the link between Middelburg and Bethal.
- **Main Road:** Is a Class 4 municipal road and borders the proposed developments on the western boundaries of PV Site A and PV Site B.
- **Flamingo Street:** Is a Class 5 municipal road and borders the proposed PV Site A on the northern boundary of the site. Flamingo Street also provides access to the town of Komati.

The locations of these roads relative to the proposed development are shown on the locality map in **Annexure A, Figure A1.**

5 ACCESS

Access to the proposed developments is proposed from Flamingo Street for PV Site A and from the current road that borders the airfield for PV Site B respectively.

6 TRAFFIC VOLUMES

6.1 Background Traffic Volumes 2022

Traffic counts were conducted, at the intersections shown in **Figure A2** in **Annexure A**, covering a 12-hour period on Wednesday, 1 June 2022. The counts conducted were used for the 2022 base year traffic. The background weekday AM and PM peak hour traffic volumes for 2022 are shown in **Annexure B**.

6.2 Future Background Traffic Volumes 2024

A growth rate of 2% per annum was applied to the 2022 background peak hour volumes to estimate the future background volumes for the 2024 horizon year. The horizon year 2024 was chosen to align with the estimated construction period. The estimated background AM and PM peak hour traffic volumes for 2024 are shown in **Annexure B**.

6.3 Future Background Traffic Volumes 2027

A growth rate of 2% per annum was applied to the 2022 background peak hour volumes to estimate the future background volumes for the 2027 horizon year. The horizon year 2027 was chosen as it is 5 years from the start of the project and it is expected that operations will have started within a 5 year period. The estimated background AM and PM peak hour traffic volumes for 2027 are shown in **Annexure B**.

7 CAPACITY ANALYSIS

PTV Vistro software was used to conduct the capacity analysis for the intersections included in the study area. The intersections that were included in the analysis are:

- Int 1 – Main Road / Koornfontein Mine Access
- Int 2 – R542 / Main Road
- Int 3 – R35 / R542 to Emalahleni
- Int 4 – R35 / R542 to Hendrina
- Int 5 – R35 / Komati Power Station
- Int 6 – Main Road / Flamingo St

The scenarios that were analysed for the peak hours are summarised in **Table 1**.

Table 1: Scenarios Analysed for the Proposed Komati PV Developments

No	Scenario No	Scenario
1	Scenario 1	2022 AM and PM Weekday Peak Hour Background Traffic with Existing Geometry.
2	Scenario 2	2024 AM and PM Weekday Peak Hour Background Traffic with Existing Geometry.
3	Scenario 3	2027 AM and PM Weekday Peak Hour Background Traffic with Existing Geometry.

The capacity analysis results for the intersections included in the study area are summarised in **Table 2** and **Table 3.** Refer to **Annexure B** for the PTV Vistro output.

Table 2: Capacity Analysis Results for the Weekday AM Peak Hour

Scenario	Intersection	INT 1	INT 2	INT 3	INT 4	INT 5	INT 6
Scenario 1: 2022 AM Peak Hour Traffic with existing geometry	LOS	A	A	A	A	B	A
	Del	9.02	9.22	9.91	9.96	10.81	8.94
	v/c	0.03	0.02	0.05	0.08	0.04	0.02
Scenario 2: 2024 AM Peak Hour with existing geometry	LOS	A	A	A	A	B	A
	Del	9.04	9.25	9.97	10.04	10.93	8.96
	v/c	0.03	0.03	0.05	0.08	0.04	0.02
Scenario 3: 2027 AM Peak Hour with existing geometry	LOS	A	A	A	A	B	A
	Del	9.08	9.31	10.09	10.14	11.09	8.99
	v/c	0.03	0.03	0.05	0.09	0.04	0.03

Table 3: Capacity Analysis Results for the Weekday PM Peak Hour

Scenario	Intersection	INT 1	INT 2	INT 3	INT 4	INT 5	INT 6
Scenario 1: 2022 AM Peak Hour Traffic with existing geometry	LOS	A	B	B	B	B	A
	Del	9.53	10	11.81	10.99	10.86	9.24
	v/c	0	0.02	0.11	0.12	0.02	0.01
Scenario 2: 2024 AM Peak Hour with existing geometry	LOS	A	B	B	B	B	A
	Del	9.54	10.07	11.98	11.1	10.97	9.27
	v/c	0	0.02	0.11	0.12	0.03	0.01
Scenario 3: 2027 AM Peak Hour with existing geometry	LOS	A	B	B	B	A	A
	Del	9.57	10.16	12.28	11.32	11.15	9.32
	v/c	0	0.03	0.13	0.13	0.03	0.01

The existing road network is operating at acceptable levels of service with the existing geometry. The future background traffic scenarios are also expected to operate at acceptable levels of service with the existing geometry. The existing geometry of the road network is shown schematically in **Annexure A** in **Figure A3.**

8 PUBLIC TRANSPORT

Due to the locality of the proposed developments, no formal public transport facilities are located in close approximation to the proposed development. It is unlikely that public transport facilities will be required.

9 ENVIRONMENTAL IMPACT OF THE TRANSPORT ACTIVITIES

The environmental impact of the transport activities for the PV developments will be assessed and quantified according to the prescribed impact tables as provided. The assessment based on available data is shown below.

The impact of the transport activities for both the construction phase and operational phase of the project will be assessed based on the following parameters and scoring as provided in the impact tables:

- Impact Magnitude (M)
- Impact Extent (A)
- Impact Reversibility (R)
- Impact Duration (D)
- Probability of Occurrence (P)
- Significance Rating [S = (E + D + R + M) x P]

Table 4: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

The initial assessment of the transportation activities for the proposed developments are shown in the tables below:

Table 5: Environmental Impact Assessment for Construction Phase

CONSTRUCTION

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Transportation	Impact of construction vehicles on roads and access roads	Construction	Negative	Moderate	1	1	2	2	5	**30**	**N2**	1	1	2	2	5	**30**	**N2**
					Significance	**N2 - Low**							**N2 - Low**						

Table 6: Environmental Impact Assessment for Operational Phase

OPERATIONAL

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Transportation	Transportation activities during operations	Operational	Negative	Moderate	1	1	1	4	5	**35**	**N3**	1	1	1	4	5	**35**	**N3**
					Significance	**N3 - Moderate**							**N3 - Moderate**						

10 REFERENCES

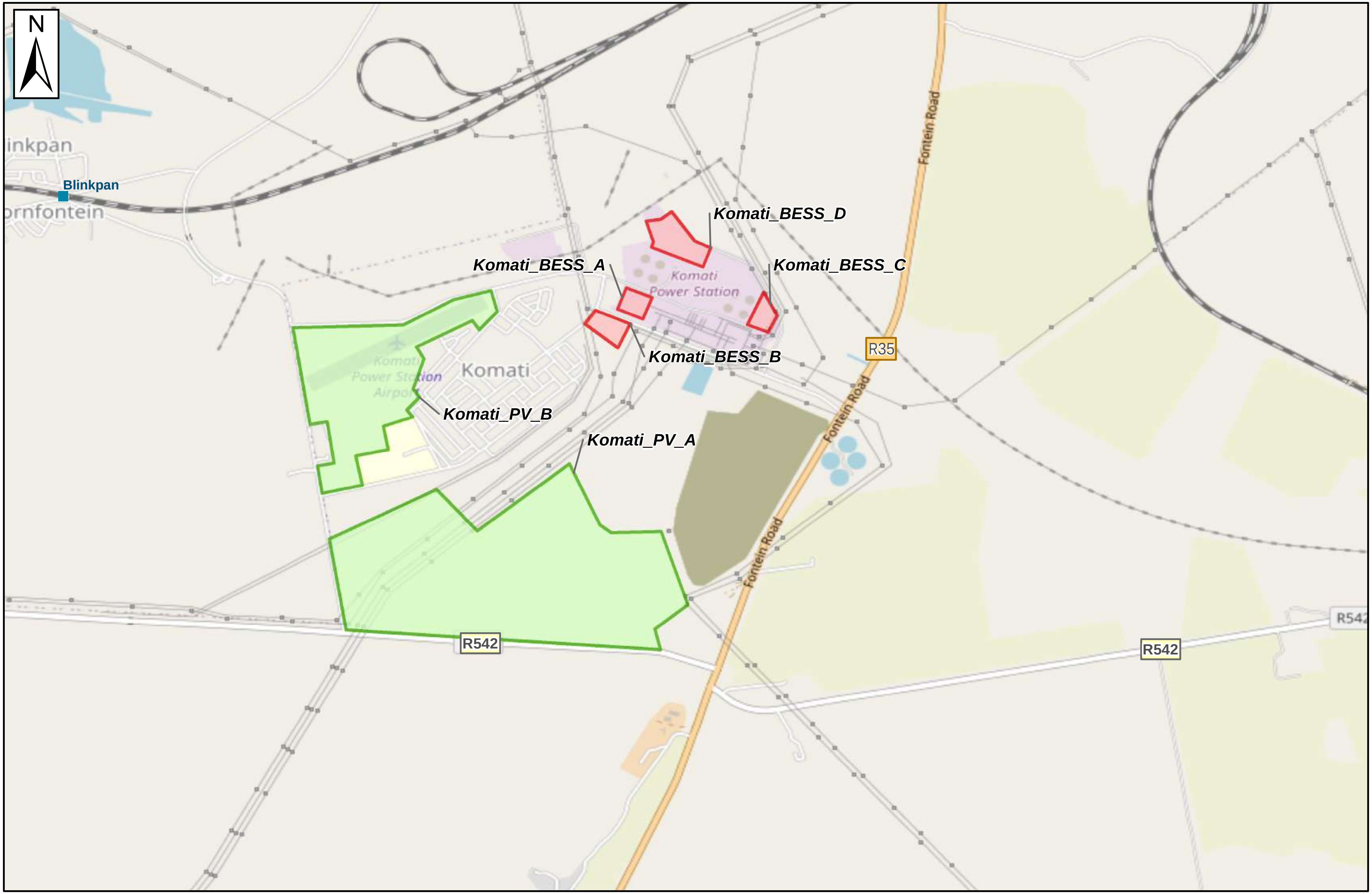
[1] Committee of Transport Officials (COTO) Technical Methods for Highways (TMH 17) Volume 1 “South African Trip Data Manual.

[2] Committee of Transport Officials (COTO) Technical Methods for Highways (TMH 16) Volume 1, South African Traffic Impact and Site Traffic Assessment Standards Manual, August 2012.

[3] Committee of Transport Officials (COTO) Technical Methods for Highways (TMH 16) Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, August 2012.

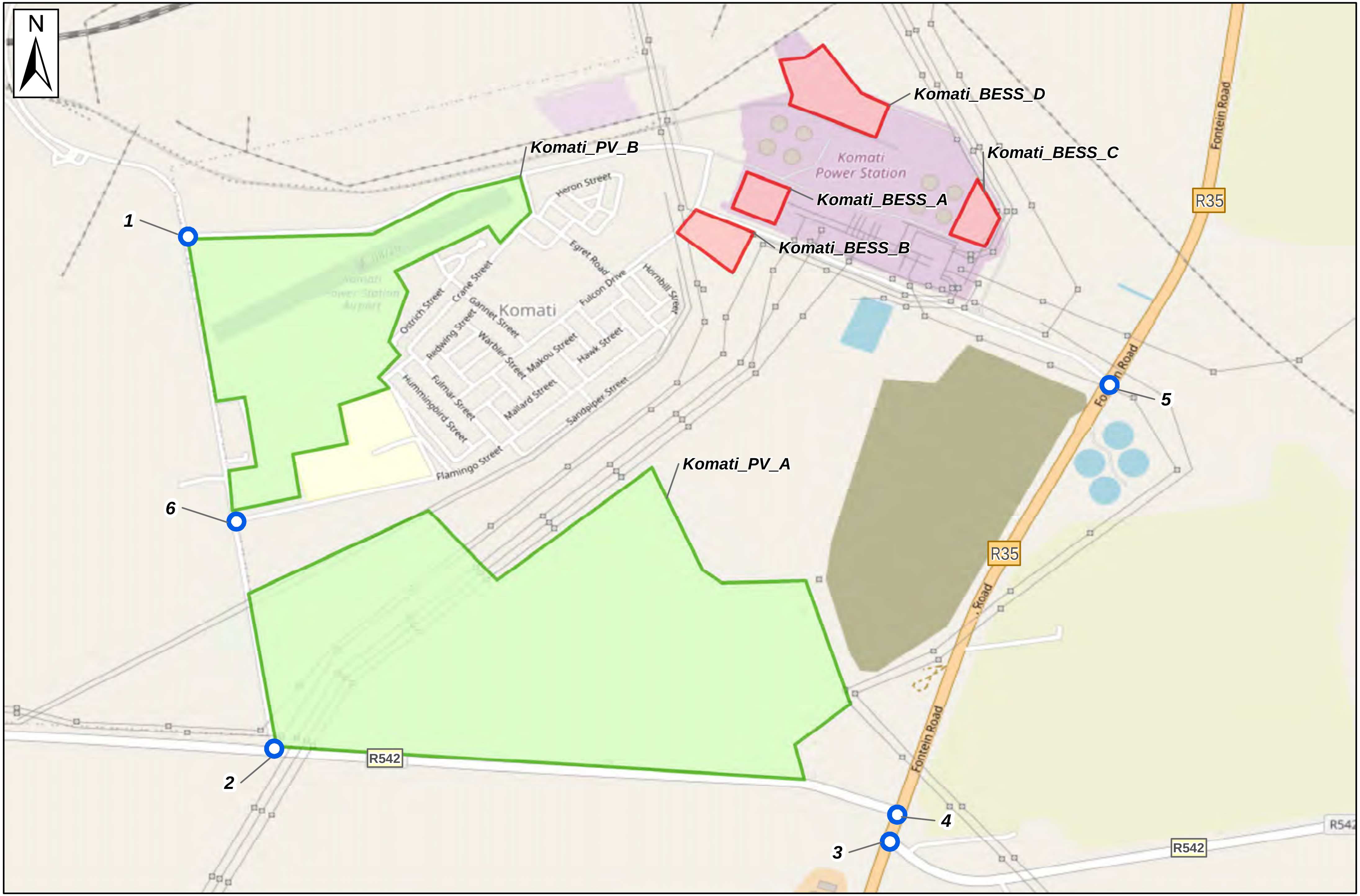
Annexure A

Figures

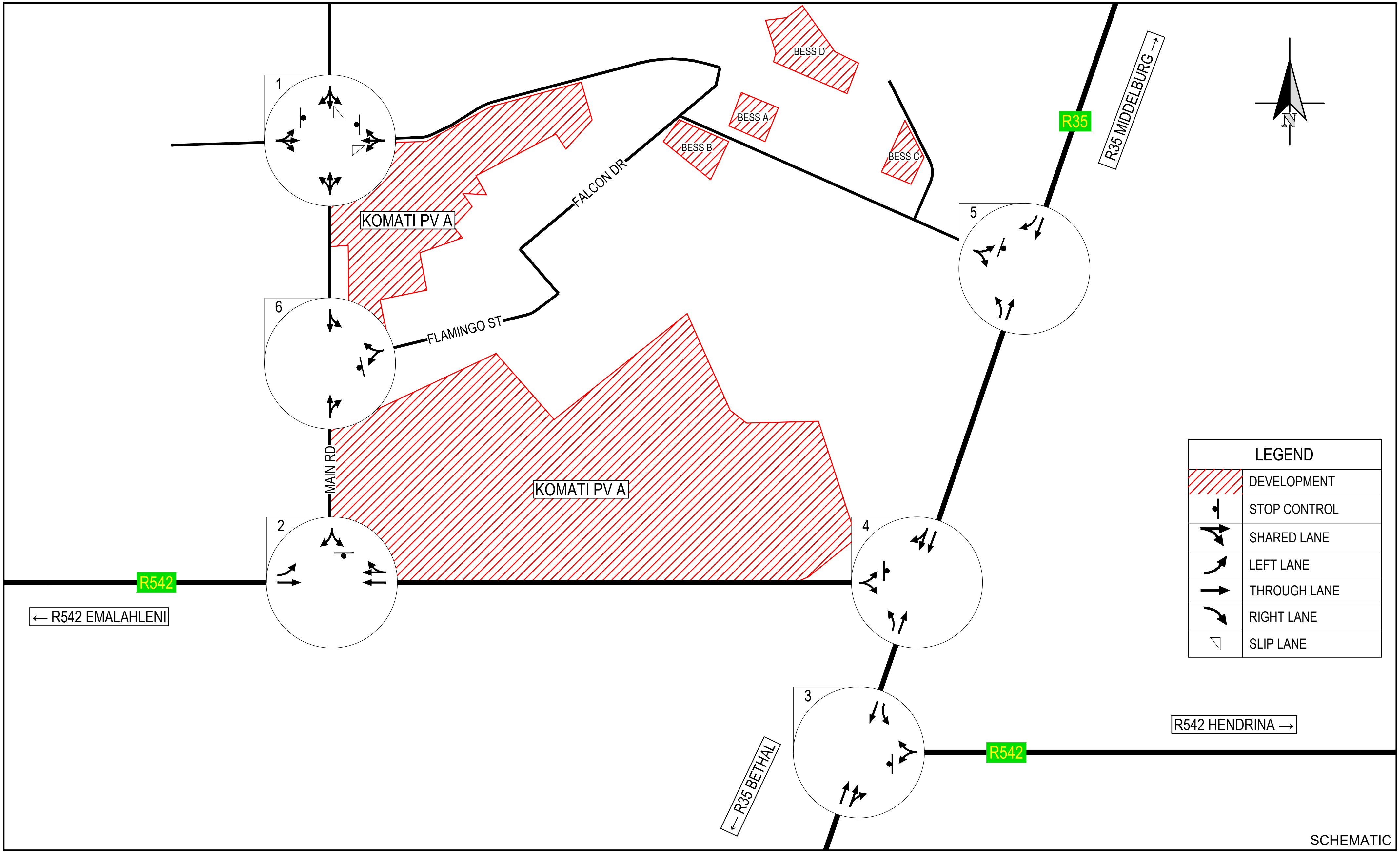


4484 /Fig A1

PROJECT: KOMATI POWER STATION TIA	MAP: LOCALITY MAP	NO: A1



PROJECT:	MAP:	SCALE:	NO:
KOMATI POWER STATION TIA	INTERSECTIONS COUNTED	1:18 000	A2



its

PROJECT:	FIGURE:	NUMBER:
KOMATI POWER STATION TIA	EXISTING GEOMETRY	A3

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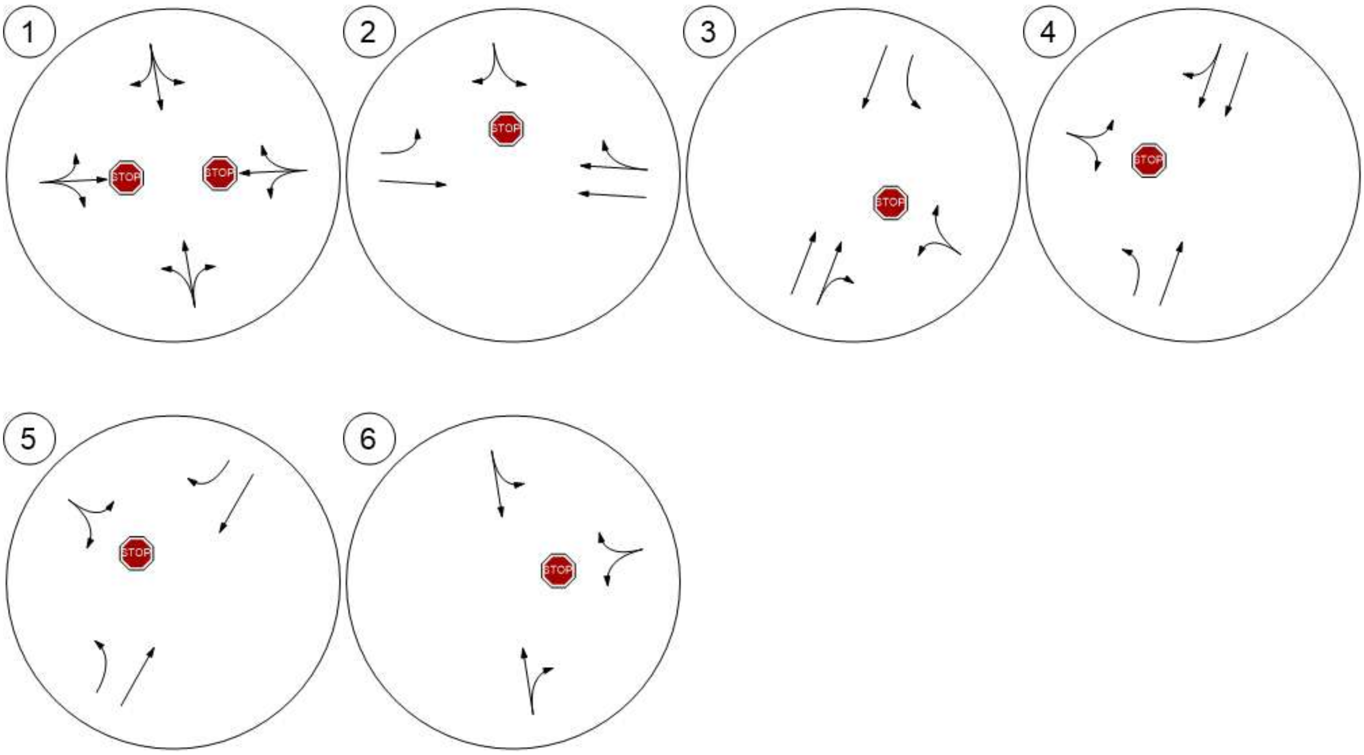
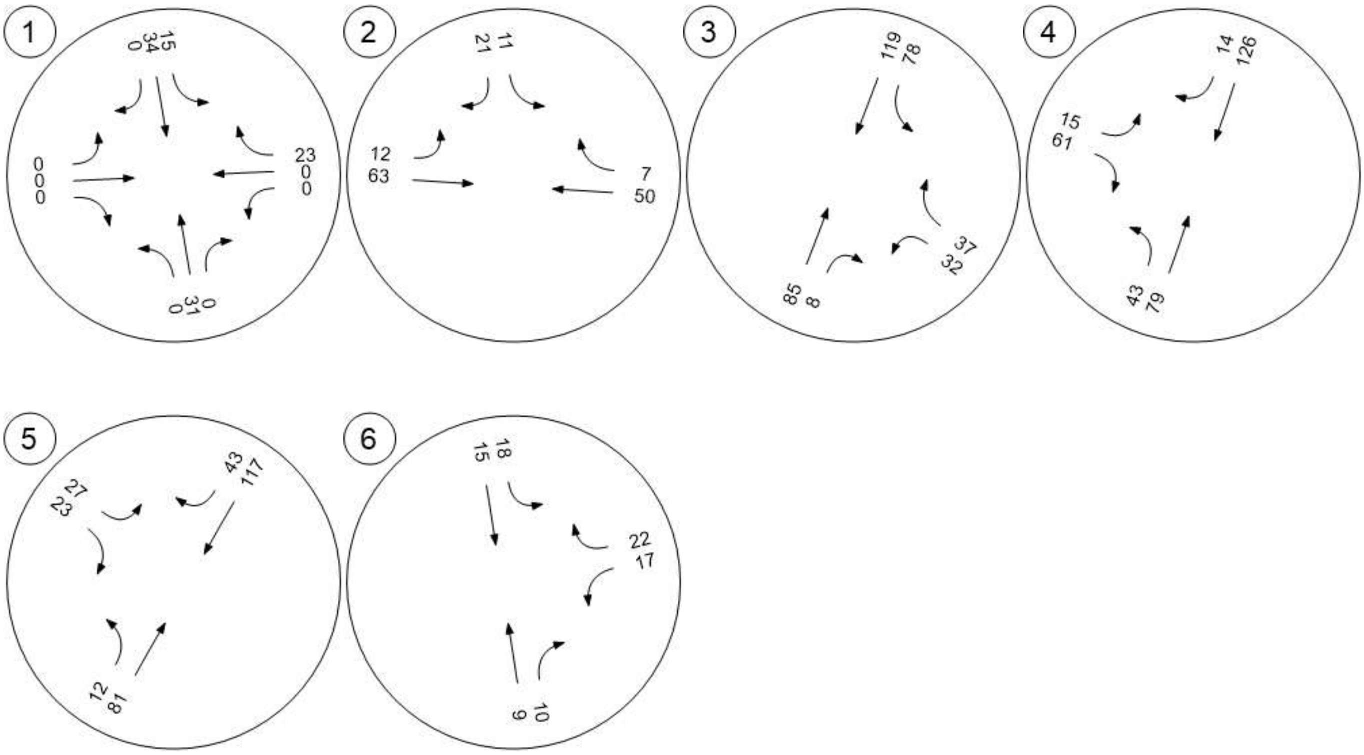
Annexure B

Traffic Volumes and Geometry

Lane Configuration and Traffic Control



Traffic Volume - Future Total Volume



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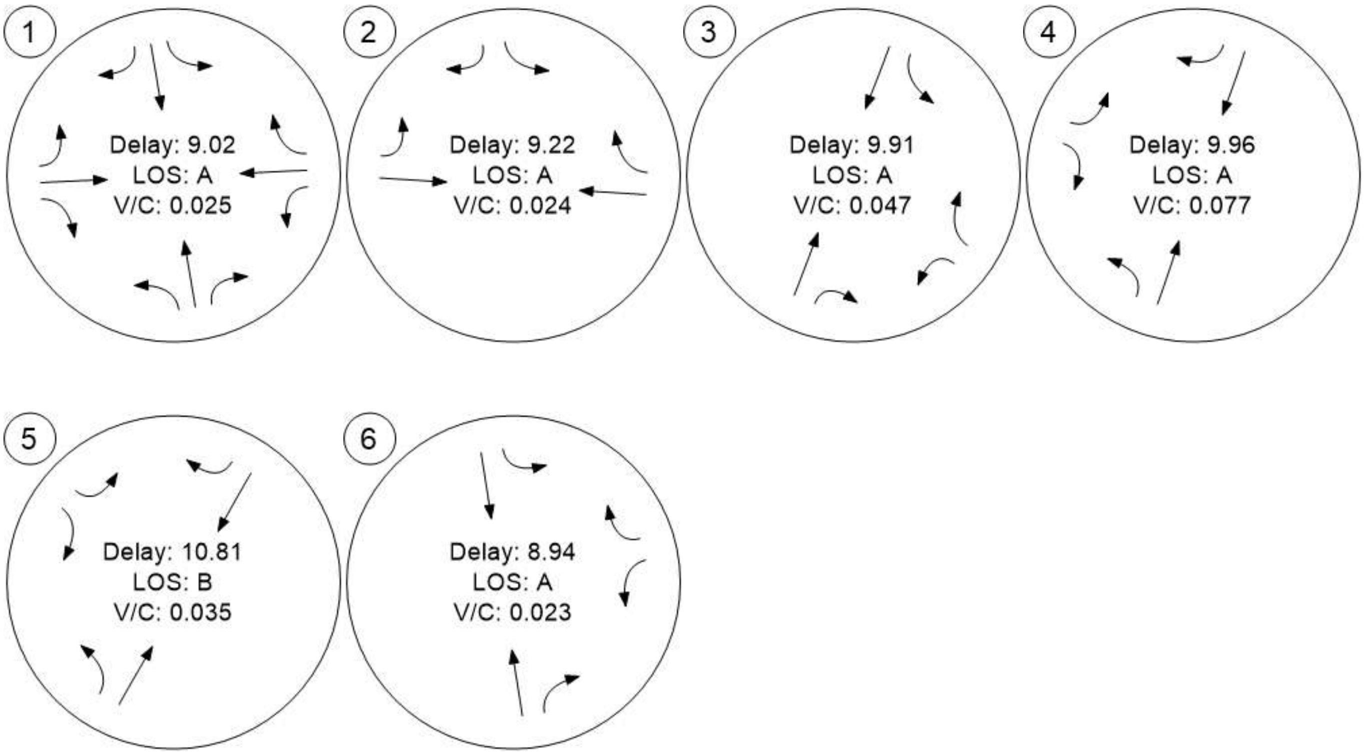
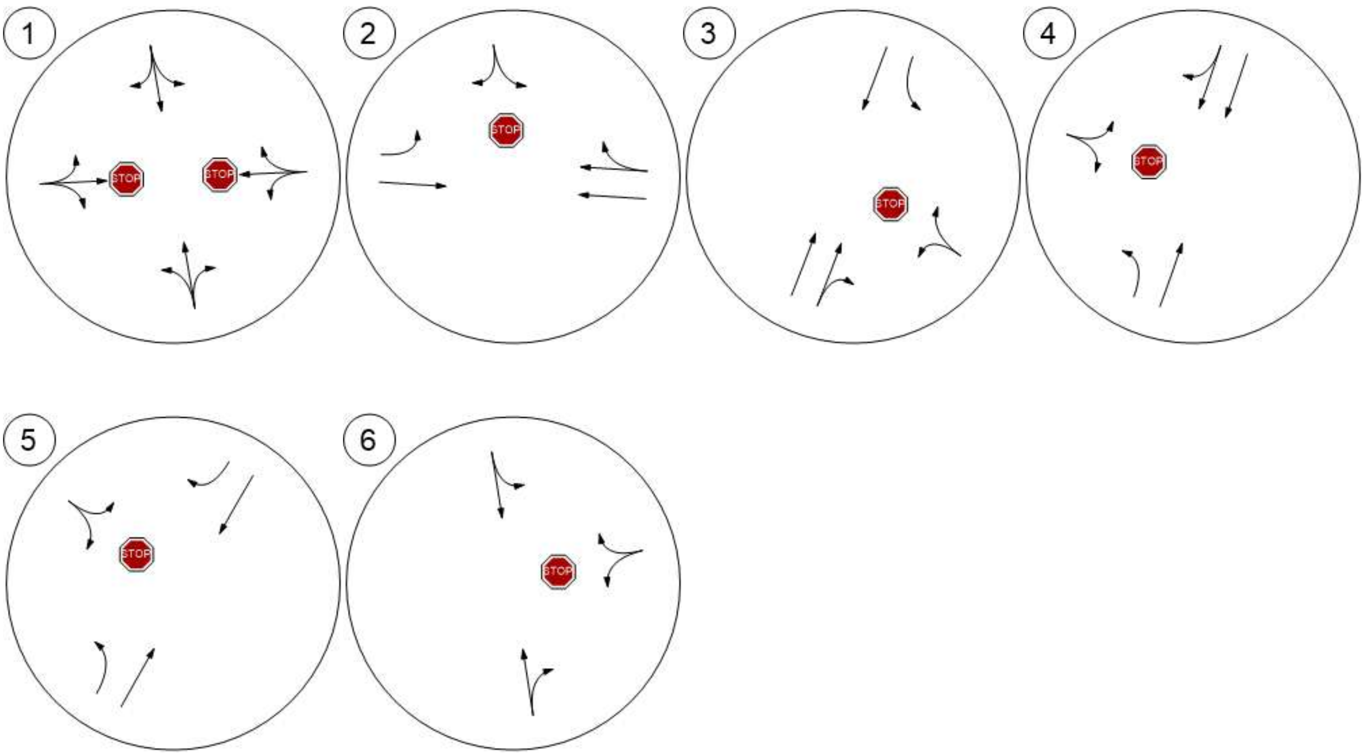
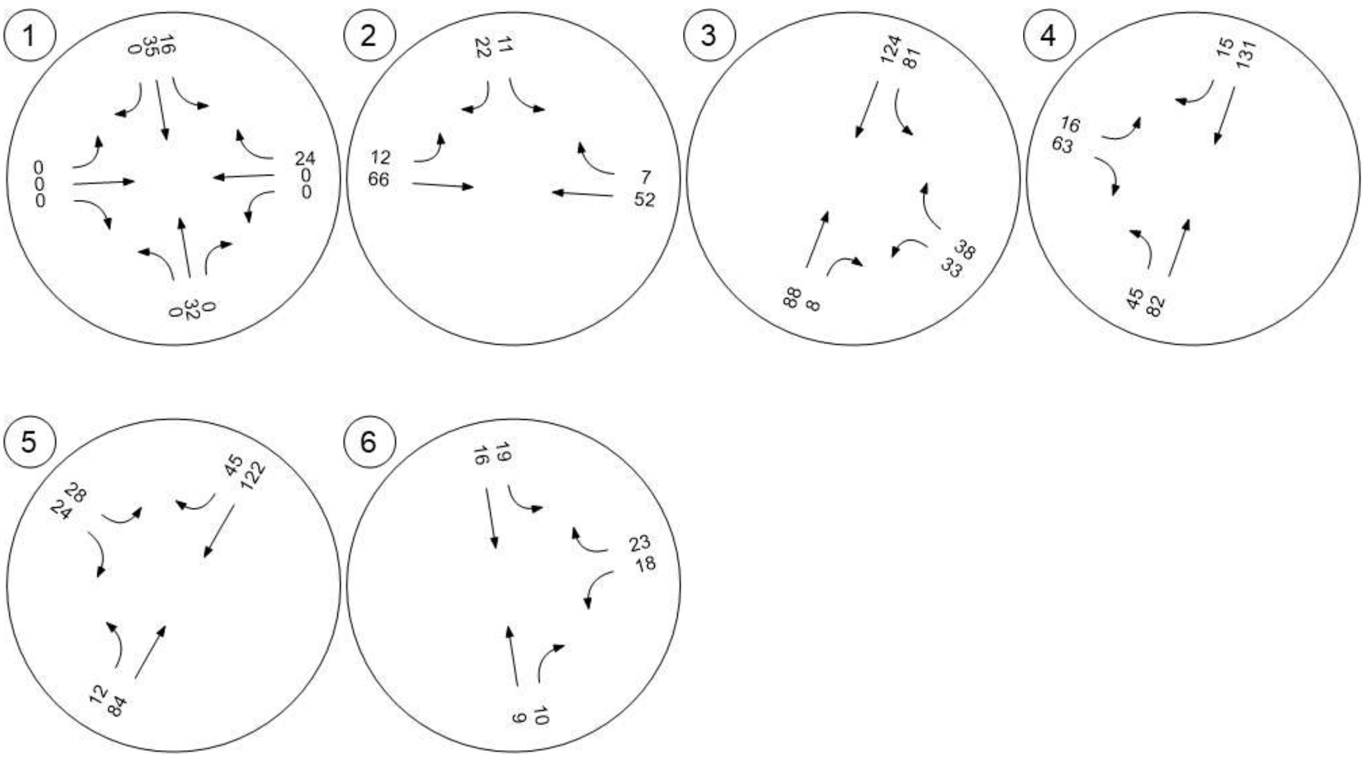


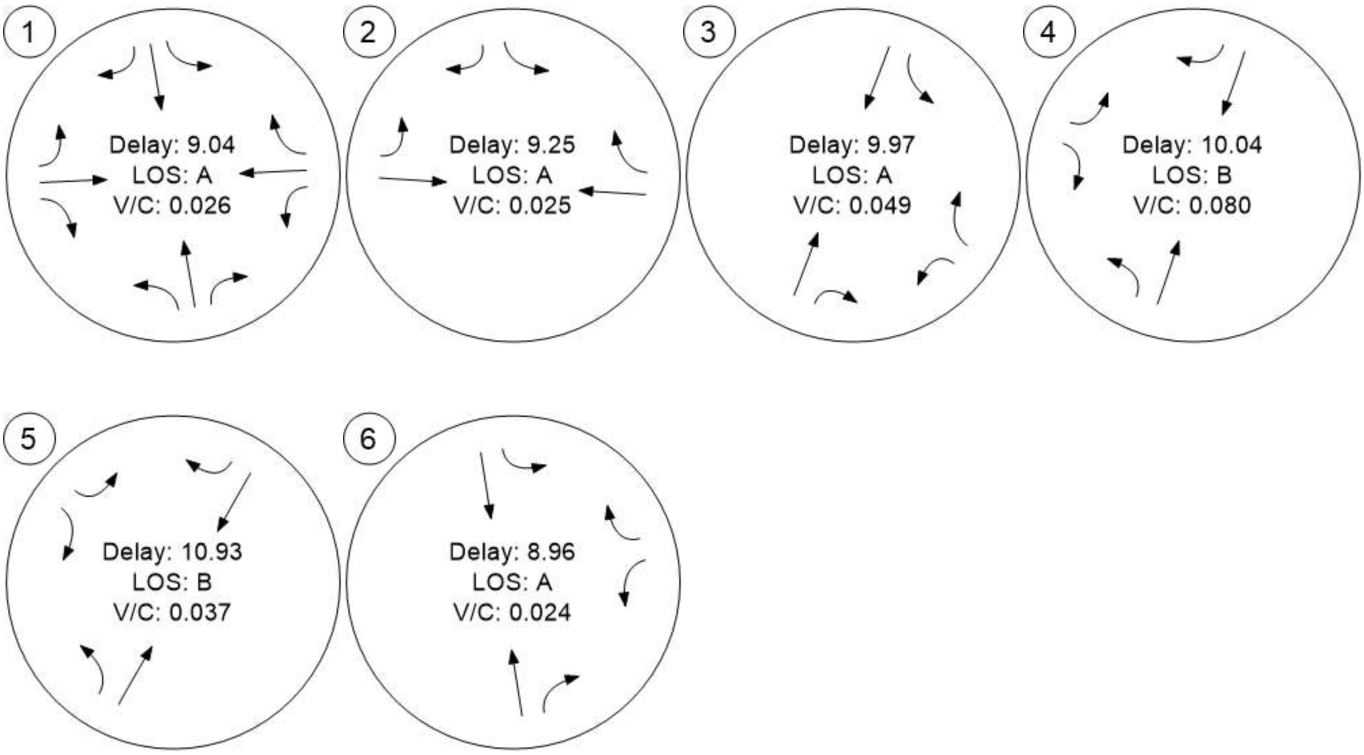
Lane Configuration and Traffic Control



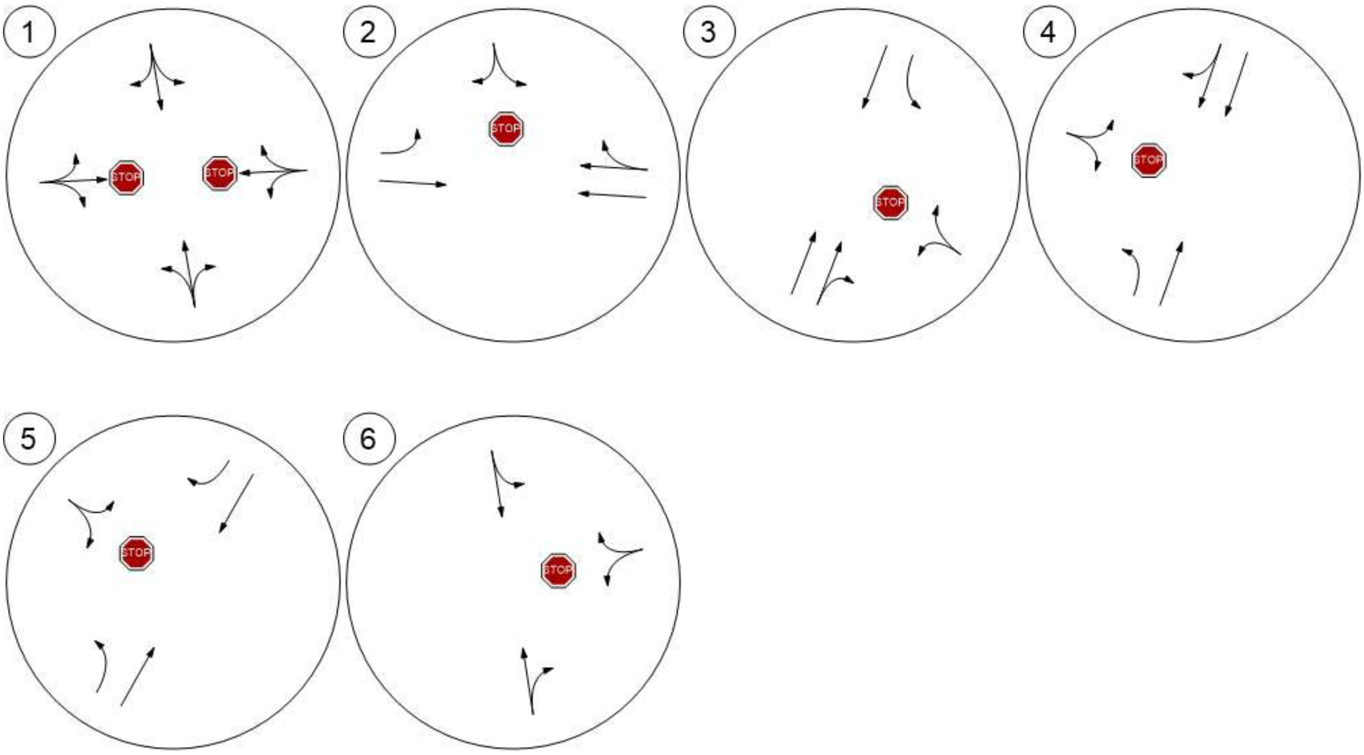
Traffic Volume - Future Total Volume



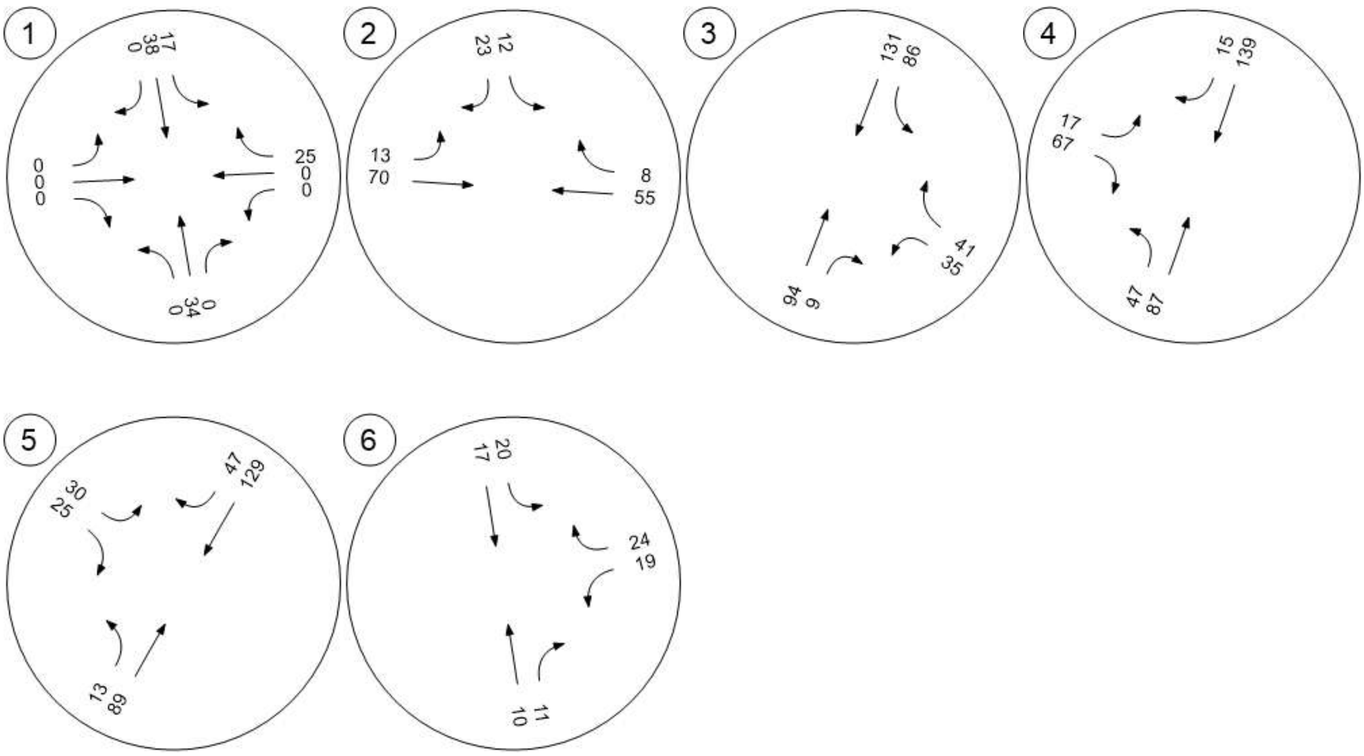
Traffic Conditions



Lane Configuration and Traffic Control



Traffic Volume - Future Total Volume



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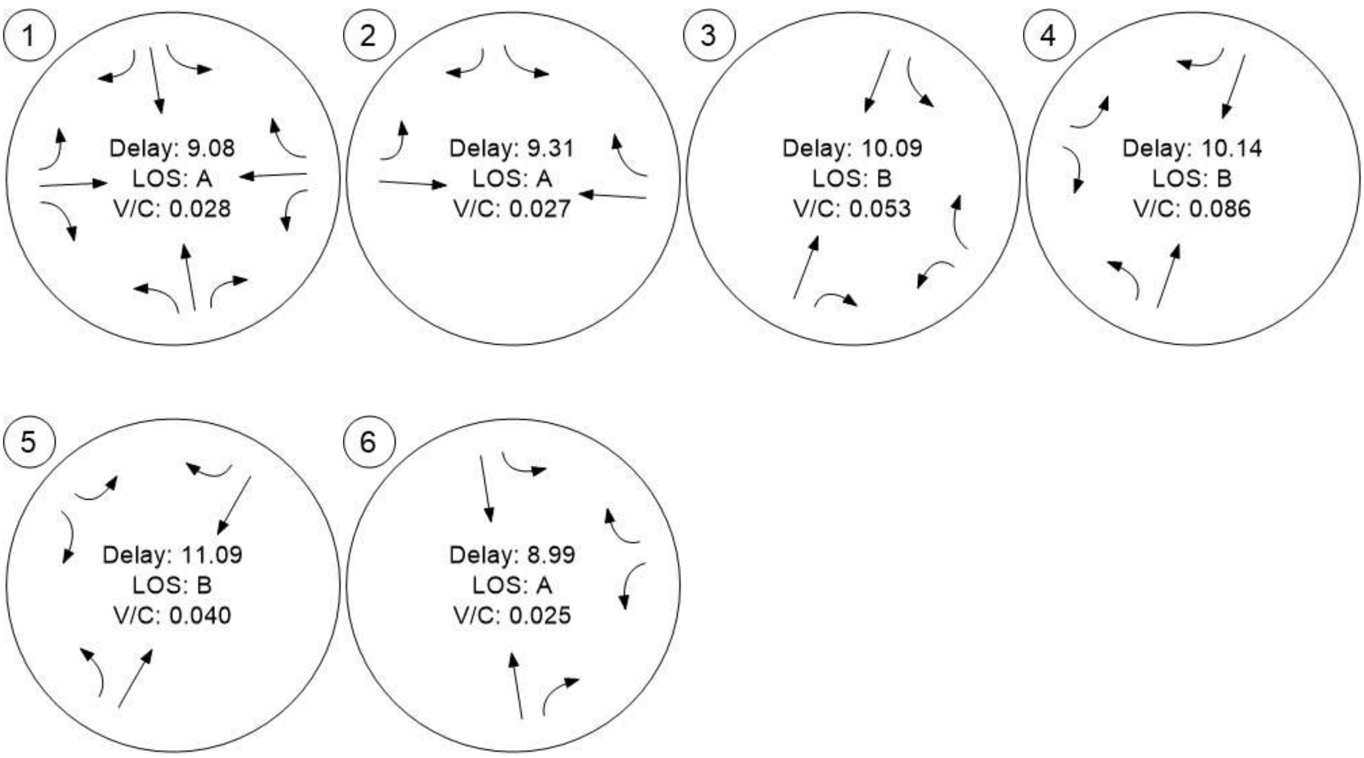

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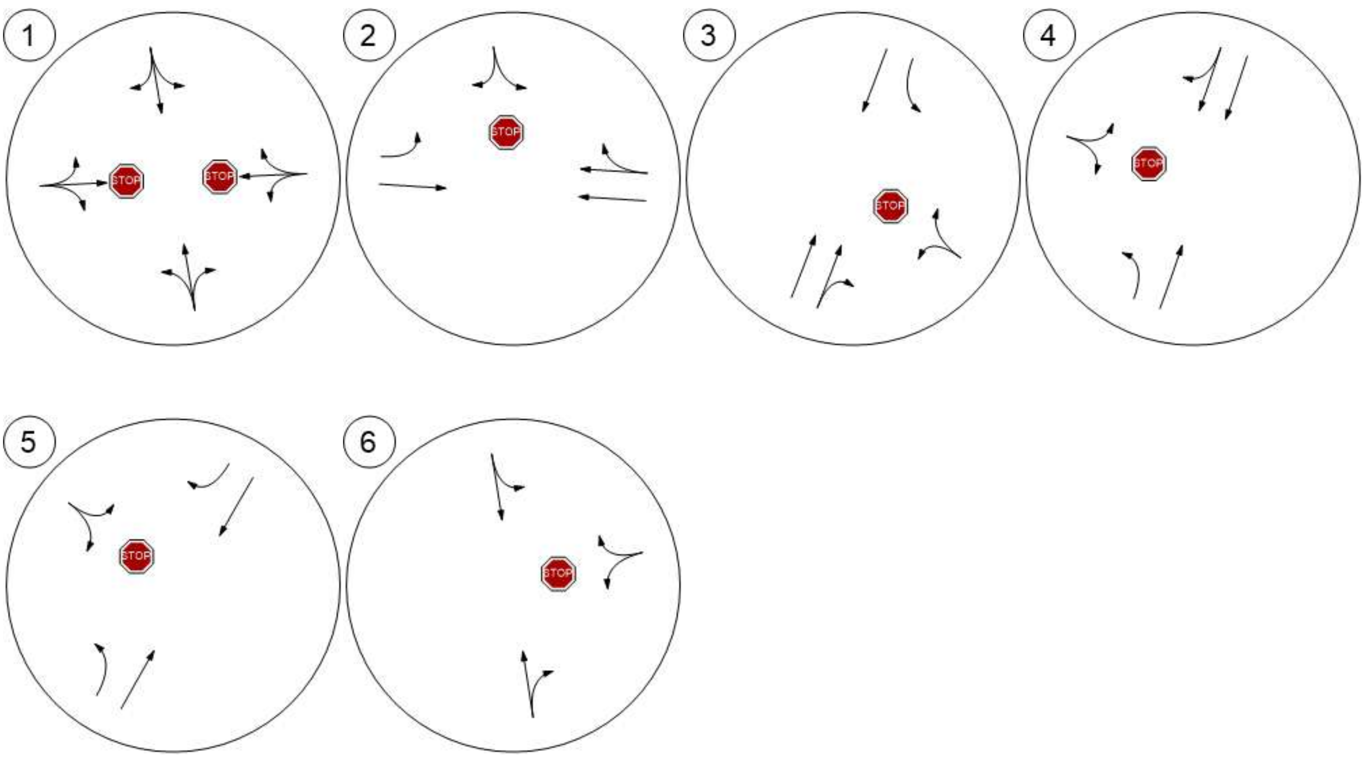

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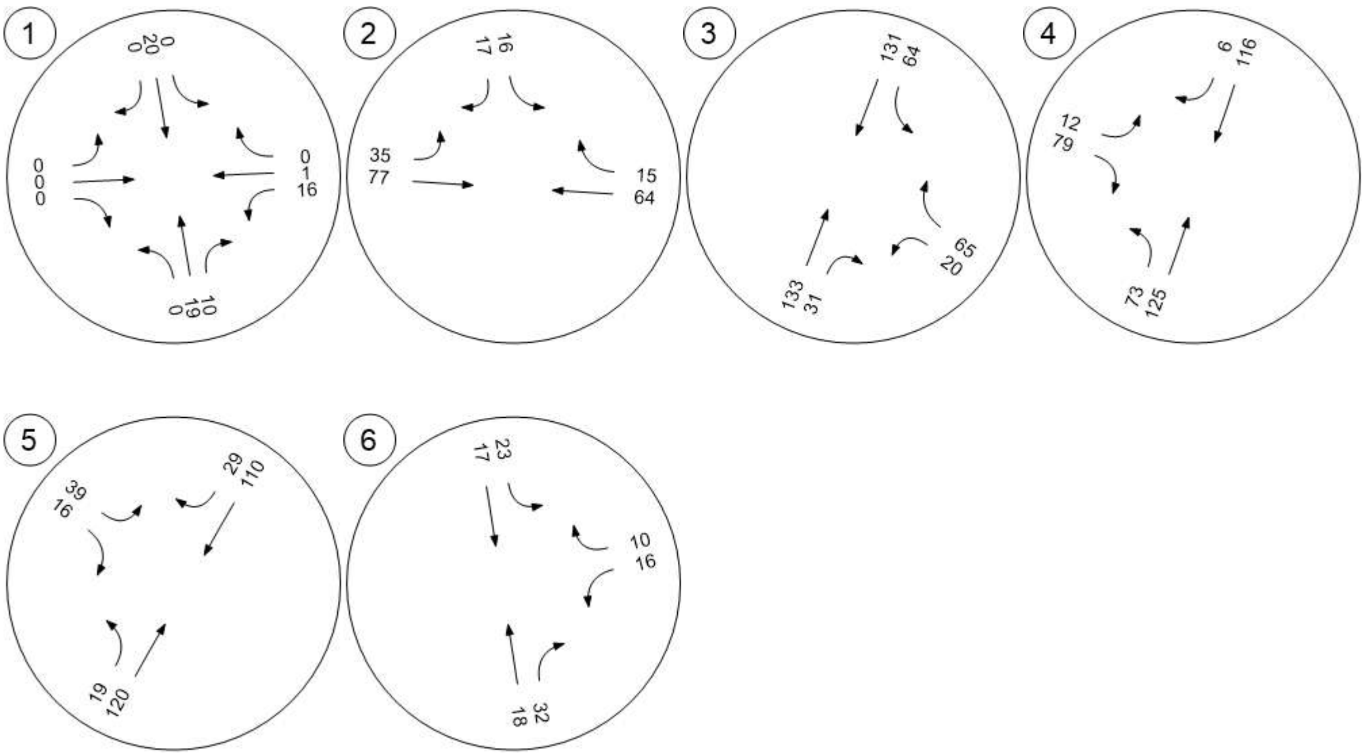

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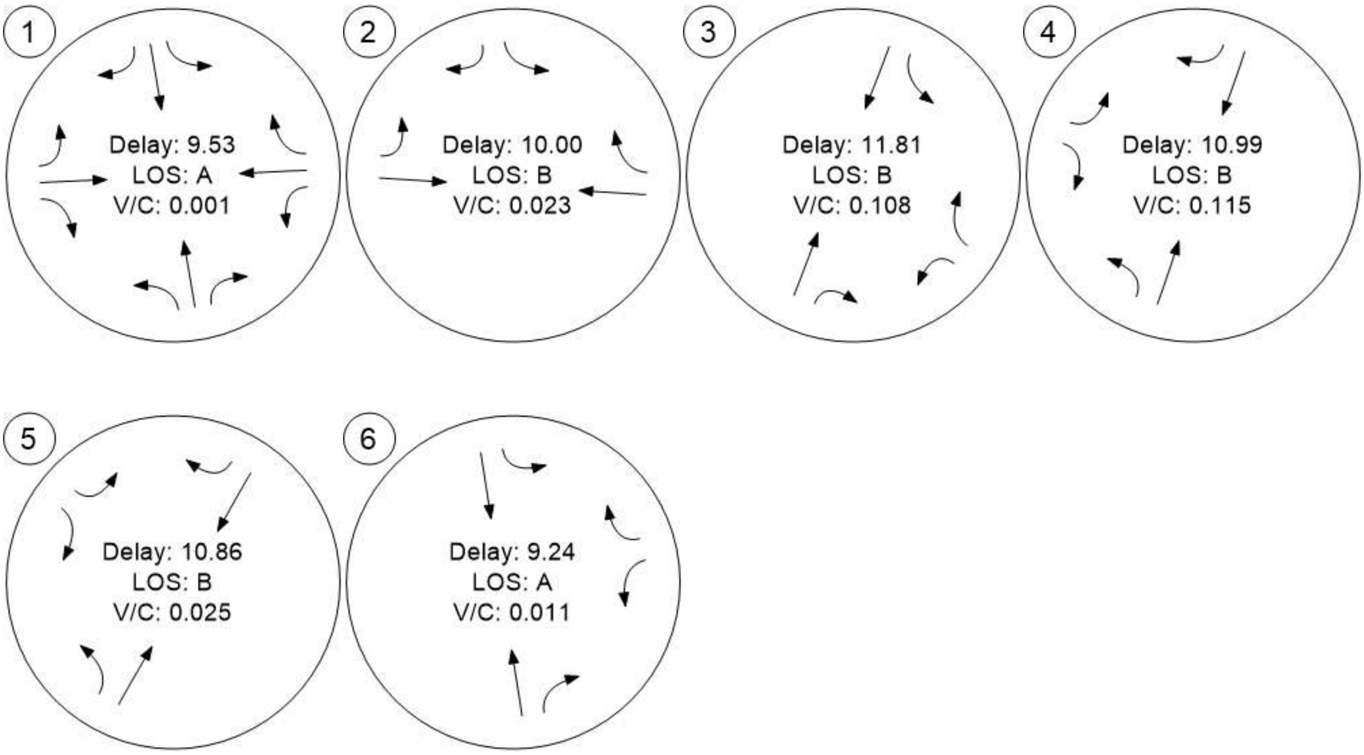

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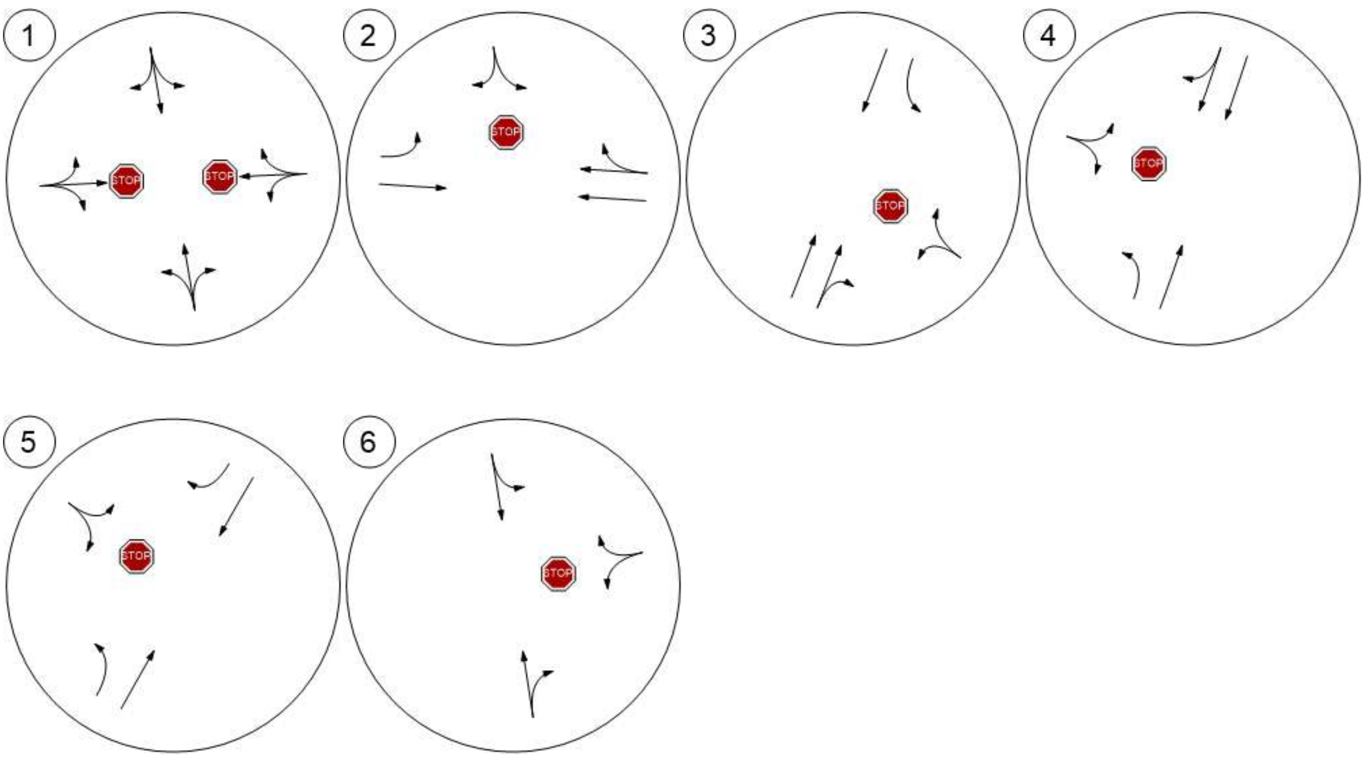

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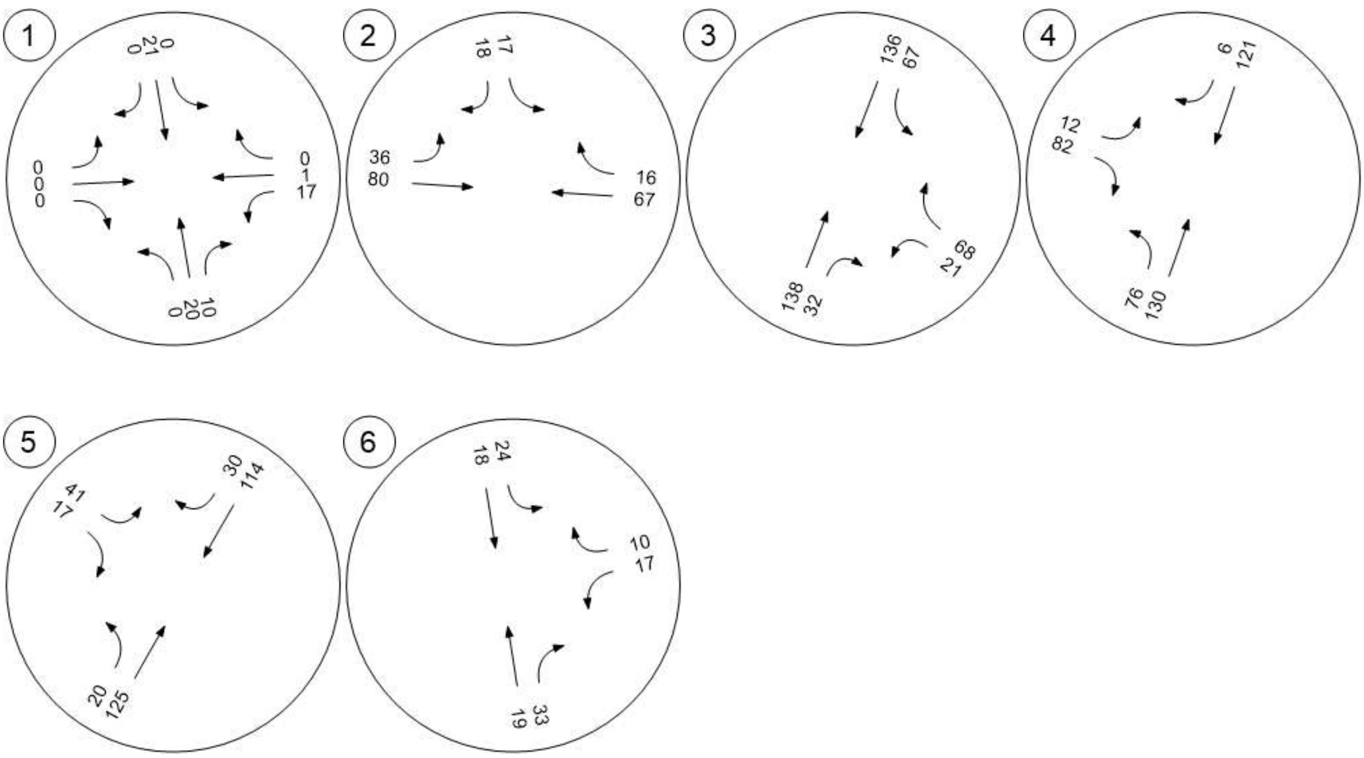

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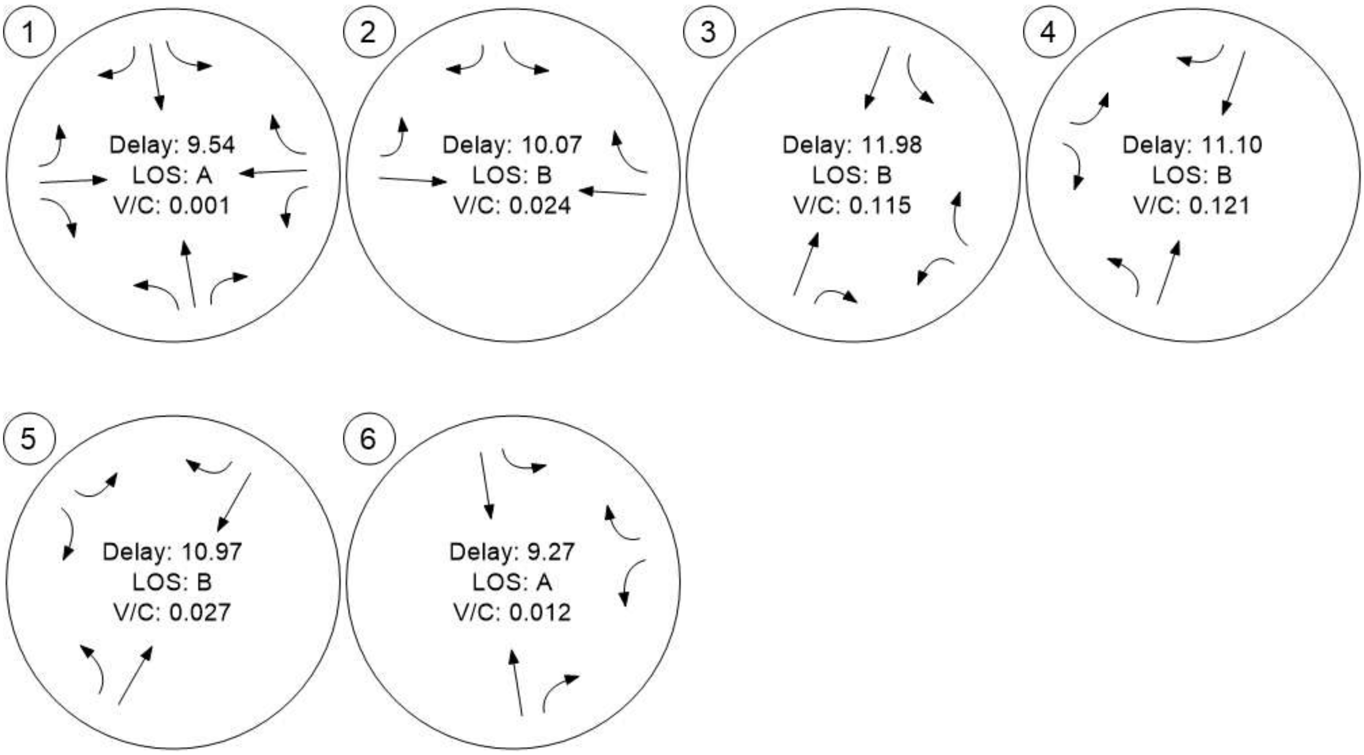

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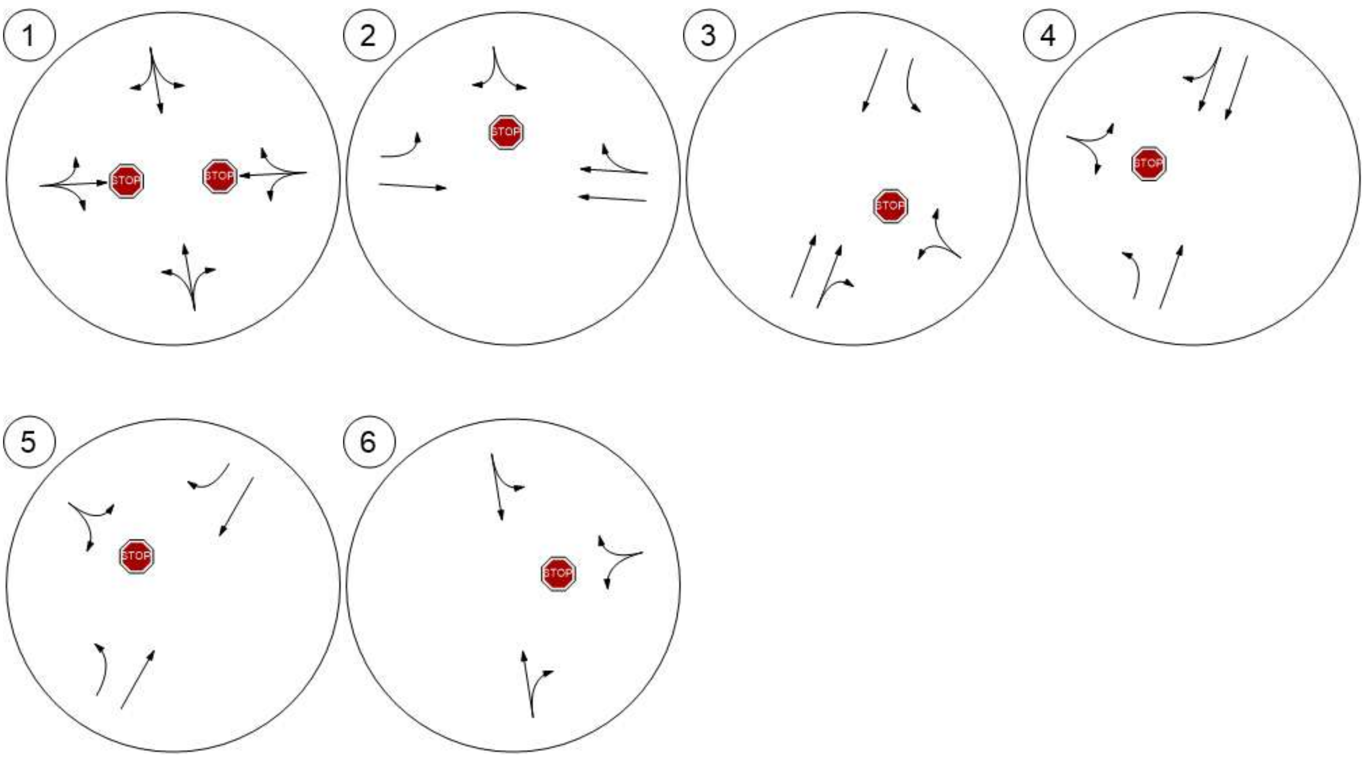

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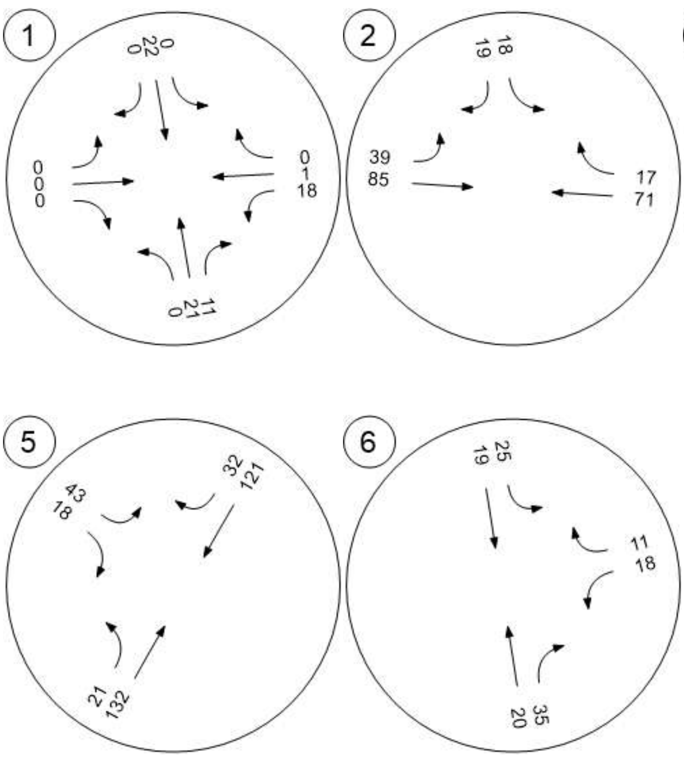

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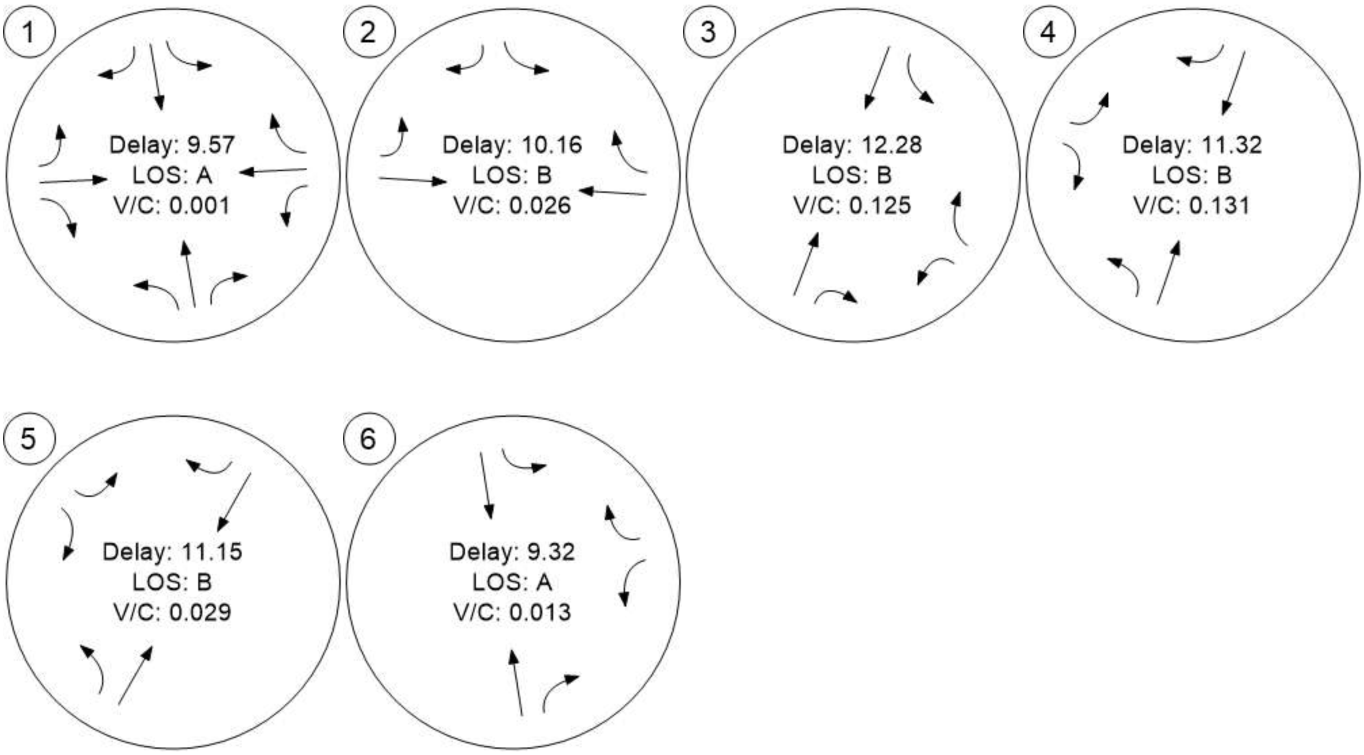

APPENDIX

E-11 *SOCIAL*

REPORT

The Proposed Solar Photovoltaic and Battery Energy Storage System at Komati Power Station

Social Impact Assessment

Submitted to:

Eskom Holdings SOC Ltd

Submitted by:

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TABLE OF ABBREVIATIONS

EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessments
ESS	Environmental and Social Standards
FGM	Focus Group Meeting
GPN	Good Practice Note
GW	Giga Watt
I&AP	Interested and Affected Parties
IDP	Integrated Development Plans
MSDF	Mpumalanga Spatial Development Framework
NEMA	National Environmental Management Act 107 of 1998
NDM	Nkangala District Municipality
NDP	National Development Plan
SIA	Social Impact Assessment
STLM	Steve Tshwete Local Municipality
ToR	Terms of Reference

1.0 INTRODUCTION

Eskom has commissioned WSP to undertake the environmental permitting processes required for the repurposing of the Komati Power Station located in Komati**,** Mpumalanga. The following sections provide the project description, world bank and South African legislative requirement, screening impact assessment, and terms of reference for the EIA phase Social Impact Assessment (SIA**).**

2.0 PROJECT DESCRIPTION

Eskom is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for the Komati Power Station. The plan is to install 100MW of Solar Photovoltaics (PV) and a 150MW Battery Energy Storage System. The parcels of land for the proposed development are provided in Figure 1 below. Eskom owns the identified parcels of land.

2.1 Project location

The Komati Power Station is situated about 37km from Middelburg, 43km from Bethal and 40km from Emalahleni, via Vandyksdrift in the Mpumalanga Province of South Africa. The GPS coordinates for the power plant are 26.0896668 S, and 29.4655907 E. The station has nine units, five 100MW units on the east (Units 1 to 5) and four 125 MW units on the west (Units 6 to 9), with a total installed capacity of 1000 MW. Its units operated on a simple Rankine Cycle without reheat and with a low superheat pressure, resulting in a lower thermodynamic efficiency (efficiency up to 27%). Komati Units are small and have a higher operating and maintenance cost per megawatt generated than modern newer stations. Komati Power Station will reach its end-of-life expectancy in September 2022, when Unit 9 will have reached its dead stop date (DSD). Units 1 to 8 have already reached their DSD [1].

Figure 1: Locality map

3.0 SOCIAL IMPACT ASSESSMENT METHODOLOGY

3.1 Data collection

To understand the socio-economic baseline conditions of the project-affected areas and the socio-economic implications of the proposed project to the receiving environment, WSP - Golder conducted secondary desktop data collection (desktop review) and primary data collection as part of the stakeholder consultation process. These two methods are elaborated further in the following sections.

3.1.1 Desktop review

Golder reviewed available documents to obtain information regarding the socio-economic conditions in the study area. The documents reviewed include the following:

- IDPs and Spatial Development Frameworks of the affected local and district municipalities.
- Socio-economic and demographic statistics (sourced from Statistics South Africa's 2011 census data, municipal report, provincial data, and the 2016 community survey).
- Documents concerning the proposed project, which included the project description document,
- Social impact assessments undertaken for the closure of the Komati Power Station.
- Available maps and satellite imagery.

3.1.2 Primary Research

Golder consulted with interested and affected parties (I&AP) during the scoping phase of the project. .

A focus group meeting (FGM) was held on 09 June 2022 at the Eskom Komati SBSS Conference Room. In addition, the draft scoping report will be made available for public review for 30 days. All issues, questions, concerns, and suggestions for enhanced benefits raised by I&APs to date have been captured in the Comment and Response Report. The information derived from the meeting minutes was used to understand better the stakeholder's concerns, issues, and expectations. This process formed part of the primary research process.

The main issues raised by participants at the meeting were:

- Where would the labour for the project be sourced?
- What skills will be required when construction commences?
- Local business and contractors should be used during the construction and maintenance of the Solar Photovoltaics and Battery Energy Storage System.

4.0 WORLD BANK AND SOUTH AFRICAN LEGISLATIVE REQUIREMENTS

The legislation related to the project aids in identifying and assessing the associated potential impacts. This section identifies the documentation reviewed as part of assessment process.

4.1.1 World Bank Borrower Requirements

The World Bank Environmental and Social Framework sets out the mandatory requirements for projects seeking funding from the Bank. The aim of this Framework is to ensure that the Borrower (Eskom) assesses and manages the environmental and social risks and impacts associated with the project and where possible minimises the impact of the project. The framework is underpinned by the Environmental and Social Standards (ESS) and in Particular ESS1 which set out the requirements for borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing.

The objectives of the ESS1 are:

- To identify, evaluate, and manage the environment and social risks and impacts of the project in a manner consistent with the ESSs.
- To adopt a mitigation hierarchy approach to:
  a) Anticipate and avoid risks and impacts;
  b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
  c) Once risks and impacts have been minimized or reduced, mitigate; and
  d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.
- To adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing development benefits and opportunities resulting from the project.
- To utilize national environmental and social institutions, systems, laws, regulations, and procedures in the assessment, development, and implementation of projects, whenever appropriate.
- To promote improved environmental and social performance, in ways which recognize and enhance Borrower capacity. [2]

4.1.2 The Constitution of South Africa

The Constitution in Section 151 states that local government should provide a democratic and accountable government for communities. It also encourages municipalities to ensure the provision of services to communities in a sustainable manner to promote social and economic development. The local government must promote a safe and healthy environment and encourage community involvement in matters of local government.

Table 1: Aspects of the South African Constitution Applicable to SIA

Regulation	Description
Section 24 of the Constitution	Everyone has the right a. to an environment that is not harmful to their health or wellbeing; and b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: i. prevent pollution and ecological degradation. ii. promote conservation; and iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

4.1.3 National Environmental Management Act, 1998 (NEMA) (Act No 107 of 1998)

According to NEMA, sustainable development requires the integration of social, economic, and environmental factors in the planning, implementation, and evaluation of decisions to ensure that development serves present and future generations. NEMA also sets out the process for public participation.

4.1.4 National Environmental Management: Air Quality Act (Act 39 of 2004)

This act advocates for the enhancement and protection of air quality in the country. Future projects should not contribute to air pollution and ecological degradation. It also promotes justifiable economic and social development while securing ecologically sustainable development.

4.1.5 National Environmental Management: Waste Act (Act 59 of 2008)

The Act seeks to ensure that future interventions should protect the health, well-being and environment of the affected communities and seeks to increase awareness of the impact of waste on the health, well-being and environment of affected communities.

4.1.6 National Water Act (Act 36 of 1998)

The National Water Act seeks to ensure that projects and future interventions should not alter the capability of water resources to meet basic human needs. And seeks to maintain equitable access to water and the efficient, sustainable, and beneficial use of water. Future developments must reduce and prevent the pollution and degradation of water resources.

4.1.7 National Energy Act (Act No. 34 of 2008)

The Electricity Regulation Act gives the Minister of Energy the power to determine the need for new generation capacity and to take the initiative for its procurement. It also states that one needs a generation licence to produce over one megawatt of electricity.

The Act aims to strengthen energy planning in Electricity Regulation Act (Act No. 4 of 2006), Second Amendment (2011). The Act gives power to the Minister of Energy to determine new generation capacity and to approve the generation and procurement of electricity. A licence for generation capacity is subject to ministerial approval. An amendment to the Electricity Regulations on new generation capacity was made in 2015 this amendment provides for renewable energy power generation including PV generation.

4.1.8 National Development Plan

The National Development Plan (NDP) seeks to eliminate poverty and reduce inequality by 2030. The NDP aims to achieve its goal by growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society. A key focus of the NDP is the country's ability to return to a state of continued and uninterrupted electricity supply. This was to be achieved by increasing the electricity generation reserve margin from 1% (2014) to 19% in 2019, which would require the development of 10 Giga Watt (GW) of additional electricity capacity by 2019 against the 2010 baseline of 44GW. Five of the 10 GW were to be sourced from renewable energy sources, with an additional 2GW to be operational by 2020. The NDP aims to acquire 2GW of renewable energy in efforts to move the country to less carbon reliant means of energy production by 2030.

4.1.9 New growth path framework

The New growth Path framework sets out the framework for economic policy and the drivers for creating jobs in the South African economy. The NGP targeted 5 million new jobs by 2020. It also aimed for 300,000 additional direct jobs by 2020 to green the economy. The framework identifies investments in five key areas namely: energy, transport, communication, water and housing. Sustaining high levels of public investment in these areas will create jobs in construction, operation and maintenance of infrastructure. The New Growth Path identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the

State and the private sector. The Green economy will include expansions in construction and the production of technologies for solar, wind and biofuels as supported by the draft Energy on Integrated Resource Plan. There is potential for renewable energy generation to provide for some of these 300 000 jobs and to provide green power to the economy to generate additional jobs (State of Renewable energy in south Africa, 2015).

4.1.10 Industrial Policy Action Plan (IPAP)

The IPAP is driven by the Department of Trade and Industry. The IPAP is an annually updated, three-year rolling plan for industrial policy implementation; since 2011 it has specifically identified the energy sector (solar and wind energy); as a priority for the country's industrial sector in (2014). In its review report the following was reported in terms of progress made in the green economy specifically reporting on the Renewable Energy Independent Power Producer Programme (REIPPPP) programme stating that this has proved an extraordinarily successful green economy project, attracting investment to the value of R201.8 billion, contributing 3,162 MW of electricity generation capacity and mandating South African entity participation of 40% (Industrial Policy Action Plan 2018/19-2020/21).

4.1.11 Integrated Resource Plan 2019

The Integrated Resource Plan (IRP) is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, considering security of supply and the environment namely to minimize negative emissions and water usage. The first plan was promulgated in March 2011, the plan is a living plan and was last updated in 2019.

The 2019 report indicates that a total 6 422 MW under the REIPPP has been procured, with 3 876 MW operational and made available to the grid. Current base from wind is 1 980 MW in 2018 by 2030 this will be 17 742 MW which is the highest of all renewable energy sources. The next closest is PV Solar 8 288 but coal will still dominate with in 2030 with 333 64 MW.

Table 2: **Draft IRP 2018**

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)

However, the 2019 report also states that build limits on renewables (wind and solar) will remain in place until the next review limiting the development of new renewable energy build projects. Imposing annual build limits on renewables for the period up to 2030 does not affect the capacity from wind or solar PV in any significant way.

4.1.12 National Spatial Development Perspective

According to the National Spatial Development Perspective, spatial development should, where appropriate, accommodate and promote private economic ventures, which can aid sustainable economic growth, relieve poverty, increase social investment, and improve service delivery. Consequently, municipal-level spatial planning has been considered where relevant.

4.1.13 Spatial Planning and Land Use Management Act (Act 16 of 2013)

The Act seeks to ensure that projects do not alter the progress made in promoting social and economic inclusion and that future interventions should promote the efficient and sustainable use of land. Interventions should contribute towards redressing equity concerns in the affected communities through land-use management systems.

4.1.14 Mpumalanga Spatial Development Framework

The Mpumalanga Spatial Development Framework (MSDF) emanates from the SPLUMA. It serves to outline the role of transparent developmental, regulatory land and development management.

The MSDF plans to explore the possibility of renewable energy generation. It intends to make use of land that has low agricultural potential and is unused for renewable energy production, namely solar and wind [3].

4.1.15 Nkangala District Municipality Integrated Development Plan

The Municipal Systems Act 32 of 2000 requires municipal planning to be developmentally oriented and that municipalities undertake an integrated development planning process to produce Integrated Development Plans (IDP).

The IDP highlights the Nkangala District Municipality's (NDM) vision to "improve the quality of life for all." The NDM aims to accomplish its vision by aligning its priorities with the National Development Plan – Vision 2030 (NDP) [4].

4.1.16 Steve Tshwete Local Municipality Integrated Development Plan

The Steve Tshwete Local Municipality (STLM) strives to be the leading service delivery and governance municipality. It intends to achieve this by the following strategic goals:

1. Provision of sustainable and accessible basic services to all.
2. Provide a safe, healthy environment.
3. Promote economic growth and job creation.
4. Promote good governance, organisational development, and financial sustainability.

4.1.17 GPN - Addressing Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH) in Investment Project Financing involving Major Civil Works, 2020

This Good Practice Note (GPN) aims to assist Task Teams in identifying risks of SEA/SH that can emerge in projects involving major civil works contracts – and to advise on how to best manage such risks.

The ESIA will identify the potential social impacts that the project may have on women in the project affected area and will recommend measures to mitigate these potential impacts.

4.1.18 GPN - Addressing Gender Based Violence in Investment Project Financing involving Major Civil Works, 2018

This GPN was seeks to assist Task Teams in establishing an approach to identify risks of Gender Based Violence, in particular SEA and SH, that can emerge in Investment Project Financing with major civil works contracts and to advise accordingly on how to best manage such risks.

The GPN builds on World Bank experience and good international industry practices, including those of other development partners. While World Bank Task Teams are the primary audience, the GPN also aims to contribute to a growing knowledge base on the subject.

The ESIA identifies the potential social impacts that the project may have on women in the project affected area.

4.1.19 GPN – Gender, 2019

To address constraints cited in many economies as impediments to closing these gaps, such as occupational sex segregation, with women and girls often streamed into lower-paying, less secure fields of study and work; high rates of unpaid work by women; lack of safe, affordable transportation; high prevalence of gender-based violence and, more specifically, of SEA/SH in workplaces; lack of clear land and housing ownership and tenure security, wherein women's rights tend to be informal so that they are at greater risk of being displaced from land and other asset ownership; and inadequate investment in and prioritization of care services, from early childhood to old age.

The strategy sets out to help countries address challenges such as maternal mortality while also considering emerging challenges such as ageing populations, climate change, fragility, conflict, and violence, and slowing economic growth.

The ESIA will identify the potential social impacts that the project may have on the health and wellbeing of women in the project affected area. It also assesses the potential impacts on the social standing and benefits from the project.

There will be no physical or economic displacement as a result of the project.

4.1.20 GPN - Road safety, 2019

The ESF road safety requirements are defined in ESS 4. The following objective are applicable:

- To identify, evaluate and monitor the potential traffic and road safety risks to workers, affected communities and road users throughout the project life-cycle and, where appropriate, will develop measures and plans to address them. The Borrower will incorporate technically and financially feasible road safety measures into the project design to prevent and mitigate potential road safety risks to road users and affected communities"
- To undertake a road safety assessment for each phase of the project, and will monitor incidents and accidents, and prepare regular reports of such monitoring. The Borrower will use the reports to identify negative safety issues and establish and implement measures to resolve them.
- To put in place appropriate processes, including driver training, to improve driver and vehicle safety, as well as systems for monitoring and enforcement. The Borrower will consider the safety record or rating of vehicles in purchase or leasing decisions and require regular maintenance of all project vehicles.
- To take appropriate safety measures to avoid the occurrence of incidents and injuries to members of the public associated with the operation of construction equipment.

The impacts on traffic and general road safety in the project affected area will be assessed in the ESIA.

4.1.21 GPN - Assessing and managing the risks and impacts of the use of security personnel, 2018

To assess and manage potential environmental and social risks and impacts arising from projects.

The health and safety and security of communities is assessed and considered in the ESIA.

4.1.22 GPN - Assessing and Managing the risks of adverse impacts on communities from temporary project induced labor influx, 2016

To assist the identification and management of risks to and impacts on local communities related to the influx of labour that typically results from construction works.

The potential impacts of the influx of labourers and labour seekers will be assessed in the ESIA.

4.1.23 Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)

Workers and employers, without distinction whatsoever, shall have the right to establish and, subject only to the rules of the organisation concerned, to join organisations of their own choosing without previous authorisation.

The right to associate is enshrined in the constitution of South Africa.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.24 Right to Organise and Collective Bargaining Convention, 1949 (No. 98)

Workers' and employers' organisations shall enjoy adequate protection against any acts of interference by each other or each other's agents or members in their establishment, functioning or administration.

The right to collectively bargain is enshrined in the constitution of South Africa.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa

4.1.25 Forced Labour Convention, 1930 (No. 29)

Aims to suppress the use of forced or compulsory labour in all its forms within the shortest possible period.

The constitution of South Africa states that no one may be subjected to slavery, servitude or forced labour.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.26 Abolition of Forced Labour Convention, 1957 (No. 105)

Undertakes to suppress and not to make use of any form of forced or compulsory labour--

a) As a means of political coercion or education or as a punishment for holding or expressing political views or views ideologically opposed to the established political, social or economic system;

b) As a method of mobilising and using labour for purposes of economic development;

c) As a means of labour discipline;

d) As a punishment for having participated in strikes;

e) As a means of racial, social, national or religious discrimination.

The constitution of South Africa states that no one may be subjected to slavery, servitude or forced labour.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.27 Minimum Age Convention, 1973 (No. 138)

Seeks to ensure the effective abolition of child labour and to raise progressively the minimum age for admission to employment or work to a level consistent with the fullest physical and mental development of young persons.

The Basic Conditions of Employment Act in South Africa states that it is a criminal offence to employ a child younger than 15.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.28 Worst Forms of Child Labour Convention, 1999 (No. 182)

To secure the prohibition and elimination of the worst forms of child labour as a matter of urgency.

he Basic Conditions of Employment Act in South Africa states that it is a criminal offence to employ a child younger than 15.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.29 Equal Remuneration Convention, 1951 (No. 100)

To ensure the application to all workers of the principle of equal remuneration for men and women workers for work of equal value.

The Employment Equity Act states that no person may discriminate directly or indirectly against an employee on the basis of race, gender, sex, pregnancy, marital status, family responsibility, ethnic or social origin, colour, sexual orientation, age, disability, religion, HIV status, conscience, belief, political opinion, culture, language and birth or on any other arbitrary grounds.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.30 Discrimination (Employment and Occupation) Convention, 1958 (No. 111)

To declare and pursue a national policy designed to promote, equality of opportunity and treatment in respect of employment and occupation.

The Employment Equity Act states that no person may discriminate directly or indirectly against an employee on the basis of race, gender, sex, pregnancy, marital status, family responsibility, ethnic or social origin, colour, sexual orientation, age, disability, religion, HIV status, conscience, belief, political opinion, culture, language and birth or on any other arbitrary grounds.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

4.1.31 Occupational Safety and Health Convention, 1981 (No. 155)

Employers shall be required to ensure that the workplaces, machinery, equipment and processes under their control are safe and without risk to health.

The Occupational Health and Safety Act seeks to provide for the health and safety of people at work or in connection with the use of plant and machinery.

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

5.0 SOCIAL BASELINE

5.1 Mpumalanga Province

Mpumalanga Province is located in the north-eastern part of South Africa. The province borders two of South Africa's neighbouring countries, Mozambique and Swaziland; and four other South African provinces, namely, Gauteng, Limpopo, KwaZulu-Natal and Free State Provinces (Figure 2). Mpumalanga is characterised by the high plateau grasslands of the Middleveld, which roll eastwards for hundreds of kilometres. It rises towards mountain peaks in the northeast and terminates in an immense escarpment [5].

Figure 2: South African regional map [6]

Mpumalanga province covers an area of 76 495km² and has a population of approximately 4 300 000 [7]. The capital city of Mpumalanga is Mbombela, and other major cities and towns include Emalahleni, Standerton, eMkhondo, Malelane, Ermelo, Barberton and Sabie. The province is divided into three district municipalities: Gert Sibande, Ehlanzeni and Nkangala District Municipalities. These three districts are further subdivided into 17 Local Municipalities. The proposed development falls within the Steve Tshwete Local Municipality (STLM). The STLM falls within the Nkangala District Municipality (NDM).

5.2 Nkangala District Municipality

The NDM has municipal executive and legislative authority in an area that includes more than one municipality which makes it a Category C municipality[1], located in the Mpumalanga Province. It is one of three district municipalities in the province, making up 22% of its geographical area. The NDM comprises the Victor Khanye, Emalahleni, Steve Tshwete, Emakhazeni, Thembisile Hani, and Dr JS Moroka local municipalities (Figure 3). The NDM is headquartered in Middelburg. The NDM is the economic hub of Mpumalanga and is rich in minerals and natural resources [8].

[1] A municipality that has municipal executive and legislative authority in an area that includes more than one municipality.

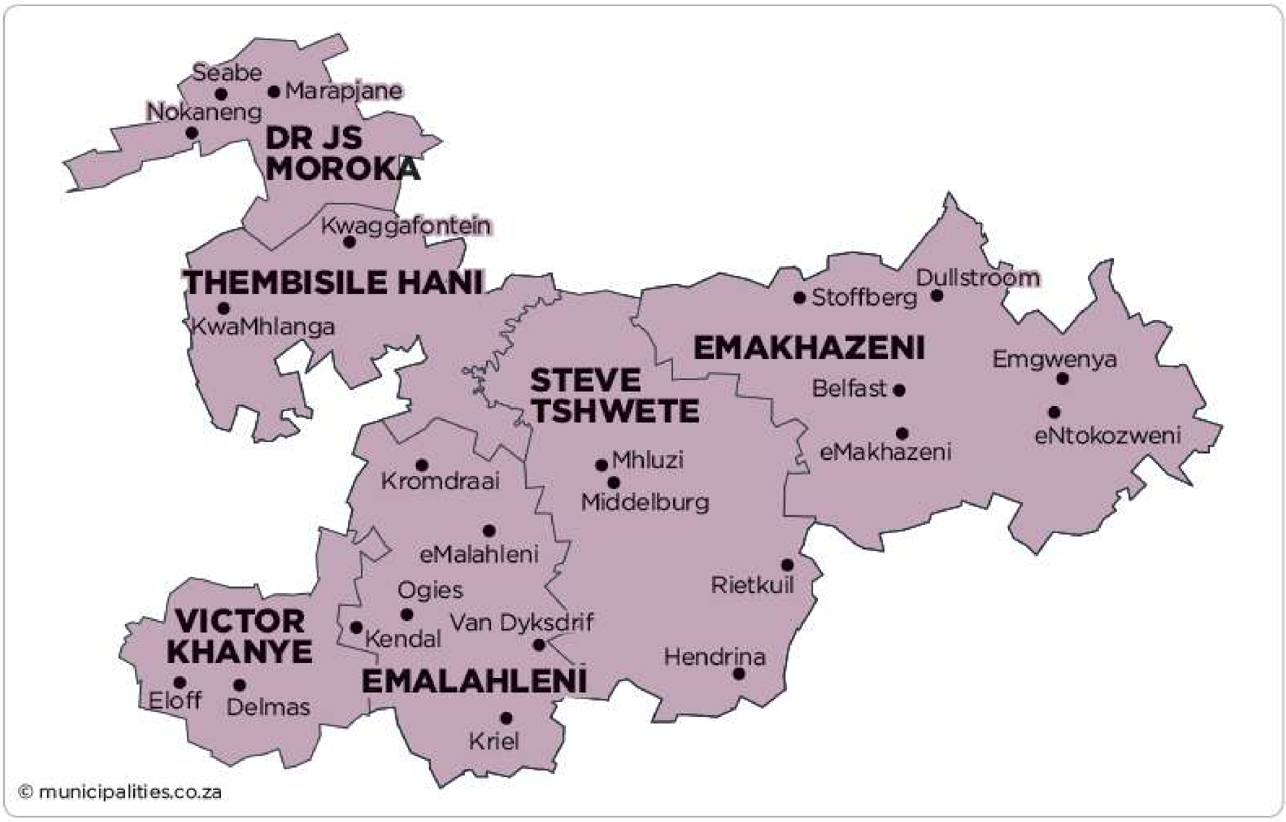

Figure 3: Nkangala District Municipality [9]

5.3 Steve Tshwete Local Municipality

STLM is approximately 3,976 square kilometres in extent, representing 23.7% of the NDM's land mass. To the west it is bordered by the Emalahleni and Thembisile Hani Local Municipalities; the Govan Mbeki and Msukaligwa Local Municipalities in Gert Sibande District to the south; and the Emakhazeni and Chief Albert Luthuli Local Municipalities to the east (Figure 3). Adjacent to the north of the Steve Tshwete Municipality is Elias Motsoaledi Municipality which forms part of the Sekhukhune District Municipality in Limpopo Province.

5.3.1 Population

The STLM's population increased to 278 749 between 2011 and 2016 (Figure 4) which represents an increase of 21.3% over the five-year period. The growth rate was 4.3% over the same period. It is estimated that in 2030 the population of the municipality will be approximately 510 000 [10]. The gender distribution of the municipality was almost equal with females representing 48% and males 52% of the population in 2011(Figure 5). People aged between 15 and 64 years old represent 70.7% of the population with 25% of the population representing the young and 4.3%, the elderly [11].

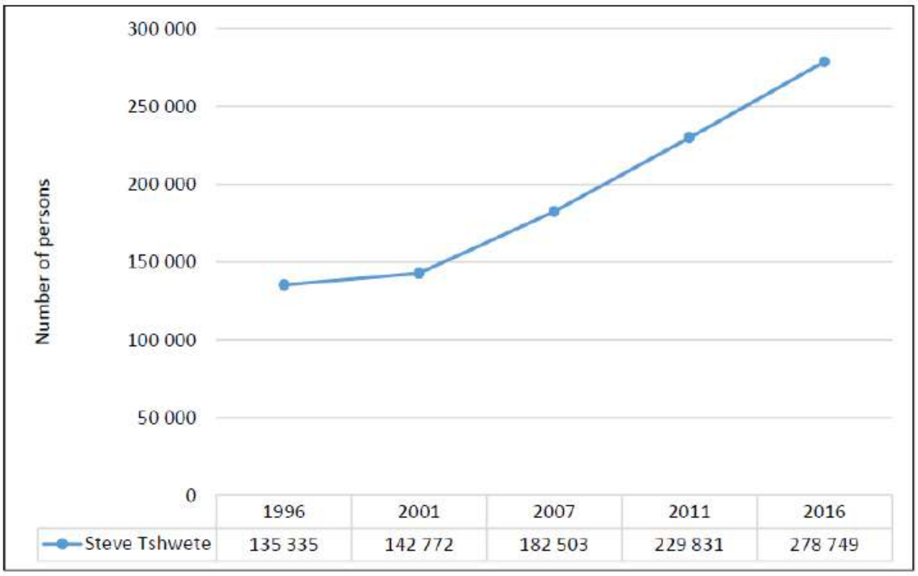

Figure 4: STLM population size [10]

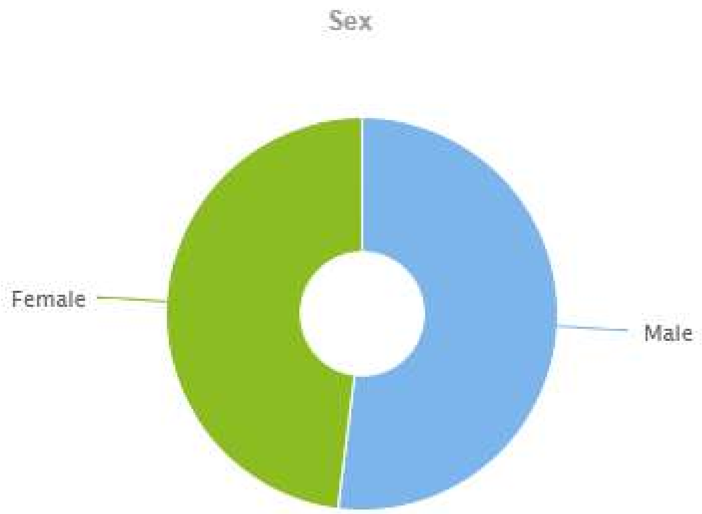

Figure 5: STLM gender distribution [11]

5.3.2 Ethnicity and language

Almost 74% of the municipality is represented by Black African people followed by nearly 22 % White and smaller portions representing remaining ethnicities as shown in Table 3 [11].

Table 3: Distribution of Steve Tshwete Local Municipality by population group [11]

Group	Percentage
Black African	73.6%
Coloureds	2.6%
Indian or Asian	1.6%
White	21.8%
Other	0.4%

Isizulu is the language most spoken in the municipality followed by Afrikaans, isiNdebele, Sepedi and other in smaller proportions (Table 4).

Table 4: Distribution of Steve Tshwete Local Municipality by language spoken

Language	Percentage
IsiZulu	27,8%
Afrikaans	22,1%
IsiNdebele	14,6%
Sepedi	10,6%
English	5,8%
Others	19.1%

5.3.3 Education

In 2011, approximately 17 000 people over the age of 20 had no form of formal education and approximately 42 500 people have completed secondary education. Approximately 2.2 % (5 050 people) have received higher educational training. Table 5 shows the levels of education represented in the municipality.

Table 5: Distribution of the levels of education represented in the municipality

Group	Percentage
No Schooling	3,1%
Some Primary	37,8%
Completed Primary	5,8%
Some Secondary	31,1%
Completed Secondary	18,5%
Higher Education	2,2%
Not Applicable	1,5%

5.3.4 Vulnerable Groups

Vulnerable groups include the economically disadvantaged, racial and ethnic minorities, the uninsured, low-income children, the elderly, the homeless, those with HIV, and those with other chronic health conditions, including severe mental illness and indigenous people. There are no identified vulnerable groups in the project area.

5.3.5 Indigenous People

Due to the varied and changing contexts in which indigenous peoples live, there is no universally accepted definition of indigenous peoples. For this Project, the term indigenous people is used in a generic sense to refer to a distinct, vulnerable, social, and cultural group, which possess the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others

- Collective attachment to geographically distinct habitats or ancestral territories in the Project area and the natural resources in these habitats and territories
- Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- An indigenous language, often different from the official language of the country or region.

(World Bank, 2013)

The screening was undertaken to determine whether indigenous peoples are present in, or have a collective attachment to, the Project-affected area. There are no indigenous people as defined above in the Komati power station area.

5.3.6 Employment and income profile

The unemployment rate of STLM decreased from 19.7% in 2011 to 16.4% and is among the lowest in the municipalities within the Mpumalanga province. The unemployment rate for females of 21.8% is nearly double that of males at 12.9%. The youth unemployment, as recorded by the 2011 census, is 27.1% [10].

5.3.7 Types of Employment

In 2011, there were 682 people employed in the formal sector and 76 in the informal sector [12]. Eskom is the major employer in the area. Komati is also surrounded by agricultural land where people will be employed in this sector.

5.3.8 Labour

Eskom will adhere to the International Labour Organisation Conventions which have been ratified by South Africa.

5.3.9 Child Labour

Eskom will not employ child labour in the construction or in the operation of the facilities.

5.3.10 Housing

The number of households in the STLM increased by almost 22 000 from 64 971 in 2011 to a total of 86 713 in 2016. The STLM provides services such as water, electricity and waste to these households. The average size of a household has declined from 3.5 to 3.2 people in the same period [10].

5.3.11 Health

The main challenges to the health care in the STLM is the prevalence of HIV/AIDS. A decrease in the HIV/AIDS prevalence rate was recorded between 2011 and 2013, seeing a decline from 52% to 43%. This decrease is attributed to increased HIV Counselling and Testing campaigns in the local municipality and increased community awareness [10].

5.3.12 Security and Safety

The Komati community is serviced by the Blinkpan Police Station. The crime statistic published for the 2020/2021 financial year by the South African Police Service (SAPS) indicated that only 62 contact crimes were committed during the period with Assault with the intent to inflict grievous bodily harm being record, Common assault and Robbery with aggravating circumstances representing 89% of contact crimes.

In total, 298 community reported serious crimes were reported at the Blinkpan Police Station with 71% (208) being theft, followed by contact crimes (21%) and property related crimes (6%).

Eskom will either provide or contract security during the construction and operation of the Project these will be trained professionals and will need to sign a code of conduct committing themselves to the protection of the local communities.

5.3.13 Gender-Based Violence

In terms of gender-based violence, i.e. Rape, Sexual assault, and contact sexual offences, two cases were recorded at the Blinkpan Police Station during the2020/2021 period. Both cases were rape cases.

There is no organisation based in the Komati area that offer GBV services to victims. However, the Department of Social Development established a GBV command centre in 2013 that allows a survivor to contact the centre and be assigned a social worker close to them. There are national NGOs that offer services to GBV victims namely, People Opposing Woman Abuse (POWA), Sonke Gender Justice and Shukumisa.

5.3.14 Agricultural Lands

There are 8 681 households that take part in agricultural activities in the Steve Tshwete Local Municipality. The main types are poultry (28%), livestock (24%) and vegetable growing (21%). Other crops and other types of agriculture represent 9% and 19% respectively.

5.4 Social and physical infrastructure

5.4.1 Schools

There is one school in the Komati area (Laerskool Koornfontein). The nearest secondary school (Allendale Secondary School) is 27 kilometres from Komati.

5.4.2 Healthcare

The nearest hospital to the project location is the Impungwe Public Hospital which is 30 kilometres from Komati power station. The nearest provincial hospital is the Middleburg Provincial Hospital, which is 42 kilometres from Komati, in Middelburg.

5.4.3 Water and sanitation

In the STLM, 60.8% of households have access to piped water inside dwellings and 24.2% have access to piped water inside the yard. Community stands provide piped water to 13.1% of households while the remainder of the households rely on tankers, boreholes, dams and other sources of water [13].

5.4.4 Electricity

Based on the District Municipality's IDP, the STLM's energy supply is licensed from a third party. The supply has become strained due to supply infrastructure failures and the unwillingness of coal suppliers to become long-term suppliers to Eskom. The export market is more lucrative for the coal suppliers [4].

The STLM must make efforts to address the electricity supply issues by emphasising the following [4]:

1. Partially licenced municipalities to provide electricity.
2. Municipalities exceeding their notified maximum demand.
3. Non-payment of bulk electricity.
4. Ageing of bulk electricity Infrastructure.
5. Inadequate bulk electricity infrastructure to meet the demand.
6. Lack of operation and maintenance plan.
7. Theft of solar panels from the borehole pump station.

With the stated supply constraints, households in the STLM have good access to electricity with a 91% of households having access to electricity.

5.4.5 Access to sanitation

Over half (51%) of NDM households have access to flush toilet facilities and 43% use pit latrines. The rest of the households rely on other types of sanitation facilities. The majority of STLM households (84%) have access to flush toilet facilities,9% use pit latrines and the rest rely on other types of facilities [13].

5.4.6 Access to waste removal

In contrast to the NDM, who only 40% of its population makes use of refuse dumps [13], 84.7% of the households in the STLM have their waste removed weekly by the municipality and only 11% of the households make use of a refuse dump [11].

5.4.7 Telecommunications

Komati is serviced by all the major network providers in the country. It has access to 4G/LTE coverage and access to the internet via the service provider rain.

5.4.8 Public Transport

The Komati area relies on taxis as the main form of public transportation. The area is serviced by the Middelburg District Taxi Association. Buses also operate in the area but are mainly used as scholar transport.

6.0 IDENTIFICATION AND HIGH-LEVEL SCREENING IMPACTS

6.1 Impact assessment approach

GNR 982 requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase impacts. The screening tool is based on two criteria: probability; and consequence, where the latter is based on a general consideration of the intensity, extent, and duration.

Significance Screening Tool

Probability Scale		1	2	3	4
	1	Very Low	Very Low	Low	Medium
	2	Very Low	Low	Medium	Medium
	3	Low	Medium	Medium	High
	4	Medium	Medium	High	High

Probability Scores and Descriptors

Score	Descriptor
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur

Score	Descriptor
1	**Improbable:** The possibility of the impact occurring is very low

Table 6: Consequence Score Description

Score	Negative	Positive
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: Long-term impacts on the affected system(s) or party(ies) could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long-term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time-consuming, or some combination of these.
2	Moderately severe: A medium to long-term impact on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long-term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time-consuming (or some combination of these) as achieving them in this way.
1	Negligible: A short to medium term impact on the affected system(s) or party(ies). Mitigation is straightforward, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are more accessible, cheaper, and quicker, or some combination of these.

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (**Table 7**) has been applied according to the nature and significance of the identified impacts.

Table 7: Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	**Negligible**
Very Low	**Very Low**

Negative Impacts (-ve)	Positive Impacts (+ve)
Low	**Low**
Medium	**Medium**
High	**High**

The key objectives of the risk assessment methodology are to identify any additional potential social issues and associated social impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

The significance ranking is calculated using the following formula:

Significance=(Extent+Duration+Reversibility+Magnitude)×Probability $[S = (E + D + R + M) \times P]$

6.1.1 Identification of impacts

Based on the collected secondary data, outcomes of the stakeholder consultation and expert knowledge, impacts were identified and categorised according to the project phase in which the impacts are likely to occur, construction, operation, closure and decommissioning phases.

6.2 Preliminary key impacts

The Komati Solar Photovoltaic and Battery Energy Storage System has been selected based on several factors namely: repurposing the Komati power station, solar resources, environmental constraints, readily available grid connection, site access, and land ownership. The following section analyses the social impacts of the Komati facility with the preliminary impact's construction, operational and closure phase of the facility. The following section analyses the social impacts of the Komati facility.

6.2.1 Construction Phase

6.2.1.1 Economic Impact

During the construction phase of the project, the Principal Engineer appointed by Eskom will require various goods and services. These requirements are likely to generate economic opportunities for local businesses. It is anticipated that the construction workforce (sourced from outside the surrounding communities) will be housed in local accommodations (guest houses or rental options) adding to the local economy. Provided that a significant proportion of money derived from wages earned would likely be spent in the vicinity of the project area, it is expected to create substantial flows of revenue within the surrounding communities, thus acting as a catalyst for growth in the formal and secondary economy. Additionally, workers sources from the surrounding communities are foreseen to spend an even larger proportion of their wages within the local communities further adding to the flows of revenue.

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[2] Impacts that arise directly from activities that form an integral part of the Project.

[3] Impacts that arise indirectly from activities not explicitly forming part of the Project.

[4] Secondary or induced impacts caused by a change in the Project environment.

[5] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

6.2.1.2 Community, Health and Safety Risk

During construction, noise affects humans differently, and the new noise which will be coming from the facilities. The construction of facilities can result in traffic and resources are being transported. Waste material that results from the construction could be detrimental to aesthetics and nearby community.

Social ills may also increase in the area with construction known to result in an influx of people from further afield seeking employment opportunities. The limited opportunities may result in increased unemployment in the area and thus increased crime.

Construction activities can be take much longer than initially planned at the beginning of a project. This can result in extended stays away from home for the labourers, who are generally men, and this may lead to an increase in the night economy.

Table 8: Ratings of impacts during the construction phase

	Impact					
	Magnitude	Extend	Reversibility	Duration	Probability	Significance
Economic Impact	3	3	3	2	4	44
Community, Health and Safety Risk	3	3	3	2	3	33

6.2.2 Operational phase

6.2.2.1 Low Carbon Power Generation

During the operational phase of the project, no waste or emissions will be produced by the facility. South Africa's per capita greenhouse emissions are the highest in Africa [14] thus this project will aid in reducing the carbon footprint and emissions of the country.

6.2.2.2 Impact on the community

The change in the landscape/view within the community and the increased presence of construction workers may lead to a decreased sense of place/belonging for the residents of the area.

6.2.2.3 Employment and Business Opportunities

The maintenance of the facility and functioning of the facility will create employment. It is assumed that the unskilled labour will be sourced from the local community and that skilled labour, within reason, will be sourced from the local communities as well.

Table 9: Ratings of impacts during the operational phase

	Impact					
	Magnitude	Extend	Reversibility	Duration	Probability	Significance
Low Carbon Power Generation	3	4	1	4	5	60
Impact on the community	3	3	3	4	4	52
Employment and Business Opportunities	3	3	3	4	4	52

6.2.3 Decommissioning and closure phase

6.2.3.1 Loss of employment

During this phase the operational workforce will lose their jobs and it may lead to adverse social consequences in the municipality and labour sending area.

6.2.3.2 Reduced community investment

There will be reduced local spending by Eskom and its staff and contractors. Consequently, local business revenue may be affected.

Table 10: Ratings of impacts during the decommissioning phase

	Impact					
	Magnitude	Extend	Reversibility	Duration	Probability	Significance
Loss of employment	4	3	3	4	4	56
Reduced community investment	4	3	3	4	4	56

6.3 Cumulative impacts

6.3.1 Visual impacts

The proposed development will change the aesthetics of the project area. Construction activities, dust mobilisation and construction vehicles traversing the proposed site, as well as the presence of new infrastructure will transform the landscape. The solar panels will be visually prominent from several vantage points.

6.3.2 Employment

One of the positive short-term social impacts will be the creation of jobs. Construction activities will create several temporary employment opportunities. Other social impacts include the increased demand on local services, the influx of job seekers, social problems arising from population increase in the area, change in land use and the effect on sense of place.

6.3.3 Traffic

Transportation of construction materials and workers to the proposed site, during the construction phase is anticipated to have a significant impact on the condition of the transportation infrastructure and traffic volumes in the area. Additional heavy construction vehicles have the potential to damage roads, create noise, dust, and cause risks impacts for other road users and residents in the area.

6.3.4 Economic benefits

Increased expenditure during the construction of the proposed facility will contribute to the local economy. The income of the workers will also increase spending in the local community and thus stimulate the formal and informal sectors and secondary industries, having a positive multiplier effect.

The local businesses used will be skilled in the construction of solar facilities leading to a wider range of opportunities for the business and its workers.

7.0 TERMS OF REFERENCE

Following the approval of the Terms of Reference (ToR) by the Mpumalanga Province: Department of Economic Development, Environment and Tourism, field work will be undertaken to collect socio-economic data. This study will employ a predominantly qualitative approach (i.e. interviews, meetings and focus group discussions) to gather data.

Environmental Impact Assessment (EIA) for the project in line with the National Environmental Management Act 107 of 1998 (NEMA) [EIA Regulations (2014 as amended)] and the World Bank ESS Guidance notes will be undertaken. As part of the environmental authorisation process a Social Impact Assessment (SIA) is required. The SIA will:

- Describe the socio-economic conditions of the receiving environment.
- Identifying and describing the socio-economic implications associated with the proposed project.
- Identify, describe, and rate the significance of the socio-economic impact that may result from the proposed project.
- Recommend feasible (practical and cost-effective) mitigation measures to enhance positive effects and reduce negative impacts.

8.0 CONCLUSION

The development of the proposed Komati Solar Photovoltaic and Battery Energy Storage System is in line with legislative and policy frameworks. The Project will create employment, training, and business opportunities during both the construction and operation phases of the project. The potential negative impacts associated with the construction phase and operation phase can be mitigated. Detailed mitigation measures will be outlined in the Social Impact Assessment Report.

The proposed development will also represent an investment in clean, renewable energy infrastructure for the country which will go some way to offset the negative environmental and socio-economic impacts associated with coal-based fossil fuel energy generation. Renewable energy also addresses climate change and assists the country in meeting its climate change reduction goals.

The potential visual, noise and dust impacts will be assessed from these specialist studies to be undertaken as part of the EIA. The cumulative impacts on the area's sense of place and assessment of significance of impacts will be informed by the findings of the visual and noise assessments undertaken for the proposed facility as part of the EIA.

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APPENDIX

E-12 *GROUNDWATER*

REPORT

Hydrogeological Investigation - Eskom Komati Power Station
WSP Group Africa (Pty) Ltd

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1.0 INTRODUCTION

Eskom Holdings SOC Limited (Eskom) appointed WSP (Pty) Ltd (WSP) to undertake the Environmental & Social Impact Assessment (ESIA), and Water Use Licence Application (WULA) processes for the Solar Photovoltaics (PV) and Battery Energy Storage System (BESS) Project at Komati Power Station (KPS) - Request for Quote (RFQ): Task Order: 00211.

This report provides the hydrogeological investigation and impact assessment of Eskom KPS as part of the Environmental & Social Impact Assessment (ESIA). It is understood that a Water Use License Application (WULA) authorization process will follow for potential (c) and (i) water uses.

1.1 Background

The KPS is about 37 km from Middelburg, 43 km from Bethal and 40 km from Witbank via Vandyksdrift in the Steve Tshwete Municipality, Mpumalanga Province of South Africa. The regional setting is provided in Figure 1.

KPS was initially commissioned in 1961 and operated until 1990. The power station was mothballed in 1990 but was returned to service in December 2005 (Eskom, 2021, Mochesane & Brummer, 2015). The station has a total of nine units, five 100 MW units on the east (Units 1 to 5) and four 125 MW units on the west (Units 6 to 9), with a total installed capacity of 1000 MW but will reach its end-of-life expectancy in September 2022. The regional layout is presented in Figure 1.

Water is supplied via pipeline by the Komati Government Water Scheme which originates from the Nooitgedacht dam, (Mochesane & Brummer, 2015).

1.2 Proposed activity

Eskom is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for KPS. The plan is to install 100 MW of Solar Photovoltaics (PV) and 150 MW of Battery Energy Storage System (BESS). The proposed development (refer Figure 2) is located within the property owned by Eskom termed the Project Area for reporting purposes. KPS is located in the east of the Project Area with Komati town in the north. The areas of investigation within the Project Area include:

Block A – located in the south-west corner of the Eskom property with the R542 to the south, Komati town to the north, agricultural land and the Goedehoop Colliery (an underground coal mine) to the west and the Eskom Komati Ash dumps and dams (termed the Ashing area) to the east,

Block B – located in the north-west corner of the Eskom property with Goedehoop Colliery to the west and north and Komati town to the east and

Four smaller portions are located around the KPS plant. These include:

- Block C: Between Komati town and south-west of the KPS,
- Block D: South-west of the KPS,
- Block E: North-east of KPS in the coal stockyard bounded to the north-east by the Koringspruit River,
- Block F: East of KPS and down-gradient of the KPS ash dams.

Further information on the proposed infrastructure and specifications are provided in the ESIA report.

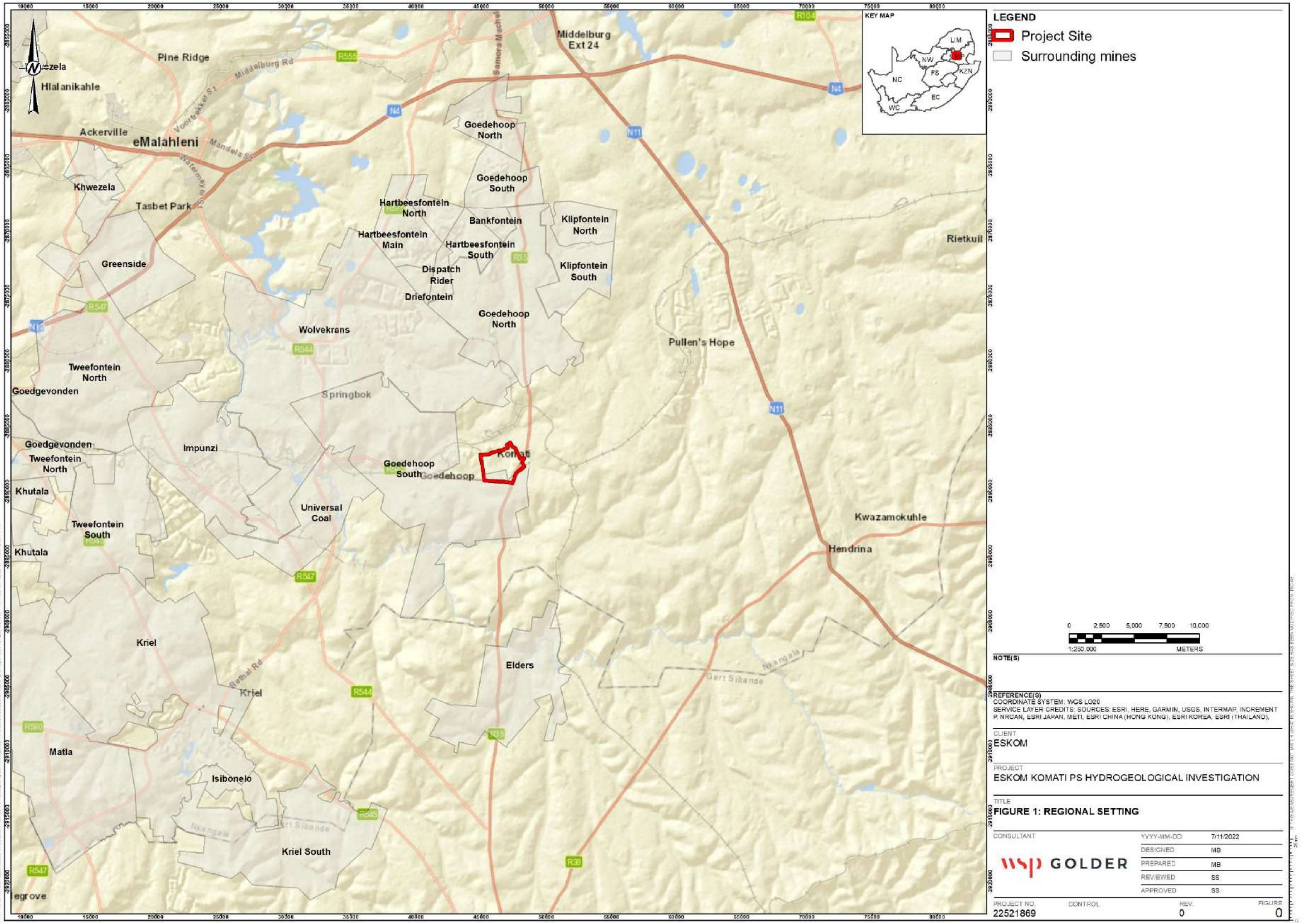

Figure 1: Regional setting

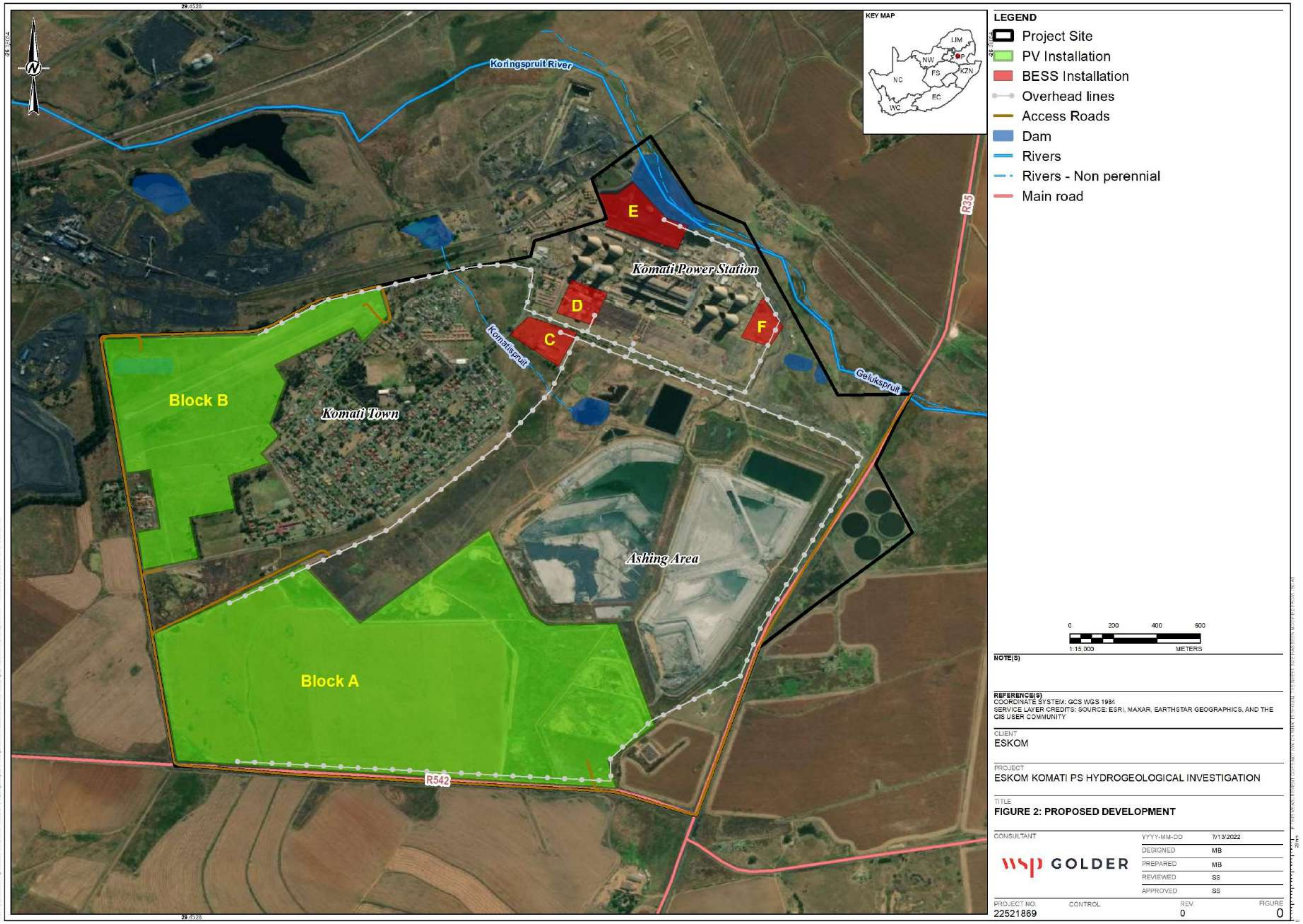

Figure 2: Proposed Development

1.3 Legislative context

Eskom has an existing Water Use License (WUL) and an amendment (WULA):

- Water Use License number 04/B11B/BCGI/1970 dated 2 February 2014 – Eskom KPS facility. The groundwater reserve is provided in this License.
- Water Use License number 04/B11B/CI/2556 dated 11 January 2015 – c and I construction of Komati storage facility within 500m from a boundary of an unchanneled valley bottom wetland and seepage wetland.
- Amendment License in terms of Section 50 and 158 of the NWA, 7/08/2017.
- Amendment of Eskom holdings SOC (Pty) Limited: KPS WUL in terms of Section 50 and 158 of the NWA, 22 February 2021.
- Waste Management Facility: KPS Ash Disposal facility (License #: 12/9/11/L1010/6), and

Decommissioning Waste Management License (License #12/9/11/L73467/6).

1.4 Objectives

The main objective of the hydrogeological investigation is to provide a report including:

- Detailed baseline description of groundwater conditions,
- Identification and high-level screening of impacts,
- Recommendations for potential mitigation measures.

1.5 Scope of Work

The scope of work includes the following:

- Review of available information,
- Compilation of a qualitative IA for the proposed new activities, and
- Reporting on the current site groundwater conditions, conceptual model understanding.

1.6 Limitations and data gaps

The following limitations were noted as part of the study:

- The study is based on available data and has not been verified.
- The available monitoring data is limited to the area surrounding the KPS. Groundwater monitoring data is therefore limited in the PV and BESS areas with no information for Block B, C, D and F. This was resolved following the completion of the study carried out as part of the Contaminated Land Scope of work (WSP Report 41103965 dated 16 August 2022) which included the drilling of 10 shallow boreholes.
- Water level data for 2022 was not available and the borehole elevation has not been surveyed for the monitoring boreholes. The 2021 water level data was obtained from the monitoring reports, but it is noted that the latest data is handwritten, and the sample IDs are not verified. For example, there is no monitoring borehole AB08, it is assumed that this point is PB08. An update on water levels was provided from the boreholes drilled as part of the Contamination Land Scope of Work as discussed above.

- Borehole logs are limited to 9 of the 26 boreholes. There was no water strike nor yield information supplied at the time of drilling. Depth to weathering has therefore been assumed. This was confirmed by the study carried out during the Contaminated Land Study.

There is little distinction between a shallow perched aquifer and deeper fractured rock aquifer in the monitoring data.

2.0 GEOGRAPHICAL SETTING

2.1 Topography and drainage

Topography information was sourced from the 1:50 000 topographic map series, Mathetsa, 2021 and Mathetsa, & Swatz, 2019. The Project Area is a generally undulating with Block A located in the higher lying areas and sloping towards the small drainage line of the Koringspruit River to the north (towards Block B) approximately 1585 mamsl in the floodplain. The highest points lie near the junction of R35 and R542 provincial roads at approximately 1655 mamsl in the southern portion of the site (Block A). The ashing area (east of Block A) is situated at 1650 to 1615 mamsl.

The Project Area is located in the Olifants River quaternary sub-catchment B11B. The Koringspruit River flows past the northern boundary. The Koringspruit River also passes the Koornfontein and Goedehoop Coal mines and joins the Olifants River some 15 km downstream of the Project Area. The Komati spruit originates in the Ashing area (east of Block A) and drains the area west of the Ashing Area to the Koringspruit River. The Power Plant and Coal Stockyard (Area E) are situated on a topographic flat ±1605 mamsl with a poor drainage pattern. The Gelukspruit flows in a northwesterly direction and drains the area east and north of the Project Area towards the Koringspruit River. According to Mathetsa, & Swatz, 2019, this stream was diverted to prevent ingress into power plant areas and remains so due to the location of the current KPS activities. Several drains and dams have been constructed around the Ashing area, Power Plant area and Coal Stockyard area. A seepage area/drainage line within the dirty water area of the existing ash dams is noted by Mathetsa, 2021 and probably contains seepage off the ash dams which have been used as water storage facilities. Surface run-off from the KPS is in the order of 5% of the annual rainfall. An artificial wetland has developed to the east of the Coal stockyard area and is locally present along the Komati spruit between the KPS and Komati town (Mochesane & Brummer, 2015).

2.2 Climate

The Project Area experiences summer rainfall (Eastern Highveld) with cold dry and mild winters and warm, wet summers. Temperatures vary from maximum temperatures from 27 ^{0}C in January to 17 ^{0}C in July. Frost occurs frequently between May and September. The area also hosts to dust storms during prolonged dry periods.

Rainfall is seasonal with a Mean Annual Precipitation (MAP) of 687 mm and Mean Annual Evaporation (MAE) is 1550 mm per annum, (Mathetsa, 2021). A higher rainfall of approximately 735 mm was estimated by Halenyane, 2019.

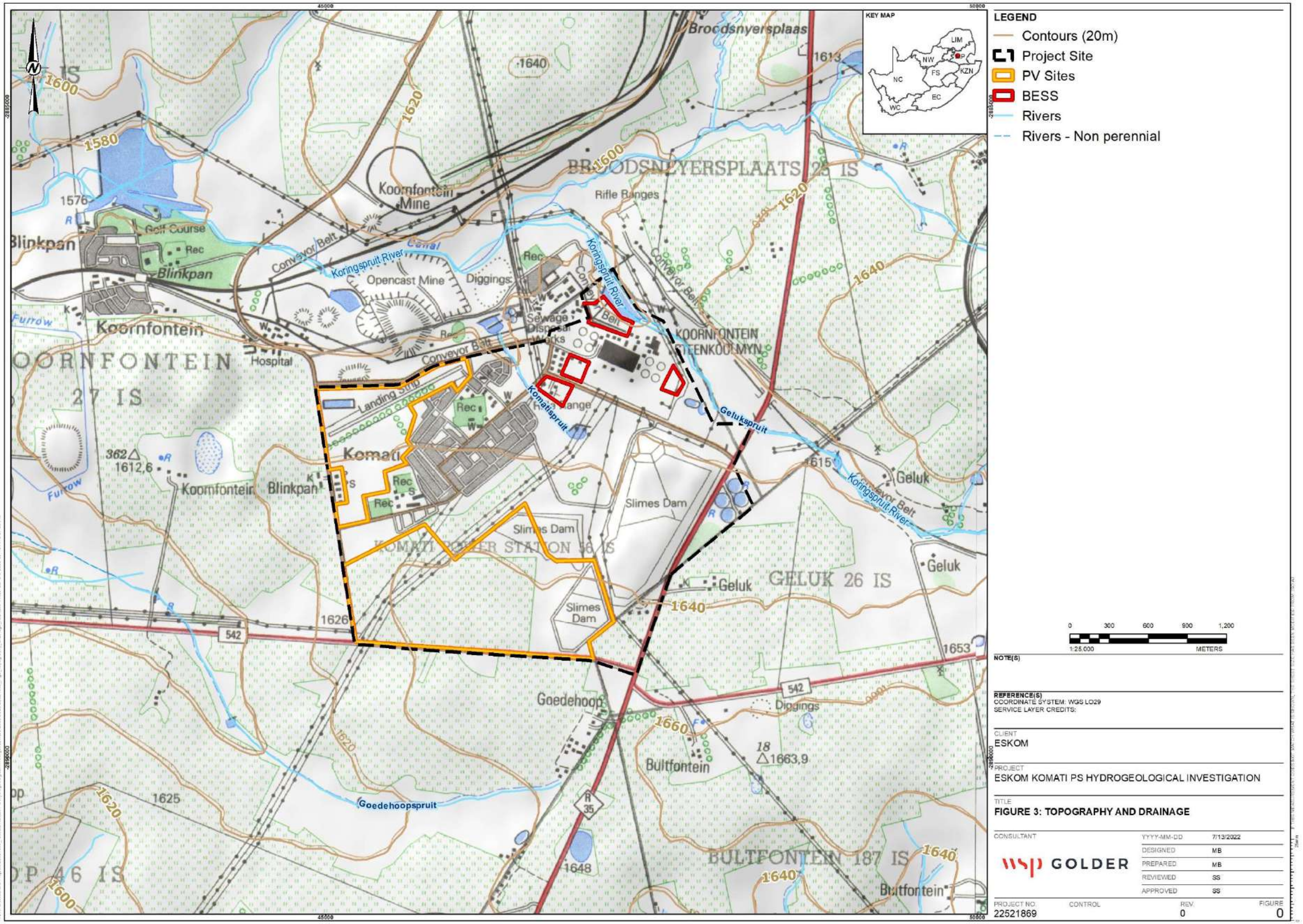

Figure 3: Topography and drainage

3.0 METHODOLOGY

3.1 Desk study

Previous groundwater studies focused on the KPS area. A summary of information provided by Eskom is presented in Table 1. Additional information is pending from the contaminant land investigation currently in progress.

A report (SRK 566657, 2021) was sourced from public information on the adjacent Goedehoop Colliery. The report is referenced as Jeffrey, L and Wertz M, March 2021, Independent Competent Person's Report on Goedehoop Colliery, SRK Report reference 566657. *https://thungela.s3.eu-west-1.amazonaws.com/downloads/investors/Goedehoop-Colliery-CPR-dated-25-March-2021.pdf.*

Table 1: Summary of available information

Type of information	Report Reference
Baseline information and hydrocensus	Van Niekerk, L.J. and Staats, S, July 2009, Komati Power Station Hydrological & geohydrological baseline study, GHT Consulting Scientists, RVN 537.5/909
IWWMP	Mochesane, M & Brummer, D, December 2015, Integrated water and waste management plan for Komati Power Station, Mpumalanga Province, Lidwala Consulting Engineers (SA) (PTY) Ltd, 16906 PRO_ENV
Numerical model	Halenyane, K September 2019, Numerical modelling and geochemistry assessment, Eskom Komati Power Station, Gauteng, Kimopax (Pty) Ltd, KIM-WAT-2018-233
2019 hydrocensus	Mathetsa, S & Swatz, N, August 2019, Komati Hydrocensus Report - 2019, Applied chemistry and microbiology section: sustainability Division Eskom, RTD/ACM/19/240-149029270
Groundwater quality	Komati WISH data – groundwater database supplied 15 June 2022.
Water level and quality monitoring Reports	Mathoho, G & Khuzwayo, L, Oct 2017, Komati Surface and Groundwater Monitoring Report, Phase 4, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/17/04
	Mathoho, G, Khuzwayo, L, and Samuels, V, Oct 2017, Komati Surface and Groundwater Monitoring Report, Phase 3, Eskom Sustainability Division, Research, Testing and Development Technical report. RTD/ACM/16/240-118739170
	Mathoho, G, April 2016, Komati Surface and Groundwater Monitoring Report, Phase 01, Eskom Sustainability Division, Research, Testing and Development Technical report. 240-112294332
	Mathoho, G, January 2017, Komati Surface and Groundwater Monitoring Report, Phase 02, Eskom Sustainability Division, Research, Testing and Development Technical report. Rrtm/acm/16/240-118739170
	Mathoho, G & Khuzwayo, L, April 2018, Komati Surface and Groundwater Monitoring Report, Phase 5, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/17/05
	Mathoho, G & Khuzwayo, L, May 2018, Komati Surface and Groundwater Monitoring Report, Phase 6, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/17/06
	Mathoho, G & Khuzwayo, L, May 2018, Komati Surface and Groundwater Monitoring Report, Phase 7, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/18/240-140434399
	Mathetsa, S & Swartz, N, August 2018, Komati Surface and Groundwater Monitoring Report, Phase 8, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/18/240-140434709

Type of information	Report Reference
	Mathetsa, S & Swartz, N, September 2019, Komati Surface and Groundwater Monitoring Report, July to September 2019, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/19/240-152749979
	Mathetsa, S & Swartz, N, September 2019, Komati Surface and Groundwater Monitoring Report, April to June 2019, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/19/240-150762666
	Sinthumule, N & Mathetsa, S, May 2020, Komati Surface and Groundwater Monitoring Annual Report, 2020/2021, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/20/240-163860231
	Mathetsa, S, November 2020, Komati Surface and Groundwater Monitoring - Quarter 2 of 2020/2021, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/20/240-160324741
Latest Water quality reports by Eskom	Mathetsa, S, January 2021, Komati Surface and Groundwater Monitoring - Quarter 3, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/21/240-1615539477
Latest Water quality reports by Eskom	Sinthumule, N, March 2022, Komati Surface and Groundwater Monitoring - Quarter 3, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/21/240-190000008

3.2 Hydro-census

A hydrocensus was carried out in 2008 (Van Niekerk & Staats, 2009) with selected points (thirteen) resampled in 2019 (Mathetsa & Swatz, 2019), Refer Figure 4. These covered an approximate 15 km radius around KPS. The census boreholes are focused in the area to the north-east of KPS and are presented in Table 2. The results of the hydrocensus confirmed the following:

- The hydrocensus area is mainly underlain by the Ecca sediments of Karoo Supergroup.
- Water level information was limited as most boreholes were installed with infrastructure which blocks access to water levels.
- Water quality analyses was carried out on the hydrocensus boreholes. This confirmed that concentrations were generally below the SANS 241:2015 limits for domestic use and is therefore suitable for drinking (based on the parameters analysed).
- Groundwater is utilized for domestic use with *ad hoc* use for irrigation.

Table 2: Hydrocensus boreholes (2008) with 2019 update indicated in blue text

SiteID	Longitude (°E)	Latitude (°S)	Farm Name	Farmer/ Owner	Bore-hole Depth (m)	Casing Height (m)_2008	Equipment	Use	WL Below Collar (mbcl)	Condition
BB10	29.42091	-26.04868	Welverdiend 23/2	Engelbreght	~	0.200	Submersible	Domestic Drink	~	Good
BB11	29.45898	-26.06239		G.F. Grobler	~	0.520	Hand pump	Domestic Drink	~	Good
BB12	29.46227	-26.06161		G.F. Grobler	~	0.300	Submersible	Domestic Drink	~	Broken
BB13	29.44845	-26.06403	Koornfontein 27/6	G.F. Grobler	27.2	0.280	Submersible	Domestic Drink	16.20	Blackish water
BB14	29.48485	-26.05469	Broodsnyers-plaas 25/10	Siyavuma Vervoer	~	0.000	Submersible	Domestic Drink	11.80	Good
BB15	29.49044	-26.05852	Broodsnyers-plaas 25/28	H De Beer	~	0.350	Submersible	Domestic Drink	~	Good
BB16	29.50683	-26.07076	Broodsnyers-plaas 25/1	P Storm	~	0.320	Hand pump	Domestic Drink	~	Good
BB17	29.49821	-26.07593	Broodsnyers-plaas 25/5	P Storm	66.0	0.000	Submersible	Domestic Drink	24.00	Good
BB18	29.49867	-26.07736		P Storm	85.0	0.000	None (2008), Pump (2019)	~	Dry	Dry hole (2008), in use in 2019

SiteID	Longitude (ºE)	Latitude (ºS)	Farm Name	Farmer/ Owner	Bore-hole Depth (m)	Casing Height (m)_2008	Equipment	Use	WL Below Collar (mbcl)	Condition
BB19	29.49741	-26.07693		P Storm	~	0.100	Hand pump	Domestic Drink	~	Good
BB20	29.48213	-26.08393	Broodsnyers-plaas 25/3	D Lee	26.1	0.100	Submersible	Domestic Drink	14.10	Good
BB21	29.47954	-26.10598	Geluk 26/7	MCL Dippenaar	26.8	0.200	None (2008), Windmill (2019)	~	2.20 (2008); 1.76 (2019)	Windmill (2019)
BB22	29.47907	-26.10586	Geluk 26/7	MCL Dippenaar	~	0.000	Submersible	Domestic Drink	~	Good
BB23	29.47905	-26.10632	Geluk 26/7	MCL Dippenaar	11.0	0.230	Submersible	Domestic Drink	4.50	Broken (2008) indicated to be in use 2019
BB24	29.47125	-26.11574	Goedehoop 46/3	F Schoeman	~	0.300	Submersible	Domestic Drink	15.00	Good
BB25	29.47127	-26.11574	Goedehoop 46/3	F Schoeman	26.5	0.300	Submersible	Domestic Drink, Livestock	20.50	Good
BB26	29.47783	-26.11699	Bultfontein 187/2	K Van Rensburg	6.1	0.100	None	~	Dry	Dry hole
BB27	29.47912	-26.11710	Bultfontein 187/2	K Van Rensburg	42.0	0.440	Submersible	Domestic Drink, Livestock	32.00	Good
BB28	29.50721	-26.11221	Bultfontein 187/11	Van Niekerk	~	0.680	Mono pump	Domestic Drink	~	Good
BB29	29.49529	-26.12859	Bultfontein 187/12	Von Wielligh	52.0	0.520	Submersible	Domestic Drink, Livestock	13.00	Good
BB30	29.50947	-26.13509	Bultfontein 187/6	E Erasmus	40.0	0.480	None	~	8.50	No Equipment
BB31	29.50961	-26.13511	Bultfontein 187/6	E Erasmus	~	0.120	Mono pump	Domestic Drink	~	Good
BB32	29.53378	-26.14317	Hartebeestkuil 185/2	D Van Woutenberg	~	0.370	None	~	5.00	No Equipment
BB33	29.53470	-26.14244	Hartebeestkuil 185/2	D Van Woutenberg	8.0	0.360	None	~	2.00	No Equipment
BB34	29.53840	-26.14023	Hartebeestkuil 185/2	D Van Woutenberg	~	0.100	Mono pump	Domestic Drink, Livestock	~	Good
BB35	29.49518	-26.15330	Wilmansrust 47/3	C.J. Van der Merwe	15.0	0.180	Submersible	Domestic Drink, Livestock	3.00	Works only in dry season
BB36	29.49503	-26.16079	Wilmansrust 47/3	C.J. Van der Merwe	32.0	0.170	Submersible	Domestic Drink, Livestock	18.00	Good
BB37	29.51189	-26.17976	Dunbar 189/2	Proefplaas	12.0	0.150	Submersible	Domestic Drink	3.50	Good
BB38	29.48366	-26.17902	Middelkraal 50/1	BJ Grobler	~	0.450	Windmill	~	~	2019: in use
BB39	29.48336	-26.17877		BJ Grobler	~	0.300	Mono pump	Livestock	~	Occasional use for domestic
BB40	29.48339	-26.17864		BJ Grobler	~	0.280	Submersible	Domestic Drink, Livestock	3.00 (2008), 2.72 (2019)	Not in use
BB41	29.47363	-26.16277	Leeufontein 48/3	BJ Grobler	~	0.450	Windmill	~	~	Not in use for a long time
BB42	29.47537	-26.16495	Leeufontein 48/16	BJ Grobler	~	0.000	Windmill	~	~	Not in use for a long time
BB43	29.42195	-26.12209	Goedehoop 46/7	J Harmse	15.0	0.300	Submersible	Domestic Drink	8.00	Good
BB44	29.42193	-26.12198		J Harmse	55.0	0.100	Submersible	Domestic Drink, Livestock	5.00	Good
BB45	29.41625	-26.11591		J Harmse	~	0.300	Windmill	~	~	Not in use for a long time
BB46	29.42719	-26.11853		J Harmse	~	0.600	Windmill	~	~	Not in use for a long time

It should be noted that groundwater is abstracted from the adjacent Goedehoop Colliery where groundwater is also utilized for supply, (SRK 566657, 2021).

Monitoring boreholes are also present on the site (Refer Figure 4). Additional boreholes were drilled as part of a concurrent study which is still in progress (Figure 4). A summary of the information from the monitoring boreholes is included in Section 4.4 to follow.

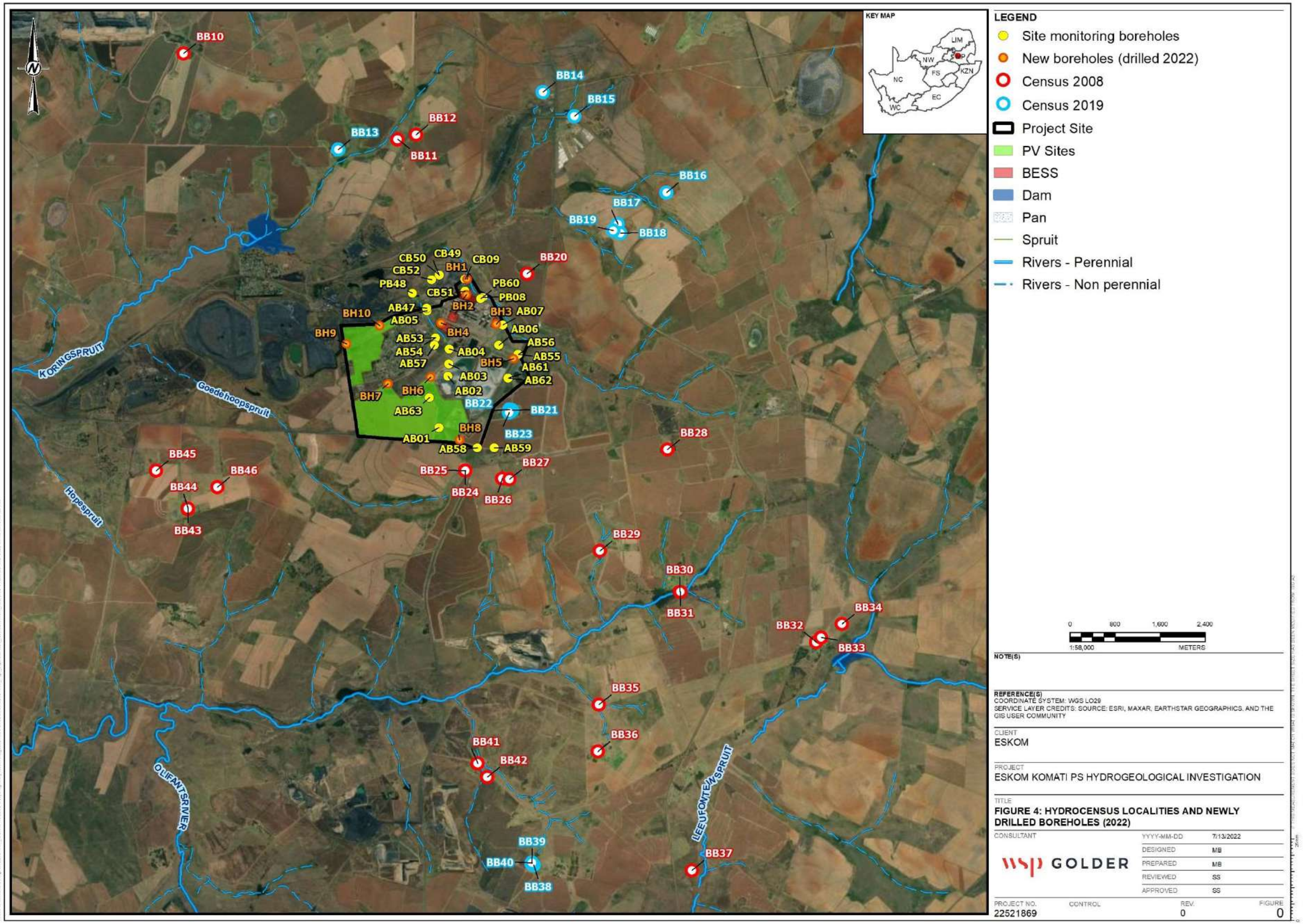

Figure 4: Hydrocensus localities and newly drilled boreholes (2022)

3.3 Geophysical survey and results

Geophysics was carried out for the 2008 baseline (Van Niekerk & Staats, 2009) and the geophysical survey focused on the boundaries of the ashing facility. The survey delineated potential drill sites for the ashing facilities for pollution remediation or management of pollution plumes from the facilities. The survey was conducted using the magnetic method to identify intrusive magmatic rocks, primarily dolerites sills or dykes, in the vicinity of the Project Area.

3.4 Drilling and siting of boreholes

A monitoring program has been established for the KPS. While some information is available from (Van Niekerk & Staats, 2009), borehole logs were unavailable for all the points. Monitoring points located in or near the vicinity of the proposed activities are included in blue text in Table 3 below with additional information from the remaining monitoring points provided for reference. here are no monitoring boreholes located in or around Blocks B, C and D.

Based on the data provided, it is inferred that shallow boreholes are drilled to depths of < 10 m below ground level (mbgl) whilst deeper boreholes are drilled to a depth of > 30 mbgl.

Table 3: Data for Monitoring boreholes (boreholes located in or adjacent to the proposed activities are indicated in blue text)

Locality	Sample ID	Latitude (°S)	Longitude (°E)	Eleva-tion [5]	Bore-hole depth	Sample depth (mbgl)(1)	Lithology
Ambient upstream (south) of Ashing area and Block A T junction - Witbank road.	AB58	-26,1121	29,473	1662	ND		
	AB59	-26,1121	29,476	1662	ND-shallow		
Inside Block A - Western boundary of Ashing Area and downstream of old rehabilitated domestic waste site.	AB01	-26.10885	29.4665	1652	35.5	15	Clay to 7,5m, weathered Sandstone to 17,5m, Siltstone and shale to 25m, coal to 26m, Siltstone and sandstone to 40m
	AB63	-26,1040	29,465	1643	ND		
Outside Eastern boundary Block A - West of Ashing Area north of small ash dam as well as west of large ash dams.	AB02	-26.10053	29.4681		32.5	20	Clay to 5m, weathered sandstone to 13m, shale and siltstone layers to 26m Dolerite at base.
Outside Eastern boundary Block A - West of Ashing Area. West of ash dam and in town area	AB53	-26,0944	29,466	1617	ND-deep		
Outside but adjacent to Block F (east of KPS boundary) downstream of seepage recovery dam AP03.	AB07	-26.09225	29.47787	1612	37.0	15	Gravel to 1m, clay to 3m, weathered sandstone to 12m, Sandstone, siltstone and shale layers to 28m, coal to 29m, sandstone to 39m
Inside Block E - Coal Stockyard Area (water is black)	CB51	-26,0868	29,471	1601	ND		
Outside Block F on north-eastern corner of boundary & downstream of Coal Stockyard Area & dirty water dam	CB09	-26.08481	29.47110		36.5	31	Soil/Clay to 2m, shale to 12m, siltsone and sandstone to 17m, shale to 20, coal to 21, shale to 23m, sandstone and siltstone to 37m, shale and coal layers at base.
Outside Block F on eastern boundary - downstream KPS Area	PB60	-26,0880	29,474	1608	ND		
Ashing Area- Monitoring borehole downstream and north of small ash dam as well as west of large ash dams.	AB03	-26.09855	29.46826		7.5 (collapsed)	-	Clay to 12m.

Locality	Sample ID	Latitude (°S)	Longitude (°E)	Eleva-tion [5]	Bore-hole depth	Sample depth (mbgl)(1)	Lithology
Ashing Area north-west of ash dams and south of dam AP02.	AB04	-26.09615	29.46831	1621	38.0	8.5	Clay to 8m, weathered sandstone to 11m, Shale and siltstone to 33m, dolerite at base
Ashing Area next to Komati Spruit west of KPS.	AB05	-26.08999	29.46438		8.5 (collapsed)	-	Clay to 8m, weathered sandstone to 16m
Ashing Area north and downstream of ash dams.	AB06	-26.09551	29.47715	1620	37.0		
KPS & Sewage Plant Area	PB08	-26.08780	29.47429	1604	35.5	13	Clay to 5m, coal to 6m, siltstone and shale to 11m, sandstone to 15m, shale and coal to 18m, shale to 40m
Not indicated – probably incorrectly labelled	AB08	ND	ND	ND			
Ashing Area close to Komati Spruit, west of KPS.	AB47	-26,8096	29.464304	1609	ND		
Ashing Area west of ash dam, next to AB53	AB54	-26,0944	29,466	1617	ND - Shallow		
Ashing Area North of ash dam. Next to tar road at Entrance road to KPS	AB55	-26,0970	29,481	1621	ND - Deep		
Ashing Area- North of ash dam. Next to tar road at Entrance road to KPS	AB56	-26,0970	29,481	1621	ND-shallow		
Ashing Area - West of ash dam	AB57	-26,0955	29,466	1621	ND		
Ashing Area - East of ash dam.	AB61	-26,1008	29,479	1634	ND- deep		
Ashing Area east of Ash Area – Shallow borehole and artesian	AB62	-26,1008	29,479	1634	ND-shallow		
Coal Stockyard Area	CB49	-26,0841	29,466		ND- deep		
Coal Stockyard Area	CB50	26,0842	29,467		ND-shallow		
Coal Stockyard Area	CB52	-26,0850	29,465	1603	ND		
KPS Area- north of sewage plant	PB48	-26,0871	29,462	1608	ND		

Notes: ND – no data
(1) – Van Niekerk & Staats, 2009
(1) – Mathetsa & Swart, 2018
(2) – Mathetsa & Swart, 2018
(3) - Sinthumule & Mathetsa, 2019
(4) – Sinthumule, 2022. Note that water levels were interpolated from hand written notes in appendix.
(5) - 1 Mathoho, G & Khuzwayo, 2017

An additional ten shallow boreholes were drilled as part of the current contaminated land study. This information will be included in that report once complete.

3.5 Aquifer testing

The baseline report (Van Niekerk & Staats, 2009) carried out falling head tests on eight of the nine monitoring boreholes available at the time. Hydraulic conductivity was estimated as ranging from 0,007 m/d at AB07 to 2.4 m/d for AB04 with an average of 0,51 m/d. No further testing has been done.

3.6 Sampling and chemical analysis

Eskom has an extensive monitoring network covering an area of 10 km^2 (Mathetsa, 2021) and is focused on the KPS. According to Eskom's monitoring data, the monitoring boreholes include:

- Boreholes (AB58 and AB59) monitoring the ambient (upstream groundwater quality);
- Boreholes (AB61, AB62, AB01, CB51, and PB48) were delineated as source monitoring boreholes and

- Boreholes (AB02, AB03, AB63, AB55 and AB56) are used to track the groundwater plume.

Sampling is carried out by Eskom. Eskom reports that it follows a groundwater sampling guideline which includes bailing of water samples at a discrete interval from pre-determined sampling depths. This was provided for a few monitoring boreholes from the baseline report in 2008 but is not stated in subsequent monitoring reports. It is noted that some of the boreholes appear to have collapsed over the preferred sample depth.

Groundwater quality parameters that need to be analysed are specified in the WUL (Appendix IV, Table 6 Clause 3.6) as pH, Electrical conductivity (EC), Total Dissolved Solids (TDS), Total Suspended Solids (SS), Total Alkalinity, chloride (as Cl), sodium (as Na), sulphate, nitrate, ammonia, orthophosphate, fluoride, potassium, manganese, copper, iron, zinc, arsenic and chromium.

As noted above, groundwater monitoring in the areas proposed for the BESS and PV are limited with monitoring boreholes located in Block A (area west of Ash dams) and in Block E (coal stock yard). Ten shallow boreholes have been drilled as part of a congruent study being carried out to assess the potential for contaminated land in the areas of investigation. This study is still pending, and the results were not available at the time of reporting.

3.7 Groundwater recharge calculations

The regional recharge distribution (37 – 50 mm/a), as provided by the hydrogeological map series information for South Africa, is presented in Figure 6. This is slightly higher than provided by the available reports which provide the following estimates:

- 3% of annual rainfall (20,6 mm/a based on 687 mm/a) in undisturbed areas Mathetsa, 2021.
- 36,5 mm/a estimated by Halenyane, 2019 based on the chloride method.

3.8 Groundwater modelling

Groundwater modelling was not carried out for this investigation as no pollution dams or 21 (g) water use are required for the PV and BESS plants. A comprehensive numerical groundwater model has been compiled for the KPS area as detailed by Halenyane, 2019.

The model considered the potential existing sources for KPS of the existing ash dams, coal stock yard, new ash return water dam and raw water dams.

Conclusions and recommendations from the model report are summarized as follows:

- The groundwater contaminant plume is expected to migrate post closure past the KPS boundary to the Koringspruit. It was recommended that the coal stockyard area be removed upon closure and disposed to an approved waste disposal facility pending confirmation of waste classification results (not provided).
- All water in contact with the ash dams should be contained and treated within the footprint area.
- The raw water and new ash return water dams need to be removed on closure, contaminated soil removed, and the footprints rehabilitated.
- Additional monitoring points were recommended, and it was noted that monitoring should continue for at least ten years following closure.

3.9 Groundwater availability assessment

Groundwater is utilized by the surrounding communities and the adjacent Goedehoop Colliery for water supply.

Groundwater availability is described as “d2” being primarily from an intergranular and fractured rock aquifer with an anticipated yield of between 0,1 and 0,5 l/s.

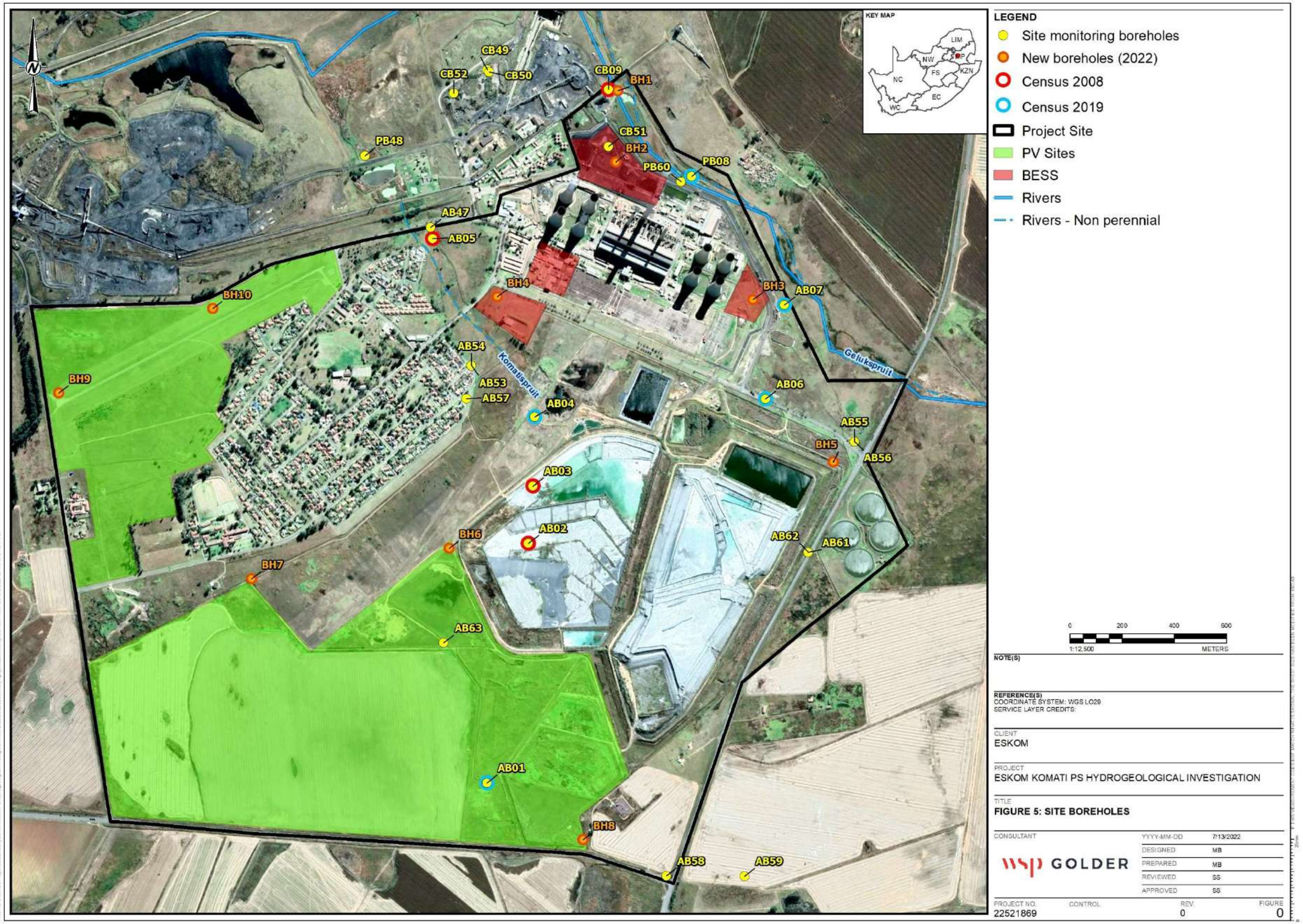

Figure 5: Site boreholes

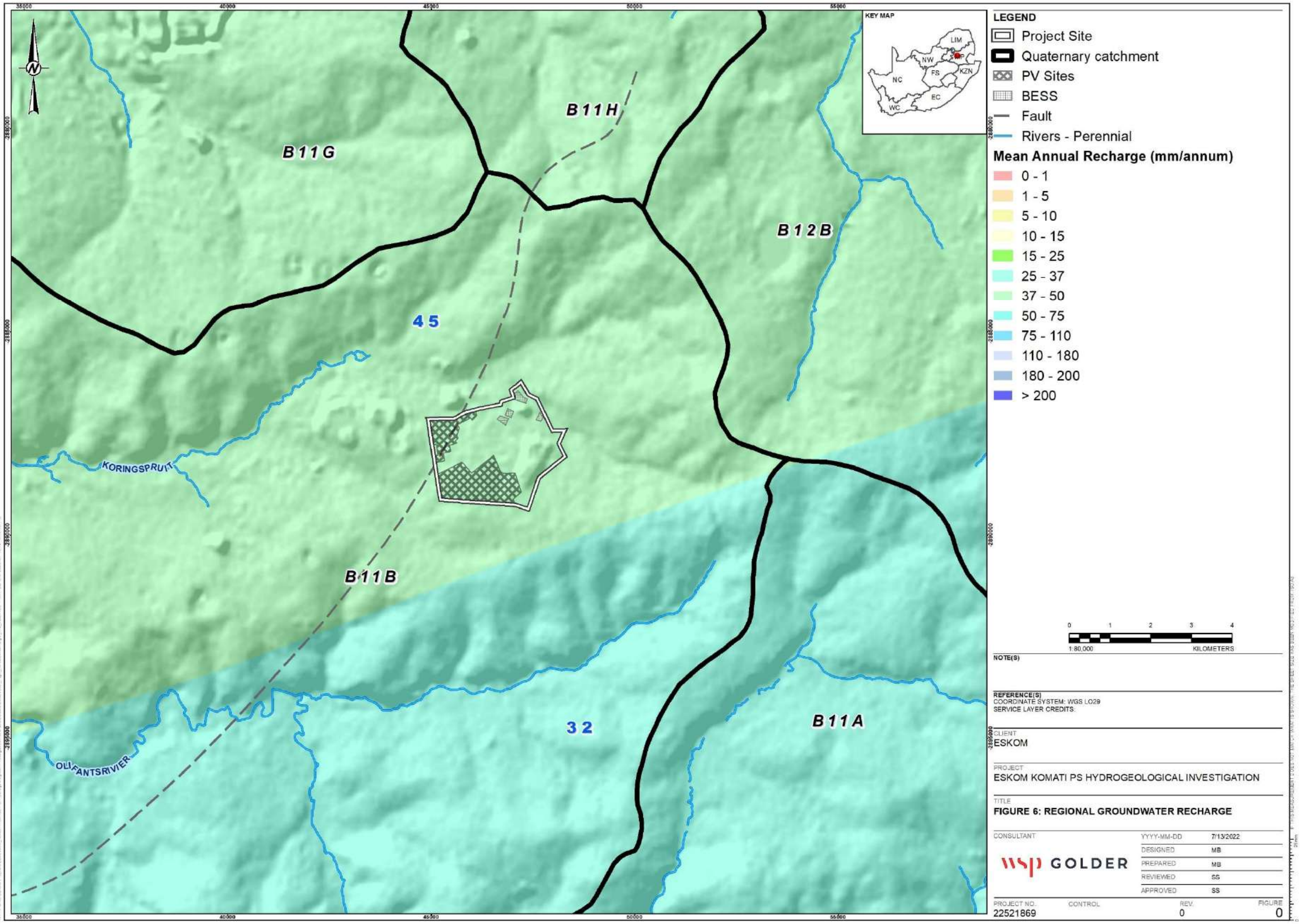

Figure 6: Regional recharge distribution

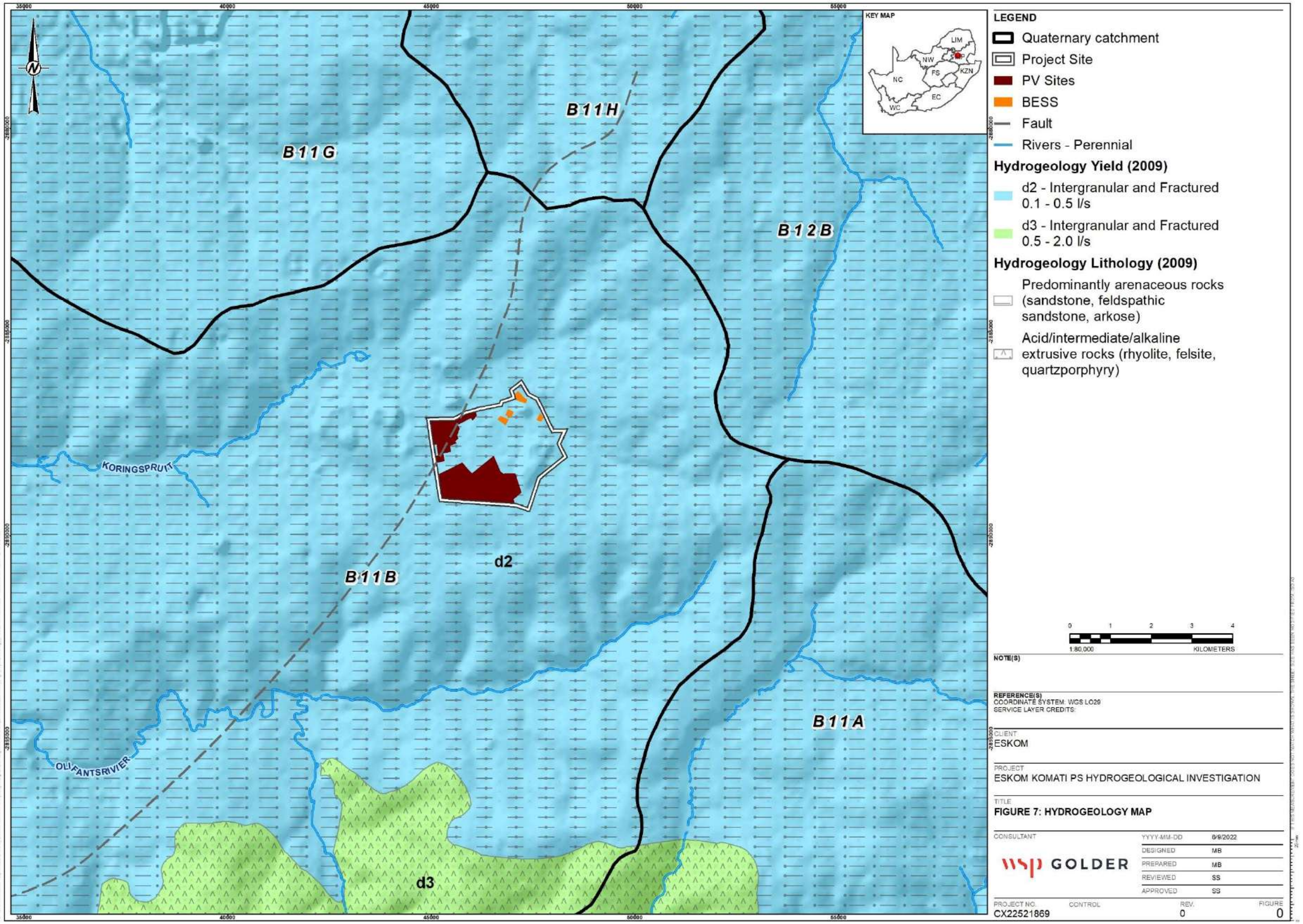

Figure 7: Groundwater availability

4.0 PREVAILING GROUNDWATER CONDITIONS

4.1 Geology

4.1.1 Regional geology

The Project Area is located within the Highveld (Witbank) Coalfield. The regional geology is described (Mathetsa, 2021, Halenyane, 2019) as falling within the Carboniferous to early Jurassic aged Karoo Basin. The Karoo Supergroup comprises, from oldest to youngest, the Dwyka, Ecca and Beaufort Groups, with the coal seams generally hosted within the Vryheid Formation of the Middle Ecca Group. The Vryheid Fromation includes interbedded sandstone, siltstone, shales and coal seams. Five coal seams are present within the Vryheid Formation and are numbered (from base up as the Number 1, 2, 3, 4 and 5 Seams. The zone of undermining (Bohlweki Environmental, 2005) indicated as underlying the Block B is noted to be associated with the No 4. and No. 2 coal seams. The No 2 Seam ranges in between 1.5 and 4.0 m in thickness where it is laterally continuous whilst the No 4 Seam averages 4.0 m, varying from 1 – 12 m in thickness at Goedehoop mine (SRK 566657, 2021). The depth below ground level should be confirmed but based on the general stratigraphy is likely to be > 50 m below surface (SRK 566657, 2021). The coal seams are mined by the adjacent Goedehoop colliery. The coal seams are mined by the adjacent collieries. The Vryheid Formation overlies the Dwyka formation. A summary of the Lithostratigraphy is provided in Table 4. The regional geological map is presented in Figure 8.

Table 4: Lithostratigraphy

Age	Supergroup	Subsuite	Lithology
Quaternary		Q	Surficial alluvial deposits to the north associated with the Koringspruit River
Jurassic		Jd	Fine-grained dolerite
Permian	Karoo	Pv (Vryheid)	Sandstone, shale and coal beds
Carboniferous		C-pd (Dwyka)	Diamictite and shale

4.1.2 Local geology

There is no information on the residual soils for the investigation areas. Additional investigations are, however, in progress. The following information is inferred from the available reports and borehole logs. All the groundwater monitoring and several hydrocensus sites are sitting on the Vryheid formation.

The local geology generally comprises weathering products of the sandstones, siltstones and mudstones of the Vryheid Formation, with isolated patches of dolerite. The top layer consists of reddish-brown sandy soil, with clayey-sandy subsoil comprising yellowish to brown clays residual of the underlying sandstone formations. Weathering is not, based on the available borehole logs, expected to extend deeper than approximately 10 m. Surficial ash and coal is likely present within Block A associated with the historical ash footprint and in the coal stockyard area.

A linear structure is indicated on the regional geological maps (Refer Figure 8) to be striking north-east to south-west through Block B.

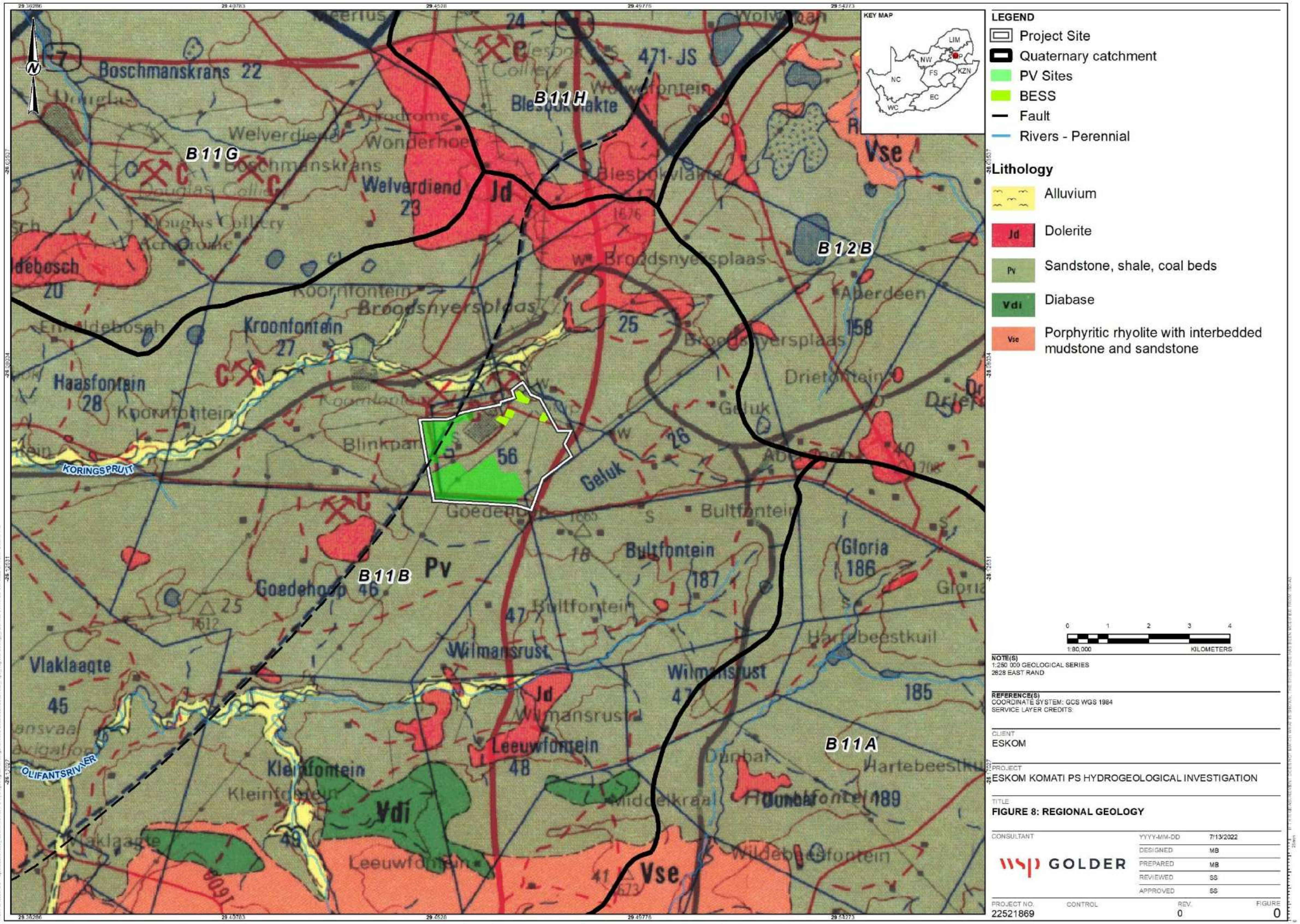

Figure 8: Regional Geology

4.2 Acid generation capacity

Not applicable as there are no waste facilities associated with the PV and BESS plant.

4.3 Hydrogeology

4.3.1 Unsaturated zone

This zone is conceptualized (Halenyane, 2019) as an upper zone of completely weathered material to a depth of 8 to 10 m. This layer is anticipated to have a higher hydraulic conductivity (k of 1 m/d) compared to the underlying rock matrix but is generally unsaturated. However, a seasonal aquifer perched on the bedrock may occur on this layer after high rainfall events.

Further information is pending from the contaminated land report currently in progress for the areas in which the PV and BESS is proposed.

4.3.2 Saturated zone

Halenyane, 2019 and Van Niekerk & Staats, 2009 suggests that multiple aquifer types are represented at the site. These include:

- Shallow aquifer with colluvial and alluvial matrix, the shallow aquifer is composed of weathered upper Ecca formation sediments, is seasonal, discontinuous, and perched above the more competent bedrock layers.
- Semi-confined aquifers within the Vryheid Formation. These aquifers are commonly confined along essentially horizontal bedding interfaces between different lithologies but can be locally unconfined along the trend of fractures zones, which allows the aquifers to recharge seasonally. This is considered to be the regional aquifer within the Project Area occurring below the unsaturated zone in slightly weathered or fractured bedrock to a depth of approximately 30 m with a low k (0,001 – 0,1 m/d). Halenyane, 2019 notes that the permanent groundwater level resides in this unit and is about 1 to 10 metres below ground level. The groundwater flow direction in this unit is influenced by regional topography and for the site flow would be in general from high lying areas to the Koringspruit River. This aquifer is likely to be highly heterogeneous.
- Deeper confined aquifers within basement lithologies.

4.3.3 Hydraulic conductivity

Hydraulic conductivity was estimated based on falling head tests (Van Niekerk & Staats, 2009) as ranging from 0,007 m/d at AB07 to 2.4 m/d for AB04 with an average of 0,51 m/d. Porosity was estimated as 0,3.

4.4 Groundwater levels

Water levels for monitoring boreholes located near the proposed BESS and PV areas (Block A, E and F) vary from around 2 to 12 mbgl and are provided in Table 5 below. The water levels for the other monitoring boreholes located within the KPS area vary from 0 (AB62) to around 6 mbgl are provided for reference. With the exception of AB55 and AB58, water levels vary between 0,6 and 3.6 m over the period provided (2016 to 2021).

As noted, above, there is no information for Block B, C, and D. New shallow boreholes have been drilled in or near these areas and will be included in the pending contaminated land report.

SRK 5666657 (2020) report that water levels have been lowered through dewatering of mine workings at Goedehoop Collieries. Water levels in the monitoring boreholes at KPS vary only slightly over time and do not appear to have been affected by dewatering at Goedehoop at the present time. Future undermining by Goodehoop Collieries to the south-east of the Ashing area may influence the local water levels. A summary of the latest water level data around August for the past three years is provided for reference in Table 5 Ambient boreholes and boreholes in or near the PV and BESS areas are presented first.

Table 5: Water level data at KPS

Locality	Sample ID	Bore-hole depth	Sample depth (mbgl)(1)	19-Aug-2018(1)	30-Jul-19(2)	20-Aug-20(3)	26-Aug-2021(4)
Ambient upstream (south) of Ashing area and Block A T junction - Witbank road.	AB58	ND		3,68	4.85	4,29	5,04
	AB59	ND-shallow		7,62	8.3	7,58	8,54
Boreholes in or near the proposed PV and BESS plants							
Inside Block A - Western boundary of Ashing Area and downstream of old rehabilitated domestic waste site.	AB01	35.5	15	1,75	3.66		
	AB63	ND		1,72	0	2,34	3,63
Outside Eastern boundary Block A - West of Ashing Area north of small ash dam as well as west of large ash dams.	AB02	32.5	20		2.79		
Outside Eastern boundary Block A - West of Ashing Area. West of ash dam and in town area	AB53	ND-deep		11,29	11.91	11,27	11,46
Outside but adjacent to Block F (east of KPS boundary) downstream of seepage recovery dam AP03.	AB07	37.0	15	2,62		2,17	4,01
Inside Block E - Coal Stockyard Area (water is black)	CB51	ND		1,85	1.18	4,28	4,92
Outside Block F on north-eastern corner of boundary & downstream of Coal Stockyard Area & dirty water dam	CB09	36.5	31		4.59		
Outside Block F on eastern boundary - downstream KPS Area	PB60	ND		2,23		2,54	2,33
Monitoring boreholes within the surrounding KPS area							
Ashing Area- Monitoring borehole downstream and north of small ash dam as well as west of large ash dams.	AB03	7.5 (collapsed)	-				
Ashing Area north-west of ash dams and south of dam AP02.	AB04	38.0	8.5		1.46		2,16
Ashing Area next to Komati Spruit west of KPS.	AB05	8.5 (collapsed)	-		4.3		
Ashing Area north and downstream of ash dams.	AB06	37.0		1,62		1,46	1,48
KPS & Sewage Plant Area	PB08	35.5	13	2,82			
Not indicated – probably incorrectly labelled	AB08					4,83	2,95
Ashing Area close to Komati Spruit, west of KPS.	AB47	ND					2,09
Ashing Area west of ash dam, next to AB53	AB54	ND - Shallow		1,47	2.33	1,59	1,98
Ashing Area North of ash dam. Next to tar road at Entrance Road to KPS	AB55	ND - Deep		5,83	6.22	5,64	6,39
Ashing Area- North of ash dam. Next to tar road at Entrance Road to KPS	AB56	ND- shallow		1,43	1.53	1,64	2,2
Ashing Area - West of ash dam	AB57	ND		2,64	4.86	3,13	3,45
Ashing Area - East of ash dam.	AB61	ND- deep				1,68	1,72
Ashing Area east of Ash Area – Shallow borehole and artesian	AB62	ND- shallow			1.88	0	0

Locality	Sample ID	Bore-hole depth	Sample depth (mbgl)(1)	19-Aug-2018(1)	30-Jul-19(2)	20-Aug-20(3)	26-Aug-2021(4)
Coal Stockyard Area	CB49	ND- deep			2.89		
Coal Stockyard Area	CB50	ND- shallow			2.8		
Coal Stockyard Area	CB52	ND		1,64		2,58	2,75
KPS Area- north of sewage plant	PB48	ND		1,06		1,6	1,36

Mathetsa, 2021 indicates that the groundwater flow mimics the topography, and the direction of flow are towards the surface stream, particularly the Koringspruit River. There is little seasonal variation noted. The contoured groundwater level is provided after Halenyane, 2019 (Refer Figure 9).

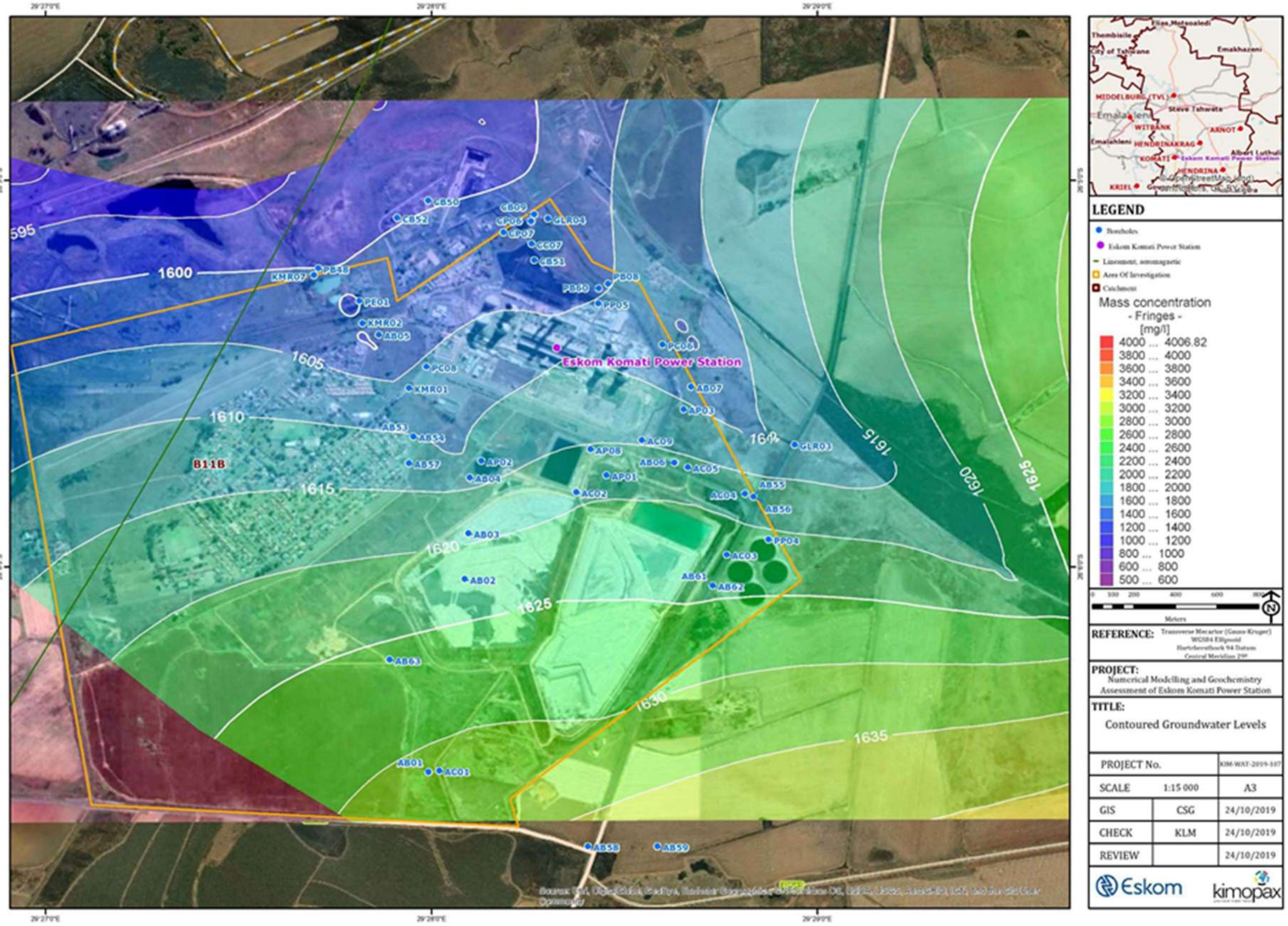

Figure 9: Groundwater contours - sourced from Halenyane, 2019

4.5 Groundwater potential contaminants

Residual contamination may be present in the PV and BESS areas due to historical activities generally related to the KPS. A contaminant land investigation is in progress to assess the potential for contamination to the groundwater. Of note is the residual ash footprint noted to the east of Block A. Block E is located in the coal stock yard area. Van Niekerk, 2009 noted that this area comprises the coal storage yard and coal stockyard pollution control dam as well as the settling ponds. Additional potential sources within the KPS area include a domestic waste dump, sewage plant and fuel depot,

4.6 Groundwater quality

Water quality data is captured in the WISH database for all parameters. Groundwater quality parameters that need to be analysed are specified in the WUL (Appendix IV, Table 6 Clause 3.6) as pH, Electrical conductivity (EC), Total Dissolved Solids (TDS), Total Suspended Solids (SS), Total Alkalinity, chloride (as Cl), sodium (as Na), sulphate, nitrate, ammonia, orthophosphate, fluoride, potassium, manganese, copper, iron, zinc, arsenic and chromium.

The groundwater reserve is provided in the WUL (Appendix IV, Table 7, Clause 4.1). Water quality is in, addition compared to the SANS 241-2015 standard for drinking water and to ambient water quality as represented by two upgradient monitoring boreholes (AB58 and AB59). The average and 95th percentile results for the upgradient ambient water quality (AB58 and AB59) and boreholes located in and around the proposed areas (Block B and Block E) are provided for reference in the table below

4.7 In summary:

The groundwater reserve is conservative and provides several determinants at concentrations which exceed baseline groundwater quality. (Refer Table 6). As a result, several parameters are not in compliance with the WUL.

The groundwater quality is generally alkaline with an average pH of 8,3 at the upstream ambient boreholes (AB58 and AB59). The 95th percentile results being higher at 9.1. pH is slightly lower in the boreholes located around the proposed areas with average pH varying from 7.2 to 8.

Electrical conductivity (EC) in the ambient boreholes (average 17 and 32 mS/m for AB58 and AB58 respectively) is below the groundwater reserve of 112 mS/m. EC is comparatively elevated at some of the boreholes in the proposed areas with the 95th percentiles for EC exceeding ambient groundwater quality and the reserve for AB01, AB07, CB51, CB09, PB60. The localized increase in salinity is associated with elevated chloride, sulfate, calcium, magnesium, and sodium. Fluoride is near the groundwater reserve of 0,4 mg/l in the ambient boreholes (95th percentile of 0,3 and 0,4 mg/l) and is locally elevated particularly in the coal stock yard area (Block E) with the 95th percentile of 1.1 mg/l at CB09 and 0,5 mg/L at the boundary of the KPS at PB60.

Metal concentrations for iron (95th percentile of 3.7 to 5.3 mg/l) and manganese (95th percentile of 6.6 mg/l) are slightly elevated compared to the ambient groundwater quality (<0,1 for iron and <0,5 for manganese) at AB07 (downgrade of the Ash dams) and in CB09 (coal stockyard). Arsenic is reported at below detection,

Water quality is locally affected by KPS activities particularly from the Ash dams (ashing area) and coal stockyard. A pollution plume is anticipated to migrate from the pollution sources towards the Koringspruit River to the north.

Table 6: Statistical Water Quality

Site Name		WUL	SANS 241-2015	Ambient Water Quality				Block A										Coal Stockyard			Block F	
				AB58		AB59		AB01		AB63		AC02		AB53		AB07		CB51		CB09	PB60	
				Ave	95th	Ave	95th	Ave	95th	Ave	95th	Ave	95th	Ave	95th	Ave	95th	Ave	95th		Ave	95th
Analyses	**Unit**			Oct-11 to Jan-22		Oct-11 to Jan-22		Aug-11 to May-21		Oct-11 to Jan-22		Jan -11 to Sep-18		Oct-11 to Jan-22		Oct-11 to Jan-22		Oct-11 to Mqy-20		Jan-11	Oct-11 to Jan-14	
pH	pH units	6.6	5.5-9.7	8,3	9,1	8,3	8,8	7,7	8,5	7,8	8,9	7,7	8,4	8,0	8,5	7,2	8,3	8,0	8,7	7,0	7,8	8,6
EC	mS/m	112	≤170 ^{AS}	32	44	17	29	214	275	102	223	112	140	38	45	192	248	89	143	43	107	169
TDS	mg/l	NLG	≤1 200 ^{AS}	214	290	107	189	1680	2055	706	1597	491	606	242	302	1570	2204	715	1124		819	1167
Turbidity	NTU			67	254	3	5	128	249	93	338	2	2	78	125	79	254	176	700		348	492
Ca	mg/l	96	NLG	16	25	7	12	154	225	75	222	107	125	32	39	175	286	50	150	51	52	71
Mg	mg/l	38	NLG	23	41	6	14	126	180	49	137	7	14	16	19	115	140	59	113	16	37	52
Na	mg/l	0	≤200AS	17	22	15	17	214	266	89	198	117	135	18	21	146	163	66	88	19	150	245
K	mg/l	NLG	NLG	12	15	8	11	28	37	10	33	35	43	8	9	10	12	2	3	4	5	7
TAlk as CaCO3	mg/l	NLG	NLG	165	253	75	126	480	823	197	484	100	136	112	141	169	210	197	383	156	315	484
F	mg/l	0.4	≤1.5 ^{CH}	0,3	0,4	0,1	0,3	3,1	0,6	1,5	1,0	0,3	0,4	0,9	0,5	2,5	0,6	0,3	0,7	0,7	0,1	0,5
Cl	mg/l	31	≤300 ^{AS}	7	11	7	10	106	189	58	137	60	79	55	80	69	83	45	82	22	50	79
SO4	mg/l	0	≤500 $^{A.}$ ≤250^{A}	8	21	2	8	669	999	293	940	403	497	5	15	852	1252	231	464	39	227	495
NO3-N	mgN/l	10.9	≤11^{A}	0,4	1,1	0,4	1,4	0,2	0,8	0,6	1,9	0,3	0,8	0,1	0,5	0,2	0,5	0,2	0,6	0,1	0,2	0,5
NH4-N	mgN/l	NLG	≤1.5 ^{AS}	0,4	1,9	0,9	1,1	0,1	0,2	0,2	0,9	<0,003	0,1	0,2	0,2	0,1	0,3	0,3	0,7		0,2	0,3
PO4	mgP/l	NLG	NLG	<0,01	0,03	<0,01	0,02	<0,01	0,02	0,46	0,10	0,003	0,10	<0,01	0,03	0,03	0,04	<0,01	0,03	0,10	<0,02	0,01
COD				16,5	51,7	16,9	55,4	23,7	70,2	26,9	79,7	31,0	59,7	12,4	31,3	28,8	69,6	34,0	71,8		29,5	52,1
Suspended Solids			<25	18,5	65,7	14,5	140,6	59,4	129,2	51,7	145,2	16,2	43,7	20,8	43,0	37,5	93,6	68,5	256,2		121,6	311,1
As	mg/l	NLG	≤0,01 ^{CH}	<0,03	<0,01	<0,03	<0,01	<0,04	<0,01	0,06	<0,01	1,60	3,04	<0,03	<0,01	<0,03	<0,01	<0,05	<0,01		<0,06	<0,01
Cr	mg/l	NLG	≤0,05 ^{CH}	<0,018	0,004	<0,018	0,004	<0,020	0,002	<0,003	0,010	0,109	0,588	<0,019	0,004	<0,015	0,006	<0,024	0,002	0,006	<0,020	0,005
Cr6+	mg/l	NLG		<0,198	<0,002	0,331	<0,002	3,331	14,999	3,616	0,031	<0,002	<0,002	1,903	<0,002	2,208	4,198	<0,002	<0,002		<0,002	<0,002
Cu	mg/l	NLG	≤2 ^{CH}	<0,01	0,01	<0,02	0,00	<0,02	0,03	<0,01	0,02	<0,11	0,01	<0,02	0,01	<0,01	0,03	<0,03	0,02	0,01	<0,03	0,01
Fe	mg/l	NLG	≤ 2 $^{CH.}$ 0,3^{AS}	0,16	0,01	0,01	0,12	0,35	0,01	0,51	2,07	<0,03	0,17	0,02	0,07	0,98	5,28	0,16	0,01	0,1	0,0	0,0
Al	mg/l	NLG	300 (o)	0,52	0,88	0,01	0,16	0,98	0,06	0,42	0,29	1,08	5,50	0,08	0,12	1,45	0,30	<0,04	0,003	0,020	<0,037	0,003
Pb	mg/l	NLG	≤0,01^{CH}	<0,004	<0,004	<0,004	<0,004	<0,004	<0,004	0,243	<0,004			<0,004	<0,004	<0,004	<0,004	<0,004	<0,004		<0,004	<0,004
Mn	mg/l	NLG	≤0,4^{CH} and ≤0,1^{AS}	0,1	0,5	9,2	0,1	21,3	0,6	2,4	4,2	0,1	0,7	2,4	0,2	5,3	6,7	13,8	3,2	0,1	6,901	0,832
Hg	mg/l	NLG	≤0,006^{CH}	<0,004	<0,004	<0,004	<0,004	<0,004	<0,004	<0,004	<0,004			<0,004	<0,004	<0,004	<0,004	<0,004	<0,004			
Zn	mg/l	NLG	≤5 ^{AS}	<0,027	0,012	<0,029	0,006	0,4	2,0	0,1	0,02	<0,3	<0,03	<0,03	<0,0002	0,7	1,8	<0,1	<0,002		<0,052	0,009
Si	mg/l	NLG	NLG	5,0	10,6	0,1	0,3	7,7	11,3	5,6	20,7	2,6	2,6	1,7	2,3	17,7	23,1	1,5	4,7		4,8	6,9

NLG: no guideline

H: Health

CH: Chronic health

A: Aesthetic

O= Operational

5.0 AQUIFER CHARACTERIZATION

5.1 Groundwater vulnerability

The Project Area is vulnerable to groundwater contamination due to the shallow water table. This is mitigated by the low k and low recharge. Due to the surrounding use of groundwater by communities, the aquifer is considered to have a high vulnerability to contamination as is indicated by the observed localised impact from existing sources.

5.2 Aquifer classification

The aquifer is classified as a Minor (Parsons[1], 1995; DWAF[2], 1998) or Poor (DEA[3], 2010) aquifer due to the low exploitation potential and low yields. It does, however, represent an important source of water for domestic supply to the local communities.

5.3 Aquifer protection classification

A weighting and rating approach is then used to decide on the appropriate level of groundwater protection (Table 7). After rating the aquifer system management and the aquifer vulnerability, the points are multiplied to obtain a Groundwater Quality Management (GQM) index.

Table 7: Ratings for the Aquifer Quality Management Classification System

Aquifer Classification		Vulnerability	
Class	Points	Class	Points
Sole Source Aquifer System	6	High	3
Major Aquifer System	4	Medium	2
Minor Aquifer System	2	Low	1
Non-Aquifer System	0		
Special Aquifer System	0 – 6		

Table 8: Appropriate level of groundwater protection required

GQM Index	Level of Protection
<1	Limited Protection
1 – 3	Low Level Protection
4 – 6	Medium Level Protection
7 – 10	High Level Protection
>10	Strictly Non-degradation

Table 9: Aquifer classification and vulnerability assessment

Description	Aquifer	Vulnerability	Rating	Protection
Regional Aquifer	Minor (2)	1-2	4	Medium

The above classification implies that the regional aquifer is less sensitive due to the low recharge and low k and hence a medium level of protection is required, (Parsons, 1995).

[1] Parsons, R, 1995, A South African Aquifer System Management Classification, WRC Report No. KV77/95.

[2] Department of Water Affairs and Forestry, Second Edition, 1998. Waste Management Series, Minimum Requirements for Water Monitoring as Waste Management Facilities.

[3] Department of Environmental Affairs, May 2010, Framework for the Management of Contaminated Land.

6.0 GROUNDWATER MODELLING

As stated in Section 4.5, a groundwater model is not required for this investigation as no pollution dams or 21 (g) water use are required for the PV and BESS plants. A comprehensive numerical groundwater model has been compiled for the KPS area as detailed by Halenyane, 2019.

7.0 IMPACT ASSESSMENT

The impact assessment follows the methodology as described in the EISA.

The activity is described in the EISA as follows:

The solar PV plant has a minimum design life of 25 years.

- During the life of the Solar PV facility, there will be normal maintenance of all electrical and mechanical components of the plant. In addition, there will be periodic cleaning and washing of the solar PV modules. This PV module cleaning will be performed when required, and it is estimated to occur 2-4 times a year. The water consumption during operation - estimated water required per year during operation is 10,000 kilolitres (total per year for design life of plant)”.
- The site will have temporary laydown areas and offices for the construction contractors. Electrical supply could include use of generators and fuel storage (potentially diesel and oil), A concrete batching plant may be required.
- Construction could include excavation of trenches to allow for cabling and connections, foundations of the solar PV array and inverter stations.
- The main impacts considered are in terms of groundwater quality and quantity.
- Quality impacts could result from:
- Hydrocarbons associated with heavy moving equipment during site preparation and construction.
- Site equipment including transformers, solar PV modules, inverters, excavators, graders, trucks, compacting equipment and construction material etc.
- Fuel storage areas (diesel and oil for example).
- Existing contaminated footprint where washing of the panels could result in an increased leaching of contamination to the groundwater.
- The following parameters were noted as needing to be considered for the new activity: arsenic, cadmium, chromium, iron, lead, mercury, nickel, selenium, manganese, and zinc from the ash and coal storage areas; polychlorinated biphenyls, polycyclic aromatic hydrocarbon, BTEX (benzene, toluene, ethyl benzene, xylene), and other petroleum hydrocarbons from oil storage and mechanical and electrical equipment; and copper, iron, nickel, chromium, and zinc from metal cleaning and cooling tower blowdown wastewaters

Quantity impacts could result from:

- Reduced recharge as solar panels and an increased compacted/hard standing footprint will reduce the extent that rainfall can infiltrate to ground and recharge the aquifer.
- Localised ad hoc artificial recharge from water used to wash the panels and/or footprint areas.

It is noted that there is no groundwater abstraction planned from the groundwater for this activity.

The main receptors are considered to be community boreholes located in the surrounding farms and rivers both in terms of the aquatic ecology and as potential pathway of contaminated water downstream.

8.0 GEOHYDROLOGICAL IMPACTS

The impact assessment follows the methodology provided for the Scope of Works and assesses the potential significance of the impact pre- and post-mitigation for the following:

- Magnitude (M)
- Extent (E)
- Reversibility (R)
- Probability (P) and
- Duration (D)

8.1 Construction phase

There a no groundwater quantity impacts identified during construction as water will not be obtained from the groundwater resource.

Quality impacts are assessed as follows:

Impact number	Aspect	Description	Character	Ease of mitigation	Pre mitigation							Post Mitigation						
					M	E	R	D	P	S	Significance	M	E	R	D	P	S	Significance
1	Hydrocarbon spills from moving equipment	Decrease in groundwater quality	-ve	Moderate	2	1	3	2	3	24	N2 - Low	1	1	3	1	2	12	N1
2	Leachate/spills from fuel storage areas	Decrease in groundwater quality	-ve	Moderate	2	1	3	2	3	24	N2 - Low	1	1	3	1	2	12	N1
3	Spoil from excavated trenches may be contaminated and could leach to the groundwater.	Decrease in groundwater quality	-ve	Moderate	2	1	3	2	3	24	N2 - Low	1	1	3	1	2	12	N1

The following mitigation and management is recommended to manage the potential impacts:

- The low k and low recharge will limit the migration of contamination to receptors.
- Vehicles should be routinely inspected, and maintenance carried out to reduce likelihood of spillages.
- Parking should be on hard standing.
- Spill kits should be used to clean up spills when they occur.
- Fuel storage areas should be located in hard standing and bunded areas and pipelines regularly inspected to avoid leaks.

- Potentially contaminated areas should be assessed and identified such that spoil recovered from trenches in these areas can be disposed in an appropriate manner.

8.2 Operational phase

There are no groundwater quantity impacts identified during construction as water will not be obtained from the groundwater resource.

Note that the potential for leachate from contaminated land should be re-assessed following the outcome of the contaminated land investigation.

The following mitigation and management are recommended to manage the potential impacts:

- The aquifers within the proposed areas are limited and there are no groundwater users within the Project Area boundary. A reduction in recharge will therefore have a limited impact on receptors in the area. The potential for contaminated land in these areas is being assessed. However, groundwater is generally impacted (quality) by sources within the KPS, limiting the infiltration of rain through contaminated soils, particularly in the coal stock yard area which has been identified as a potential source, would reduce the leachate of contamination to the groundwater. This is therefore likely to result in a net positive benefit to the groundwater.
- The low k and low recharge will limit the migration of contamination to receptors.
- All equipment that has the potential to leach contamination to the environment should be stored on hard standing and in a bunded area (e.g., Fuel storage, soaps, greases, transformers etc.).
- Surface water controls to capture and contain wash water for re-use/management will reduce the impact to groundwater.

Quantity impacts are assessed as follows:

Impact number	Receptor	Description	Character	Ease of mitigation	Pre mitigation							Post Mitigation						
					M	E	R	D	P	S	Significance	M	E	R	D	P	S	Significance
1	Groundwater	Reduced recharge due to increase in hardstanding footprint	-ve	Moderate	3	1	3	4	3	33	N2 - Low	2	1	3	4	2	20	N2- low
2	Groundwater & Rivers	Localised artificial recharge due to washing of solar panels	-ve	Moderate	2	1	3	4	3	30	N2 - Low	1	1	3	1	2	12	N1 – very low

Quality impacts are assessed as follows:

Impact number	Receptor	Description	Character	Ease of mitigation	Pre mitigation							Post Mitigation						
					M	E	R	D	P	S	Significance	M	E	R	D	P	S	Significance
3	Groundwater	Reduced leachate from contaminated soils	+ve	Moderate	2	1	4	4	3	33	P3 - moderate	2	1	5	4	3	36	P3 - moderate
4	Groundwater & Rivers	Localised leachate from equipment	-ve	Moderate	3	1	5	4	3	39	N3 - Moderate	2	1	4	4	2	22	N2 - Low
5	Groundwater & Rivers	Localised increased leachate from contaminated soils due to following washing of solar panels	-ve	Moderate	3	1	5	4	3	39	N3 - Moderate	2	1	4	4	2	22	N2 - Low

8.3 Decommissioning phase

There are no quantity impacts identified during decommissioning. The quality impacts are anticipated to be similar to that envisaged during construction.

Impact number	Aspect	Description	Character	Ease of mitigation	Pre mitigation							Post Mitigation						
					M	E	R	D	P	S	Significance	M	E	R	D	P	S	Significance
1	Hydrocarbon spills from moving equipment	Decrease in groundwater quality	-ve	Moderate	2	1	3	2	3	24	N2 - Low	1	1	3	1	2	12	N1
2	Leachate from equipment no longer in use	Decrease in groundwater quality	-ve	Moderate	3	1	4	5	3	39	N2 - moderate	2	1	3	4	3	30	N2

The following mitigation and management are recommended to manage the potential impacts:

- The low k and low recharge will limit the migration of contamination to receptors.
- Vehicles should be routinely inspected, and maintenance carried out to reduce likelihood of spillages.
- Parking should be on hard standing.
- Spill kits should be used to clean up spills when they occur.
- Redundant equipment must be demolished and removed to an appropriate waste facility.
- Footprints should be re-assessed in terms of the Norms and Standards for Contaminated land and the areas managed accordingly. A remediation plan may be required depending on the outcome of the study.

8.4 Cumulative phase

Cumulative impacts are limited due to the low k and recharge. Monitoring and management as provided in the WUL should continue.

9.0 CONCLUSION AND RECOMMENDATIONS

The potential impacts from the PV and BESS activities are anticipated to be low to moderate and can be mitigated. A positive impact may be possible during operation where the activities could reduce the recharge through contaminated soils to groundwater.

Further monitoring requirements, other than the existing monitoring as provided by the WUL, has not been identified.

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APPENDIX A

Document Limitations

APPENDIX

E-13 *CONTAMINATED LAND*

ESKOM HOLDINGS SOC LTD

ESKOM KOMATI POWER STATION ESIA AND WULA

PRELIMINARY CONTAMINATED LAND STUDY

18 AUGUST 2022

CONFIDENTIAL

ESKOM KOMATI POWER STATION ESIA AND WULA

PRELIMINARY CONTAMINATED LAND STUDY

ESKOM HOLDINGS SOC LTD

CONFIDENTIAL

PROJECT NO.: 41103965
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This report was prepared by WSP for the account of Eskom Holdings SOC Ltd, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given to by any modifications to be made to this document.

The Eskom Komati Power Station has been designated as a National Key Point. This document, and those referenced during its preparation, are strictly confidential. Further, information contained in this report pertains to a site designated as National Key Point and, therefore, the exchange and storage of information must comply with the National Key Points Act, 1980.

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1 INTRODUCTION

1.1 AUTHORISATION

WSP Group Africa (Pty) Ltd (WSP) was commissioned by Eskom Holdings SOC Limited (Eskom) to undertake a preliminary contamination assessment for targeted portions of its Komati Power Station (KPS) facility in Mpumalanga Province, South Africa. The contamination assessment forms part of the Environmental & Social Impact Assessment (ESIA) and Water Use License Application (WULA) processes for the Solar Photovoltaics (PV) and Battery Energy Storage System (BESS) Project and Wind Energy Facilities.

The offer to carry out the works was contained in WSP proposal reference 41103965, Eskom Komati PV ESIA and WULA, dated April 2022 and was commissioned by Eskom under Purchase Order No. 4503194444 for Contract No. 4600062770.

1.2 BACKGROUND AND PROPOSED DEVELOPMENT

KPS was initially commissioned in 1961 and originally operated until 1990. The power station was mothballed in 1990 but was returned to full service in December 2008 (VPC, 2021). The station has a total of nine units, five 100 MW units on the east (Units 1 to 5) and four 125 MW units on the west (Units 6 to 9), with a total installed capacity of 1,000 MW (1 GW). KPS will reach its end-of-life expectancy in September 2022 when the remaining unit (Unit 9) will have reached its dead stop date (DSD), with eight units (Unit 1 to 8) having have already reached their DSDs.

Eskom is proposing the establishment of a solar electricity generating facility, wind energy generating facility and associated infrastructure as part of its repurposing programme for KPS. The plan is to install 150 MW of solar PV and 150 MW of BESS and up to 70 MW of Wind Turbines (within the Solar PV footprint). The proposed development is located within the property owned by Eskom termed the study area for reporting purposes. The proposed development includes two sites for the solar PV installation (PV Site A and PV Site B) and four for the BESS (BESS A, B, C and D) located within the KPS as shown in **Appendix A: Figure 1**.

The solar PV modules, which convert solar radiation directly into electricity, will occupy a space of up to approximately 720,000 m^2 over a footprint of around 200 to 250 ha. The modules will be elevated above the ground and will be mounted on either fixed tilt systems or tracking systems (comprised of galvanised steel and aluminium). The modules will be placed in rows in such a way that there is allowance for both perimeter and maintenance access roads.

The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers. The BESS components will arrive on site pre-assembled. The BESS facilities are likely to include lithium battery technologies, such as lithium iron phosphate ($LiFePO_4$), lithium nickel manganese cobalt oxides (Li-NMC) or vanadium redox (VRB), however the specific technology will only be determined following Engineering, Procurement and Construction (EPC) procurement. The BESS footprints will range from roughly 2 ha up to 6 ha. Further information on the proposed infrastructure and specifications are provided in the ESIA report.

1.2.1 EXISTING AUTHORISATIONS AND LICENCES

Eskom has two existing Water Use Licences (WUL) with amendments obtained in August 2017 and February 2021 as follows:

1. WUL number 04/B11B/BCGI/1970 dated 2 February 2014 authorises the following water uses for the Eskom property located within the farm Komati Power Station No 56 IS:
   a. Abstraction of water from the Komati Government Water Scheme (Section 21 b)
   b. Diversion and impedances of the Koringspruit (Section 21 c and i)
   c. Storage of water in the raw water dams (Section 21 b) and
   d. Storage of waste and wastewater including the coal stockyard (BESS D), ash dams and return water dam associated with the Ashing Area (Section 21 g)

This WUL includes water quality limits for surface water (Appendix III, Table 3) and groundwater reserve (Appendix IV, Table 6). Table 3 was revised in the August 2017 amendment whilst the amendment of February 2021 includes changes to frequency of monitoring.

2 WUL number 04/B11B/CI/2556 dated 11 January 2015 refers to construction of Komati storage facility within 500 m from a boundary of an unchanneled valley bottom wetland and seepage wetland which refers, based on the coordinates provided, to the Komati Spruit (Seep 2 wetland)

In addition to the above WUL, Eskom possesses the following two Waste Management Licences (WML):

1 KPS Ash Disposal facility (License #: 12/9/11/L1010/6)
2 Decommissioning of the asbestos disposal site within the Old Ash dam (License #12/9/11/L73467/6)

1.3 AIMS AND OBJECTIVES

The objective of the preliminary contamination assessment is to provide a review of available existing information and present the findings of the contemporary works. The aim of this report is therefore to:

— Establish the environmental setting/s of the relevant development areas at KPS based on a review of existing information in conjunction with site reconnaissance, targeted intrusive investigations and laboratory analysis of selected samples
— Prepare a Conceptual Site Model (CSM) utilising the supplementary information to conceptualise the hydrological, geological and hydrogeological conditions in respect to possible contamination concerns
— Interpret the significance of recorded contamination impacts in broad accordance with Part 8 of the NEM: WA to ascertain the requirement for additional works and/or remediation

1.4 REFERENCED DOCUMENTS

The chronological list of the documents and data sources which informed the desktop review are provided below and are referenced where appropriate in this report. This information includes reports and databases provided by Eskom with additional input from various published resources.

— Bohlweki Environmental, September 2005, Single page (Figure 10) showing the undermining areas, subsidence and rehabilitation ash dump referenced to the Koornfontein Mines EMPR and originally titled Plan No. 4.5.
— GHT Consulting, July 2009, Komati Power Station Hydrological & geohydrological baseline study, GHT Consulting Scientists, RVN 537.5/909.
— Lidwala, December 2015, Integrated water and waste management plan for Komati Power Station, Mpumalanga Province, Lidwala Consulting Engineers (SA) (PTY) Ltd, 16906 PROS_ENV.
— Anglo American, November 2015, Goedehoop Colliery, Hope No. 4 Seam Project Draft Environmental Impact Report (EIR) and Environmental Management Programme (EMPr), DMR Reference No.: MP 30/5/1/2/2/1 (122) EA, https://minedocs.com/21/GoedehoopColliery_EIR_EMP_Report_November2015.pdf
— Kimopax, September 2019, Numerical modelling and geochemistry assessment, Eskom Komati Power Station, Gauteng, Kimopax (Pty) Ltd, KIM-WAT-2018-233
— Eskom, August 2019, Komati Hydrocensus Report - 2019, Applied chemistry and microbiology section: sustainability Division Eskom, RTD/ACM/19/240-149029270
— Eskom, Oct 2017, Komati Surface and Groundwater Monitoring Report, Phase 4, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/17/04.
— Eskom, Oct 2017, Komati Surface and Groundwater Monitoring Report, Phase 3, Eskom Sustainability Division, Research, Testing and Development Technical report. RTD/ACM/16/240-118739170
— Eskom, April 2016, Komati Surface and Groundwater Monitoring Report, Phase 01, Eskom Sustainability Division, Research, Testing and Development Technical report, 240-112294332
— Eskom, January 2017, Komati Surface and Groundwater Monitoring Report, Phase 02, Eskom Sustainability Division, Research, Testing and Development Technical report, Rrtm/acm/16/240-118739170

- Eskom, April 2018, Komati Surface and Groundwater Monitoring Report, Phase 5, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/17/05
- Eskom, May 2018, Komati Surface and Groundwater Monitoring Report, Phase 6, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/17/06
- Eskom, May 2018, Komati Surface and Groundwater Monitoring Report, Phase 7, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/18/240-140434399
- Eskom, August 2018, Komati Surface and Groundwater Monitoring Report, Phase 8, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/18/240-140434709. (Mathetsa, S & Swartz, N)
- Eskom, September 2019, Komati Surface and Groundwater Monitoring Report, April to June 2019, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/19/240-150762666 (Authors Mathetsa, S & Swartz, N)
- Eskom, September 2019, Komati Surface and Groundwater Monitoring Report, July to September 2019, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/19/240-152749979 (Authors Mathetsa, S & Swartz, N)
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- Eskom, January 2021, Komati Surface and Groundwater Monitoring - Quarter 3, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/21/240-1615539477
- VPC, October 2021, Draft Report for Komati Thermal Power Plant Technical Analyses on retiring and repurposing four coal plants, South Africa. Report for the World Bank, VPC GmbH. P-2021-00547.
- Eskom, March 2022, Komati Surface and Groundwater Monitoring - Quarter 3, Eskom Sustainability Division, Research, Testing and Development Technical report, RTD/ACM/21/240-190000008
- SRK Consulting, March 2021, Independent Competent Person's Report on Goedehoop Colliery, SRK Report reference 566657. https://thungela.s3.eu-west-1.amazonaws.com/downloads/investors/Goedehoop-Colliery-CPR-dated-25-March-2021.pdf
- Eskom, 2022, Komati Wish_August 2021 water quality databased received on the 15 June 2022
- Eskom, 2022, Discussion on site infrastructure and existing activities with the Eskom Environmental Manager on the 07 July 2022

1.5 SCOPE OF WORK AND LIMITATIONS

This document comprises factual and interpretative reporting based on the findings of the contemporary ground investigations and incorporating available pertinent existing data. The works reported herein are focused on environmental issues pertaining to the defined aims and objectives, and with respect to the targeted areas at KPS only. The study specifically excludes geotechnical considerations.

The preliminary risk assessment is based on potential source-pathway-receptor linkages (exposure pathways) applicable under specific land-use assumptions. Should the source-pathway-receptor linkages be altered, or the applicable land-use/s change, re-assessment may be necessary as the outcomes of the current assessment may no longer be valid. Moreover, the limitations associated with the finite nature of the intrusive works conducted should be recognised and the presence of other areas of impact that have not been identified during the current scope cannot be discounted. The preliminary quantification exercise has been conducted in targeted areas only and more detailed works will likely be necessary to validate the findings.

Whilst broadly complying with Part 8 of the NEM: WA, the report does not constitute a Site Assessment Report (SAR) as described thereunder. Based on WSP's experience it is almost certain that the Department of Forestry, Fisheries and the Environment (DFFE) would require consideration of the entire KPS under a single SAR.

There is information on the depth of the existing and proposed undermining activities. Based on the available information, the coal seams being targeted for mining are located at depths of between 20 to 100 m. It is understood that additional ggeotechnical investigations will be carried out by Eskom to provide further clarity.

2 SETTING

2.1 GEOGRAPHY

While the works related to this document focussed on the proposed development areas only, these form part of the consolidated Eskom property as presented in **Appendix A: Figure 1** and **Figure 2** within the KPS 56 IS farm portion. A summary of the general information is provided in **Table 1** with additional information specific to the proposed development in **Table 2**. The localities of current and historical activities are presented on **Appendix A: Figure 2**.

Table 1 – Site Summary

Site Name	Eskom Komati Power Station
Address	R35, Emalahleni, 1034, South Africa, Witbank, Mpumalanga, 1034
Province	Mpumalanga
Municipality	Steve Tshwete Municipality
Current Owner	Eskom (Title Deed No. T24999/1975)
Location Summary	KPS is situated about 37 km from Middelburg, 43 km from Bethal and 40 km from Witbank. The proposed PV Solar Sites (A and B) are located to the west of the farm portion in vacant open grasslands whilst the proposed BESS areas are located within the KPS footprint.
Current Use	KPS is a coal power station which includes eight cooling towers, coal stock yard, fuel depot, oil storage, mechanical and electrical equipment, distribution stations, contractors' yards and a series of ash dams and return water dams (RWD) (termed the Ashing Area). A water treatment plant (WTP) to treat water to potable quality is located within the KPS. The PV Sites A and B are vacant separated by an Eskom servitude. Komati Town is a residential area located between the KPS and PV Site B.
Size	The consolidated land belonging to Eskom covers approximately 686.95 ha (VPC, 2021), with KPS covering about 315 ha.
Brief History	As previously stated, the KPS was commissioned in 1961 and operated until 1990 before being mothballed until it was returned to full service in 2008. Eskom personnel had limited information on the history of the dams and waste site. An indication has therefore been obtained based on the historical Google™ imagery where the earliest image is from 1985 (poor resolution) and subsequently for 2009 to 2022. The old ash dumps are unlined and were larger, including the historical ash dump footprint now rehabilitated within PV Site A. There were no records provided as to when this was rehabilitated but the footprint is shown in 1985 and not in the subsequent image from 2009. The footprint for the new lined ash dams first appears in 2011 with the lining in place from around 2015. Inference is made to a possible domestic waste site in an area adjacent to the historical ash dump footprint but the extent and detail for this site is not known and it is not clear on the historical imagery. An asbestos disposal site (License #12/9/11/L73467/6) was utilised for the disposal of 4,050 kg of asbestos and asbestos containing waste in 2008 and was covered with two layers of ash and fenced. VPC, 2021 notes that Ergosaf Environmental and Occupational Health Services confirmed that there was no environmental risk of the disposed asbestos in 2013. All asbestos material has been removed off site. A rehabilitated dump, subsequently identified by Eskom as a historical coal discard dump, is noted as being present in the north-west corner of PV Site B. This is in evidence in 1985 but not in 1990. This area is also noted by Bohlweki Environmental, 2005 to have been undermined with some subsidence noted as having occurred within this area. Eskom has confirmed that there are no underground storage tanks, but fuel storage areas are present in mobile tanks and at the fuel depot and there is a fuel transfer station located south of the coal stockyard. Potential contaminant areas have been identified at the coal stockyard, bulk chemical store (located in the vicinity of the Water treatment plan), Lake Stoffel, Lake Finn, Hazardous

	Waste Temporary storage (possibly in the vicinity of BESS C), Ashing Area and the historical asbestos disposal area (VPS, 2021). VPS note that limited soil testing (pH, electrical conductivity, calcium, magnesium, sodium, potassium, chloride, nitrate, aluminium, manganese and iron) was carried out to assess the impact of dust suppression near Ashing area, the coal stockyard and water treatment facilities in October 2020. Manganese was found to be elevated in the samples near the Ashing and coal stock yard area.
Contaminants of Potential Concern (CoPC)	Eskom identified the CoPC to include arsenic, cadmium, chromium, iron, lead, mercury, nickel, selenium, manganese, and zinc from the ash and coal storage areas; polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbon (PAH), benzene, toluene, ethylbenzene, and xylene (BTEX), and other petroleum hydrocarbons from oil storage and mechanical and electrical equipment; and copper, iron, nickel, chromium and zinc from metal cleaning and cooling tower blowdown wastewaters.

Table 2 – Proposed Development Areas

Area	Approximate Centre Point Coordinates	Size (ha)	Locality and Current Use
PV Site A	26° 6' 22.61" S 29° 27' 41.63" E	160.6	Southwest corner of the site with the R542 to the south, Komati town to the north, the Goedehoop Colliery (an underground coal mine) to the northwest, and the Eskom Komati Ashing Area to the east. Much of the area was historically a farm, (maize/corn rotated with bean crops). The historical ash and rehabilitated domestic waste footprints are in the eastern portion of the area. Mining of the underlying No. 4 coal seam is understood to be planned in this area. This seam is indicated as being some 20 to 100 m below surface (Anglo American, 2015).
PV Site B	26° 5' 45.17" S 29° 27' 15.52" E	60.9	Northwest corner of the site with Goedehoop Colliery to the west and north, and Komati town to the east. The Blinkpan police station is located on the south-western boundary. This area is not in use but undermining and a historical coal discard dump are noted to have been present in the northwest of this area. A landing strip / road crosses the area upslope of the historical Coal discard dump.
BESS A	26° 5' 27.74" S 29° 28' 8.22" E	2.6	Southwest portion of the KPS. Area is currently in use with several buildings and contractor's yards (D.B Thermal, Alstom Howden, Siemens, Clyde Bergeman, Roshcon EL and Roshcon Storage) as well as offices, parking areas and a boiler within the proposed development footprint. According to the site layout plan (Eskom) the distribution station is located to the east, with the KPS cooling towers and various buildings and parking areas to the north.
BESS B	26° 5' 33.34" S 29° 28' 2.59" E	3.2	The site is bounded by the Komati spruit (and wetland area) to the west and KPS (BESS A) to the northeast. Most of the area is not in use except for a church located in the south-eastern corner. There is no evidence of a graveyard, but this should be confirmed with Eskom. The church is located within a bunker which was historically an old shooting range.
BESS C	26° 5' 30.92" S 29° 28' 35.13" E	2	Site is bounded to the west by the KPS cooling towers and the drainage line of the Gelukspruit (and wetland) to the northeast. The Ashing Area is located to the south. Much of the area is currently not in use but there is a scrap yard in the southern portion. Eskom noted in discussion that an unknown fenced off area was leased to an unknown subcontractor. Based on the map provided by VPS, 2021 this may have been the temporary hazardous waste storage area.
BESS D	26° 5' 14.90" S 29° 28' 17.13" E	5.6	Site is the coal stockyard currently in use by KPS.

2.2 ENVIRONMENTAL

2.2.1 TOPOGRAPHY

Topographic information was sourced from the 1:50 000 topographic map series, (Eskom, 2021 and Eskom, 2019) and is presented in **Appendix A: Figure 3**. The topography is undulating with the highest point near the junction of the R35 and R542 provincial roads (south-eastern corner) at approximately 1,655 metres above mean sea level (mamsl). The topography slopes in a northerly direction to 1,600 mamsl on the northern boundary (PV Site B and KPS).

2.2.2 HYDROLOGY

KPS is in the upper Olifants River quaternary sub-catchment, B11B. The Koringspruit flows some 700 m to the north. The Koringspruit also passes the Koornfontein and Goedehoop Coal mines (downstream of the KPS), eventually flowing into the Koornfontein River and ultimately joining the Olifants River some 15 km downstream. The Komati spruit is a small drainage line in the centre of the site and drains the area western portion of the Ashing Area to the Koringspruit River via dams located within the municipal sewage plant located external to the site boundary.

The Gelukspruit (a tributary of the Koringspruit River) flows in a north-westerly direction to the east of the KPS. According to Eskom, 2019; this stream was diverted to prevent ingress into power plant areas and remains so due to the location of the current KPS activities. Dirty water from the Ashing Area, KPS and coal stockyard area drain to the Stoffel Dam, (VPS, 2021). Finn Dam is located downstream on the north-eastern corner of the KPS and receives water from the coal stockyard (**Appendix A: Figure 2**).

SENSITIVE AQUATIC RECEPTORS

The study area is highly developed and water resources and dams have been altered by the mining and existing activities at the KPS. There are no wetland sites of national importance in the immediate area, but four wetlands were identified during the aquatic ecology study carried out by WSP[1] in June 2022 for the ESIA. These include:

- A channel valley bottom associated with the Gelukspruit located to the east of the KPS.
- Seep 1 is located on the southern boundary. The small dam (termed the Clean Water Dam) is located downstream of the seep and impounds and pools the water in the wetland.
- Seep 2 is associated with the Komati spruit. It originates downstream of the Clean Water Dam and receives water from the Ashing Area. Seep 2 is bordered by the Komati village to the west.
- A shallow depression wetland is located within a crop field south and external to PV Site A. The wetland is approximately 3 ha in extent and is cut off from PV Site A by the tarred R542 road.

These wetlands were considered "Largely Modified" in terms of their Present Ecological State and are of low/marginal ecological importance. The channelled valley bottom wetland was however assessed as being moderate in terms of its Ecological Importance and Sensitivity as well as in terms of ecosystem services on account of biodiversity maintenance. No areas of potentially Critical Habitat, as defined by International Finance Corporation and World Bank standards, have been identified within the study area. The location of the wetlands is provided on **Appendix A: Figure 2**.

[1] Golder Associates Africa (Pty) Ltd, a member of WSP (Pty) Limited, June 2022, Draft Aquatic ecology study for the Eskom Komati Power Station, Report No 22521869-352949-22, June 2022

2.2.3 GEOLOGY

REGIONAL

Eskom KPS is located within the Highveld (Witbank) Coalfield. The regional geology is described (Eskom, 2021, Kimopax, 2019) as falling within the Carboniferous to early Jurassic aged Karoo Basin. The Karoo Supergroup comprises, from oldest to youngest, the Dwyka, Ecca and Beaufort Groups, with the coal seams generally hosted within the Vryheid Formation of the Middle Ecca Group. The Vryheid Formation includes interbedded sandstone, siltstone, shales and coal seams. The coal seams are mined by the adjacent Goedehoop Colliery. Five coal seams are present within the Vryheid Formation and are numbered (from base up) as the Number 1, 2, 3, 4 and 5 Seams. The zone of undermining (Bohlweki Environmental, 2005) indicated as underlying the PV Site B is noted to associated with the No. 4 and No. 2 coal seams. The No. 2 Seam ranges between 1.5 and 4.0 m in thickness where it is laterally continuous whilst the No. 4 Seam averages 4.0 m, varying from 1.0 – 12 m in thickness at Goedehoop mine (SRK 566657, 2021). The depth below ground level should be confirmed but based on the general stratigraphy is likely to be more than 50 m below surface (SRK 566657, 2021).

The Vryheid Formation overlies the Dwyka formation. A summary of the Lithostratigraphy is provided in **Table 3**. The regional geological map is presented in **Appendix A: Figure 4**.

Table 3 – Lithostratigraphy

Age	Supergroup	Subsuite	Lithology
Quaternary		Q	Surficial alluvial deposits to the north associated with the Koringspruit River
Jurassic		Jd	Fine-grained dolerite
Permian	Karoo	Pv (Vryheid)	Sandstone, shale and coal beds
Carboniferous		C-pd (Dwyka)	Diamictite and shale

LOCAL

The local geology comprises weathering products of the sandstones, siltstones and mudstones of the Vryheid Formation, with isolated dolerite outcrops. The top layer consists of reddish-brown sandy soil, with clayey-sandy subsoil comprising yellowish to brown clays residual of the underlying sandstone formations. Weathering is not, based on the available borehole logs, expected to extend deeper than approximately 10 m. Surficial ash and coal may be present within PV Site A associated with the historical ash dump footprint and in BESS D in the coal stockyard area. A linear structure is indicated on the regional geological map to be orientated northeast to southwest through PV Site B.

2.2.4 HYDROGEOLOGY

AQUIFER DESCRIPTION

A monitoring program has been established for the KPS with the available boreholes presented on **Appendix A: Figure 2**. The boreholes are distinguished as shallow or deep but there is limited lithological information provided. Groundwater monitoring in the areas proposed for the BESS and PV Sites are limited with monitoring boreholes located in PV Site A (west of Ashing Area) and in BESS D (coal stockyard). There are no pre-existing monitoring boreholes located in or around PV Site B, BESS B, BESS C and BESS A. Whilst borehole logs and depth are not provided for all the boreholes, the available information implies that there are two distinct aquifers present in the Komati area, namely:

— Seasonal shallow, discontinuous perched aquifer within the overlying weathered rock matrix. This zone is conceptualised (Kimopax, 2019) as an upper zone of completely weathered material to a depth of 8 to 10 m with a higher hydraulic conductivity (k of around 1 m/d). Monitoring boreholes which intercept this zone are typically less than 10 m deep. Boreholes drilled as part of this investigation (**Section 3**) target this aquifer.

- Regional weathered and/or fractured rock aquifer within the Vryheid Formation. These aquifers are commonly confined along essentially horizontal bedding interfaces between different lithologies. This aquifer occurs below the unsaturated zone (> 10 mbgl) in slightly weathered or fractured bedrock with monitoring boreholes typically being > 30 m deep. GHT Consulting, 2009 indicate that the aquifer hydraulic conductivity for the regional aquifer ranges from 0.007 m/d at AB07 to 2.4 m/d for AB04 with an average of 0.51 m/d. This aquifer is likely to be highly heterogeneous.

Recharge is estimated as 3 % of annual rainfall (20.6 mm/a based on 687 mm/a) in undisturbed areas, (Eskom, 2021).

WATER LEVELS AND FLOW DIRECTIONS

Water levels typically vary from around 1.4 to 12 mbgl with shallow groundwater at surface in AK62 between the Raw Water dams and Ashing Area. Eskom, 2021 indicates that the groundwater flow mimics the topography, and the direction of flow is towards the surface stream, particularly the Koringspruit. A comprehensive numerical groundwater model has been compiled for the KPS area as detailed by Kimopax, 2019 and also indicates that contamination is anticipated to migrate from the pollution sources towards the Koringspruit to the north.

AQUIFER CLASSIFICATION

The regional aquifer is classified as Minor (Parsons[2], 1995 and DWAF[3], 1998) or Poor (DEA[4], 2010) due to the low exploitation potential (0.1 and 0.5 l/s). It does, however, represent an important source of water for domestic supply to the local communities. The aquifer is vulnerable to groundwater contamination due to the shallow water table. This is evident by the contaminant plume (sulphate) identified as underlying the Ashing Area and coal stockyard. The impact is mitigated by the low conductivity and low recharge. Due to the surrounding use of groundwater by communities, the aquifer is considered to require a medium level of protection[5].

GROUNDWATER QUALITY

Water quality data is captured in the Eskom Komati Wish database. Groundwater quality parameters that need to be analysed are specified in the WUL (Appendix IV, Table 6, Clause 3.6) as pH, electrical conductivity (EC), Total Dissolved Solids (TDS), Total Suspended Solids (SS), Total Alkalinity, chloride (as Cl), sodium (as Na), sulphate, nitrate, ammonia, orthophosphate, fluoride, potassium, manganese, copper, iron, zinc, arsenic and chromium. The 95th percentile was estimated from the data provided for the upgradient (ambient) boreholes, selected boreholes within the KPS and boreholes located on or near the northern site boundary and is included in **Appendix B** (Table B3) for reference. In summary:

- Ambient groundwater quality (as represented by AB58 and AB59) is generally alkaline with an average pH of 8.3. Electrical conductivity (EC) (average 17 and 32 mS/m for AB58 and AB59 respectively) is below the groundwater reserve of 112 mS/m.
- Water quality is affected by KPS activities particularly from the Ashing Area and coal stockyard (BESS D). This is indicated by an increase in salinity associated with elevated chloride, sulphate, calcium, magnesium, sodium and fluoride in the coal stockyard area. Metal concentrations for iron and manganese are elevated compared to the ambient groundwater quality (<0.1 mg/l for iron and <0.5 mg/l for manganese) at AB07 (downgrade of the Ashing Area) and in CB09 (coal stockyard).
- Boreholes located on and near the northern boundary (CB52, AB47 and CB51) comprise sulphate, fluoride and manganese concentrations which are elevated compared to the ambient water quality and South African drinking water standards.

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[2] Parsons, R, 1995, A South African Aquifer System Management Classification, WRC Report No. KV77/95
[3] Department of Water Affairs and Forestry, Second Edition, 1998. Waste Management Series, Minimum Requirements for Water Monitoring as Waste Management Facilities
[4] Department of Environmental Affairs, May 2010, Framework for the Management of Contaminated Land
[5] Golder Associates Africa (Pty) Ltd, a member of WSP (Pty) Limited, June 2022, Draft Hydrogeological Investigation for the Eskom Komati Power Station, Report No 22521869-353050-43, June 202

PROXIMITY TO DRINKING WATER SUPPLIES

Water is supplied via pipeline by the Komati Government Water Scheme which originates from the Nooitgedacht Dam (c132 km from KPS), (Lidwala, 2015). The water is treated by Eskom at the Water Plant and Eskom subsequently supplies water to the municipality; however, the layout of the distribution network and its potential proximity to the areas of proposed developments has not been provided to WSP.

Groundwater is abstracted from the adjacent Goedehoop Colliery where groundwater is also utilised for supply (SRK 566657, 2021). The locality of the points of abstraction are not indicated in the available information.

A hydrocensus (**Appendix A: Figure 2**) was carried out in 2008 (GHT Consulting, 2009) with selected points (thirteen) resampled in 2019 (Eskom, 2019). These covered an approximate 15 km radius around KPS. The results of the hydrocensus imply that the surrounding farms to the east, southeast and southwest of KPS obtain water from boreholes for domestic use and for irrigation of crops. The closest boreholes are located within 500 m of the Eskom boundary on the farms Goedehoop, Geluk and Broodsnyders with details included in **Table 4**. Boreholes identified on the National Groundwater Archive were confirmed to be beyond 1 km of the farm boundary.

Table 4 – Hydrocensus Boreholes

ID	Longitude (ºE)	Latitude (ºS)	Depth (m bgl)	Use	Water Level (mbcl)	Condition
BB20	29.48213	26.08393	26.1	Domestic Drink	14.10	Good
BB21	29.47954	26.10598	26.8	~	2.20 (2008); 1.76 (2019)	Windmill (2019)
BB22	29.47907	26.10586	~	Domestic Drink	~	Good
BB23	29.47905	26.10632	11.0	Domestic Drink	4.50	Broken (2008) indicated to be in use 2019
BB24	29.47125	26.11574	~	Domestic Drink	15.00	Good
BB25	29.47127	26.11574	26.5	Domestic Drink. Livestock	20.50	Good
BB26	29.47783	26.11699	6.1	~	Dry	Dry hole
BB27	29.47912	26.11710	42.0	Domestic Drink. Livestock	32.00	Good
BB43	29.42195	26.12209	15.0	Domestic Drink	8.00	Good
BB44	29.42193	26.12198	55.0	Domestic Drink. Livestock	5.00	Good
BB45	29.41625	26.11591	~	~	~	Not in use for a long time
BB46	29.42719	26.11853	~	~	~	Not in use for a long time

Water quality analyses was carried out on the hydrocensus boreholes. According to Eskom (2019), concentrations were generally below the South African drinking water standards and therefore deemed suitable for drinking (based on the parameters analysed). No groundwater abstraction is known to take place within the study area.

3 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) has been developed based on the information contained within the preceding sections. The aim of the CSM is to define the source–pathway–receptor linkages which may be applicable under the assumption of an ongoing industrial land-use for the proposed development areas and recognising the existing surroundings and which, based on identification of linkages, could give rise to potential human and/or environmental risks.

The CSM has been developed sequentially on the basis that in the event that no plausible linkages exist then no significant risk is considered to be present. Therefore, the CSM specifically focusses on the linkages between the three aspects (i.e. exposure pathway) based on the specified scenarios and if any of these are not identified then the risks are considered negligible. It should be acknowledged that the CSM would be expected to evolve as more information becomes available and it must be recognised that if the source–pathway–receptor linkages are altered, the CSM must be reviewed to ensure that the assumptions remain valid.

3.1 POSSIBLE SOURCES

While the KPS and the associated Ashing Area along with the neighbouring colliery represent more widespread sources from long term operations, including secondary sources related to existing groundwater impacts, the potential pertinent primary sources specific to the targeted development areas are summarised as follows:

PV SITE A

— Rehabilitated Domestic Waste Site
— Historical Rehabilitated Ash Dump
— Unconfirmed use of fertilisers and/or pesticides for crop production

PV SITE B

— Historical coal discard dump
— Ash and slurry used to backfill undermined areas

BESS A

— Leakages from mechanical and electrical equipment, chemicals and fabrication activities
— Spillages of chemicals from storage areas and the contractor’s yard
— Washing and maintenance of equipment including potential solvents and paints

BESS B

— Historical shooting range
— Unconfirmed graves associated with church

BESS C

— Scrap yard
— Possibly hazardous materials within fenced temporary storage area

BESS D

— Coal stockyard

3.2 KEY RECEPTORS

The following plausible receptors have been identified assuming the use of the site and surrounds remain consistent with the current land use:

HUMAN HEALTH

— Site workers – industrial use (current and future)
— Residents in neighbouring communities (i.e. Komati Town)
— Groundwater Users: while there are no confirmed abstractions within the study area, groundwater use is known within 500 m of the Eskom boundary.

ENVIRONMENTAL

- Groundwater: The aquifer beneath the site (> 35m) is classified as Minor/Poor with the overlying shallow weathered zone (<10m) being perched and discontinuous. The overlying shallow aquifer is not considered a viable groundwater resource but may contribute to seepage in the wetland areas as well as vertical migration into the regional deeper weathered/fractured rock aquifer. It is again noted that the underlying groundwater is known to have been impacted by mining and activities at KPS. Future mining of the No.4 coal seam underlying PV Site A is understood to be planned. The seam is located 20 to 100 m below ground surface (Anglo American, 2015).
- Surface water: The closest surface water features are the wetlands associated with the Komatispruit and Geluksprui t drainage lines which originate within or immediately downstream of the Ashing Area. These flow towards the Koringspruit to the north of KPS

PROPERTY

- Subsurface water supply pipelines and other infrastructure
- Neighbouring third-party land
- Buried concrete/metal

3.3 POTENTIAL PATHWAYS

Taking account of the possible sources, and notwithstanding the potential for ongoing or future direct release/s of contaminants, the hypothetical pathways by which these may affect the identified receptors, thereby potentially completing the exposure pathway/s are discussed within the following subsections.

3.3.1 DIRECT EXPOSURE – DERMAL CONTACT AND INGESTION OF SOILS

Dermal contact and/or ingestion of contaminated soils are possible pathways, especially during the proposed development or other maintenance works, and particularly in areas not covered by hardstanding.

3.3.2 VERTICAL MIGRATION OF CONTAMINATION

Vertical migration of contamination may occur from source zones into the underlying groundwater by leaching and dissolution, or under the influence of gravity (i.e. liquid chemical products and oils). This will be exacerbated in areas where impervious cover is absent or of compromised integrity due to higher effective infiltration, where contaminant loading/s are more substantial, or where other conditions exist that may promote contaminant-specific mobility (i.e. introduction of acids).

While contributory impacts related to activities in the discrete development areas cannot be discounted, the known existing plume originating from the Ashing Area likely represents the principal source of groundwater contamination associated with activities at the KPS.

3.3.3 LATERAL MIGRATION WITHIN GROUNDWATER

The lateral migration of contamination will be highly affected by the geological structure, the hydraulic gradient of the underlying groundwater, the permeability of the aquifer unit/s, the efficacy of any attenuation, the effects of recharge and the influence of seasonal fluctuations, as well as by local abstractions. Groundwater is expected to flow generally towards the north towards the Koringspruit, and the plume associated with the impacts from the Ashing Area has been shown to already extend beyond the boundaries of Eskom's premises and, therefore, lateral migration is confirmed.

Future mining of the No. 4 coal seam underlying PV Site A could result in a change in the direction of groundwater flow during mining should groundwater from the regional aquifer be pumped from the workings. The mine workings will almost certainly be backfilled, but a cone of depression may remain until such time as the water levels recover post closure.

3.3.4 DIRECT EXPOSURE – DERMAL CONTACT AND INGESTION OF GROUNDWATER

The likelihood of direct contact to site personnel and users is likely negligible under normal operating circumstances in the absence of abstractions within Eskom's boundaries. There is, however, evidence of groundwater uses within the vicinity of KPS, including for potable use and thus this pathway represents a potential cause for concern.

3.3.5 LATERAL MIGRATION OF CONTAMINATION VIA STORMWATER

Surface water runoff from exposed and impacted soils, unconfined waste deposits, and/or impacted hardstanding may result in contaminant impacts to both man-made and natural stormwater channels and subsequent accumulation and/or migration therein. While appraisal of stormwater management is beyond the scope of the current document it should be recognised that any impacts may migrate from the site and may also contribute to subsurface impacts.

3.3.6 LATERAL MIGRATION VIA SUBSURFACE INFRASTRUCTURE CONDUITS

It is plausible that subsurface utility trenches (i.e. sewers, effluent pipelines, water distribution network) may represent preferential flow-paths for the accumulation and migration of any contaminant impacts.

3.3.7 INHALATION OF VAPOURS

Whilst unlikely to affect users of external areas, vapour intrusion into on-site buildings from either soils or shallow groundwater may represent a significant source of risk to human health.

3.3.8 GENERATION OF GROUND GAS

In addition to, but distinct from, the inhalation of vapours is the potential generation of ground gases within impacted unsaturated and saturated zones. The characteristics, mass and degradation of potential contamination may lead to the generation of methane, oxides of carbon, ethane, ethene and hydrogen sulphide, depending on the active processes. If migration of such gases into internal structure occurs, these may lead to asphyxiation (via oxygen displacement) or potential explosion.

3.3.9 INHALATION OF AIRBORNE DUST AND FIBRES

Agitation and disturbance of soils, especially during substantial earthworks and/or construction activities, may contribute to airborne particulate loads, including potential asbestos fibres, that could become inhaled either by site occupiers or by users of neighbouring areas, including residents of Komati. While specifically excluded from the current scope given its footprint outside of the development areas, the presence of the historical asbestos waste site should be acknowledged.

3.3.10 DIRECT CONTACT WITH PROPERTY

Contamination has the potential to permeate water supply pipes used for human consumption or other processes and/or result in aggressive ground conditions which may compromise the structural integrity of buried concrete, as well as metal that may be in direct contact.

4 CURRENT INVESTIGATION

4.1 FIELDWORK

4.1.1 SITE RECONNAISSANCE

As well as to confirm health and safety arrangements, an initial site visit was conducted on 05 May 2022 to oversee and discuss the placement of intrusive positions within the relevant areas of concern.

4.1.2 SITING AND SERVICE CLEARANCE

Twenty-five soil sample localities and ten shallow borehole locations were identified following the initial site reconnaissance. As well as to define baseline conditions, these primarily focused on areas where substantial contamination may have been brought about by historic and/or current site activities across the proposed solar PV and BESS development portions; however, at the request of Eskom, also included exploratory positions proximal the fuel depot and down-gradient of the Ashing Area. Where possible, positions were sited down-gradient of the activities/operations identified where any soil impact could be expected to be within the shallow soil profile. It should be noted that AH09 & AH10 were however situated to the east of BESS A due to access constraints and, therefore, may not be representative of potential impacts within the footprint of this proposed development area.

Subsurface clearance was undertaken by Hydrometrix Technologies (Pty) Ltd on 08 June 2022 under the supervision of WSP at each of the targeted intrusive locations. A Cable Avoidance Tool (CAT) was used to determine the presence/absence of underground power cables and metal utilities; thereafter, Ground Penetrating Radar (GPR) was adopted to confirm the absence (or otherwise) of other potential services. The clearance report is presented in **Appendix C**.

4.1.3 AUGERING AND SAMPLING

Twenty-five auger holes (AH01–AH25) were manually advanced to depths ranging from 0.3–1.7 mbgl; geotechnical refusal was encountered in the majority of the holes. The positions of the auger holes, digitised using a handheld Global Positioning System (GPS), are illustrated on **Appendix A: Figure 5**.

Headspace testing was undertaken to determine the potential presence of volatile contaminants within the profiles. Soil samples were obtained at approximate 0.5 m intervals (where possible) and placed in a receptacle such that headspace remained. After a period of exposure to ambient atmospheric conditions the concentration of volatile vapours within the closed headspace was measured using a Photo-Ionisation Detector (PID) calibrated using 100 ppm isobutylene. The recorded concentrations including the depth, descriptions of strata encountered and other pertinent comments on the conditions observed during the intrusive works are presented on the exploratory hole logs in **Appendix D**.

4.1.4 BOREHOLE ADVANCEMENT AND WELL INSTALLATION

At the request of Eskom ten permanent monitoring wells (BH01–BH10) were advanced by Soil and Groundwater Remediation Services (SGRS) under supervision of WSP at targeted safely-accessible locations to depths of up to 10m bgl. These were generally positioned in areas where coverage from the existing monitoring network was limited.

Boreholes were initially manually advanced to depths of up to 2 mbgl prior to completion by percussive techniques. Similar to the auger holes, headspace testing was completed at approximate 0.5 m intervals during manual advancement and, thereafter, at roughly 1 m intervals upon commencement of mechanical drilling; although, the inevitable loss of volatile due to the drilling methodology is recognised. The recorded vapour concentrations along with the depth and descriptions of strata encountered as well as other pertinent comments on conditions observed during the borehole advancement are again presented on the exploratory hole logs in **Appendix D**, alongside the construction details of each of the subsequently installed monitoring wells.

The positions of the wells, determined via specialist surveyor subsequent to their installation, are illustrated on **Appendix A: Figure 5**.

4.1.5 GROUNDWATER MONITORING AND SAMPLING

Due to the short timeframes associated with the project, a maximum period of one week (depending on drilling progression) was allowed following installation for the newly installed wells to stabilise.

Measurements of static groundwater levels and the base of each position was first carried out using a dual phase interface meter that allowed the simultaneous measurement of the thickness of any potential Non-Aqueous Phase Liquid (NAPL). Thereafter, prior to sampling, accessible wells were purged of a maximum of three well volumes (where possible) using dedicated single-use bailers. Samples were then collected in laboratory prepared containers which were stored in a temperature-controlled environment for delivery to an accredited laboratory for subsequent analysis. All samples were taken according to internationally accepted protocols, ensuring the potential for cross contamination was minimised. A blind duplicate sample (BH10-01) was obtained from BH03 for quality control purposes. The monitoring data is summarised in **Table 5**.

Table 5 – Groundwater Monitoring Data (06 June 2022)

Locality	Well	Water level (m bgl)	Water level (mamsl)	Observation
Ashing Area (Up-gradient)	BH05	1.55	1,617.05	Light brown, no odour
PV Site A	BH07	1.52	1,629.28	Light brown, no odour
	BH08	1.25	1,649.55	Light brown, no odour
	BH06	1.3	1,624.1	Clear translucent, no odour
PV Site B	BH09	0.86	1,601.54	Clear translucent, no odour
	BH10	0.95	1,610.05	Clear translucent, no odour
	BH04	0.88	1,604.42	Clear translucent, no odour
BESS C	BH03	1.52	1,605.58	Light brown, no odour
BESS D	BH02	1.55	1,600.35	Brown, no odour
BESS D (Down-gradient)	BH01	1.97	1,596.73	Light brown, no odour

4.2 LABORATORY ANALYSIS

The soil and groundwater samples were submitted to Element Materials Technology (Element), a SANAS accredited laboratory (Facility No T0729) for analyses broadly consistent with the priority contaminants listed in the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN R.331 of 2014); however, supplemented with other selected determinants at the request of Eskom, as follows:

SOILS

— Metals/metalloids: antimony, arsenic, cadmium, chromium (total and hexavalent), cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium and zinc
— Inorganics: ammoniacal nitrogen, chloride, cyanide, fluoride, nitrate, nitrite and sulphate
— Aliphatic petroleum hydrocarbons (C_7–C_9, C_{10}–C_{14} and C_{15}–C_{36})
— Volatile Organic Compounds (VOC) including benzene, toluene, ethylbenzene and xylenes (BTEX)
— Semi-Volatile Organic Compounds (SVOC) including Polycyclic Aromatic Hydrocarbons (PAH)
— Polychlorinated Biphenyls (PCB)
— Physiochemical: pH and electrical conductivity

NB: *asbestos has been specifically excluded from the current assessment given the outcomes of VPC, 2021 as summarised in Table 1 in relation to the historical asbestos disposal site.*

GROUNDWATER

- Metals/metalloids: antimony, arsenic, cadmium, calcium, chromium (total and hexavalent), cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silicon, sodium, vanadium and zinc
- Inorganics: ammoniacal nitrogen, chloride, fluoride, nitrate, ortho-phosphate and sulphate
- Aliphatic petroleum hydrocarbons (C_7–C_9, C_{10}–C_{14} and C_{15}–C_{36})
- VOC including BTEX and Tentatively Identified Compounds (TIC)
- SVOC including PAH and TIC
- PCB
- Physiochemical: alkalinity (total), electrical conductivity, pH, Total Dissolved solids (TDS) and Total Organic Carbon (TOC)

Laboratory certificates of analysis are provided in **Appendix E**.

5 GROUND AND GROUNDWATER CONDITIONS

5.1 SOILS

The deepest soil profile that could be achieved was at PV Site A within the area previously used for crops. The soil profile comprised darker brown clayey sand which become lighter brown with depth. No crops were evident at the time of the investigation.

The "natural" soil horizon (weathered bedrock) comprises a moist, orange, brown to red-brown sandy clay or clayey sand (residual Vryheid formation) with occasional mottled clayey sand with ferricrete nodules in most of the areas inferring a seasonally fluctuating water table.

Fill/made ground was encountered in several samples including:

- Coal was observed to 1.5 mbgl (BH02) in the coal stockyard; auger holes (AH01–AH03) refused at 1 mbgl and only coal samples could be obtained
- Ash was observed downgrade of the Ashing Area at AH14 and in BH05 and BH06. While ash was not identified in AH13, the soil was darker in colour than elsewhere on the site implying that this area is affected by runoff from the ash dams. By contrast, there was no ash indicated in the historical ash dump footprint sample (AH15) within PV Site A.
- A shallow horizon of around 0.5m was noted for the exploratory holes (AH23, AH24, AH25, BH9 and BH10) located in the area of the historical Coal discard dump in the vicinity of PV Site B. A seepage zone was noted as perched on mottled sandy clay under this layer in the auger holes (AH23, AH24 and AH25). There was no evidence of coal or ash in the vicinity of this historical Coal discard dump, but the gravel horizon could be backfilled weathered material sourced from the surrounding area.
- A soil stockpile of unknown origin (possibly from road building or topsoil) was observed in PV Site A. Samples were obtained near the soils (AH16 and AH17).

5.2 GROUNDWATER

5.2.1 DEPTH

Seepage was encountered in the boreholes with BH7 and BH8 (located in PV Site A), but the remaining boreholes were moist with no discrete groundwater strikes observed during drilling. Groundwater depths following stabilisation were recorded in all the boreholes with depths varying from 0.86 to 1.97 mbgl which is broadly consistent with the existing dataset (Komati WISH database).

5.2.2 FLOW DIRECTION AND HYDRAULIC GRADIENT

Comparing topographic and groundwater elevations an R^2 value of 0.99 is calculable (**Figure A**) resulting in a very strong correlation coefficient and consistent with previous works. The interpolated groundwater flow is illustrated on **Appendix A: Figure 6** and confirms an overall flow direction to the north.

Very broadly, an average hydraulic gradient is calculated with reference to groundwater elevations (**Table 5**) at BH08 in the south and BH01 in the north. This represents a difference of ~52.82 m over a lateral distance of approximately 2,866 m, equating to a hydraulic gradient of ~0.018. It should be stressed that hydrogeological conditions are unlikely to be homogenous especially recognising that the shallow aquifer is discontinuous and, therefore, local variability should be expected that may differ markedly from this calculated average.

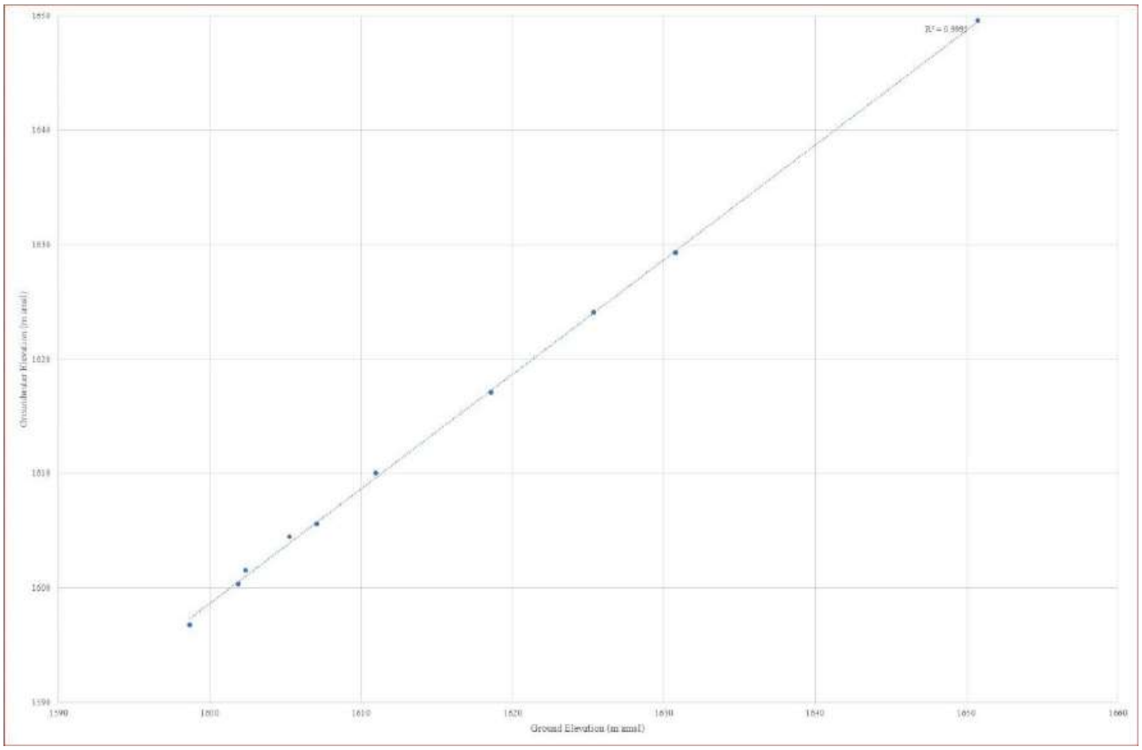


Figure A – Correlation: Topography versus Groundwater Elevation

5.3 CONTAMINATION OBSERVATIONS

The results of headspace testing indicated that volatile vapours were below the PID's level of detection (<0.1 ppm) within all soil samples. Nonetheless, visual evidence of soil contamination was noted as follows:

— Coal was noted to a depth of 1.5 mbgl in the coal stockyard
— Ash was noted within the proximity of the Ashing Area
— Discolouration (staining) was observed on the brick paving at the fuel depot (AH05 and AH06)
— Denudation was seen in the vicinity of BESS Area A adjacent to the contractor's yard.

Groundwater samples varied from brown to clear with no obvious visual or olfactory evidence of contamination.

6 SOIL RESULTS

The South African Framework for the Management of Contaminated Land (Framework, May 2010) developed by the then Department of Environmental Affairs (DEA)[6] in line with Part 8 of the NEM: WA, outlines the methodology for the screening of potentially contaminated sites to provide a risk-based decision support protocol for their assessment. Further, the then DEA gazetted GN R.331 in May 2014, with these being promulgated under Section 7(2)(d) of the NEM: WA by the then Minister of Water and Environmental Affairs. GN R.331 provides Soil Screening Values (SSVs), a tiered system of priority soil contaminants, to facilitate the determination of sensitivity of the relevant receptor which may be subject to exposure. These are defined as follows:

— SSV1 represents the lowest value calculated for each parameter from both the human health and water resource protection pathways. SSV1 values are not land-use specific
— SSV2 represents the land-use specific soil concentration and are appropriate for screening level site assessment in cases where protection of water resources is not an applicable pathway for consideration

Separately, GN R.331 provides Soil Screening Levels (SSLs) for a number of anions; however, it is notable that these are not related to potential risks to human health via direct exposure. These are specifically investigation values that are relevant only to provide guidance on potentially excessive levels of salts, which can represent a major cause of deterioration of soil or water quality from an ecological perspective.

6.1 INITIAL SCREENING

Recognising the general approach prescribed by the Framework, the analytical results for the analysed contaminants of concern have first been compared to the SSV1s published in GN R.331. Where SSV1s are not available reference has been made to the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for Residential Soil (May 2022) as a reasonable alternative while recognising the different paradigm behind their derivation. Whilst conservative under many potential exposure scenarios, such screening allows justified rationalisation of potential contaminants that may require further assessment and/or management, and discounts those potential exposure pathways that do not pose a significant risk.

Cadmium, hexavalent chromium, cyanide and PCBs as well as the majority of the VOCs and SVOCs were recorded below their respective laboratory detection limits and, therefore, are not seen as contaminants of concern for further consideration. Otherwise, the following is noted:

— Arsenic, lead, and manganese were above their respective SSV1s within shallow soils across most of the proposed development areas with the exception of BESS A and BESS B. Similar is noted for vanadium although this was also below its SSV1 at BESS D and the fuel depot, as well as down-gradient
— Excluding samples from BH02, BH06 and AH10 copper was ubiquitously above its SSV1
— Iron was above its USEPA RSL within various samples, and largely within ferruginised soils
— Sulphate was above its SSL within those samples retrieved from AH01 (coal stockyard) and AH15 (historical ash dump at PV Site A)
— Pyrene and benzo(a)pyrene were above their respective SSV1s within the sample collected from AH06 at the fuel depot

The pH of the samples collected ranged widely from 4.58–7.92. Although there are no SSVs published for the protection of human health under the NEM: WA, the South African National Standard (SANS) Globally Harmonised System of Classification and Labelling of Chemicals (GHS), SANS 10234:2019 recognises materials with a pH within a range of 2–11.5 as not being hazardous

[6] In June 2019, the DEA was renamed the Department of Environment, Forestry and Fisheries (DEFF) and, in April 2021, was renamed the Department of Forestry, Fisheries and the Environment (DFFE)

6.2 FURTHER SCREENING

Where contaminants have been recorded in excess of their respective initial assessment criteria and following the stepwise methodology described in the Framework, further screening has been separately carried out to ascertain whether these could plausibly represent risks to either human health or aquatic systems based on site-specific considerations.

As indicated, the SSLs for anions (i.e. sulphate) are only relevant to provide guidance on potentially excessive levels of salts and, therefore, have not been carried forwards into the further screening exercise. Nonetheless, with the exception of localised instances of elevated sulphate within samples containing coal and ash these were consistently below their respective SSLs and so no concern is raised.

6.2.1 RISK TO HUMAN HEALTH

Potential risks to human health are based on land-use specific considerations and refer to the applicable SSV2s for the following land uses:

— Informal residential
— Formal residential
— Commercial/industrial

Recognising that the town of Komati lies central to the overall proposed development areas, SSV2s relevant for formal residential use have been conservatively adopted to ascertain whether soil contamination may represent a potential health risk. The following is noted:

— With the exception of manganese AH20 (PV Site A), BH10 (PV Site B) and BH04 (BESS B) as well as vanadium at AH21 (PV Site A), metals were below their respective SSV2s. While these localised anomalies are noted, overall average concentrations of both manganese (~754 mg/kg) and vanadium (~124 mg/kg) were below their SSV2s for a formal residential setting. Therefore, in the wider context these are considered unlikely to represent a significant source of risk with respect to human health, especially when recognising that all were below their SSV2s relevant for the commercial/industrial land-use of the proposed development areas
— Benzo(a)pyrene was above both its formal residential and commercial/industrial SSV2s within AH06 at the fuel depot. This falls outside of the proposed development areas covered under this report; however, is indicative of potential risks to human health from ongoing operations and possibly symptomatic of more extensive impacts local to the fuel depot that will require consideration by Eskom during decommissioning

6.2.2 RISK TO AQUATIC SYSTEMS

With respect to soil-based contamination, potential risks to aquatic systems are defined based on the sensitivity of the surface water and groundwater resources. The Framework methodology recognises the adoption of SSV1 as generic criteria in the event that there is a current or potential future groundwater use on or within 1 km of a site, or there is a permanent surface watercourse on or adjacent the site. Recognising the proximal surface water courses, including wetlands, as well as the abstractions within 500 m of the premises boundary, these criteria are considered to be satisfied and therefore, with the exception of iron (USEPA RSL for human health only), the commentary in **Section 6.1** is relevant.

It must, however, be acknowledged that the published SSV1s do not distinguish between the protection of drinking water and freshwater aquatic ecosystems, nor do they differentiate from where direct human health risks may represent the critical exposure pathway. In this regard the following is noted in respect of the published SSV1s:

— Arsenic and lead are based on the protection of drinking water. While lead was noted in the shallow groundwater samples (**Section 7**), arsenic was consistently below its laboratory detection limit
— Manganese, vanadium and benzo(a)pyrene are based on the direct human health risk under an informal residential land-use (as noted by their SSV1s being equivalent to their corresponding SSV2s)
— Copper and pyrene are based on the protection of the freshwater aquatic environment

7 GROUNDWATER RESULTS

7.1 QUALITY CONTROL – DUPLICATE SAMPLE

To determine the accuracy of the field sampling methodology and the laboratory analysis, a blind field duplicate sample BH10-01 was collected from monitoring well BH03 and submitted for the full suite of analysis described. Data quality was evaluated based on the relative percentage difference (RPD) in the concentration of detected contaminants between the original and duplicate sample and assessed for a RPD target of 20%. Acknowledging that results from either the original or duplicate sample may be equally valid and that either one may be more, or less, representative of groundwater conditions, the following formula has been utilised to calculate the percentage difference:

$$Relative\ Percentage\ Difference\ (RPD) = \left(\frac{(Original\ Concentration - Duplicate\ Concentration)}{\left(\frac{(Original\ Concentration + Duplicate\ Concentration)}{2}\right)}\right)$$

Excluding pH that is logarithmic, where determinants have been detected, the comparison of the original and duplicate sample results is presented in **Table 6** whereby if two values have an RDP greater than 20%, the values are highlighted.

Table 6 – Relative Percentage Differences BH03 (Original) versus BH10-01 (Duplicate)

Determinant	Units	Concentration		~RPD (%)
		BH03 (Original)	BH10-01 (Duplicate)	
Electrical conductivity	mS/m	184.9	185	-0.05
Cobalt	µg/l	11.1	11	0.9
Iron	µg/l	164.4	163.7	0.4
Lead	µg/l	4.6	4.6	0
Manganese	µg/l	1,718.3	1,639.4	4.7
Nickel	µg/l	12.8	12.6	1.6
Vanadium	µg/l	1	1	0
Zinc	µg/l	37.9	37	2.4
Calcium	mg/l	141	141.5	-0.4
Magnesium	mg/l	125.4	116.5	7.4
Potassium	mg/l	6.2	6	3.28
Sodium	mg/l	136.4	137.1	-0.5
Silicon	µg/l	19,617	20,135	-2.6
Fluoride	mg/l	0.3	0.4	**-28.6**
Chloride	mg/l	73.9	69.9	5.6
Sulphate	mg/l	983.1	837.9	16
Orthophosphate	mg/l	0.055	0.042	**26.8**
Ammoniacal nitrogen	mg/l	0.75	0.36	70
Alkalinity	mg/l	260	256	1.6
Total Solids	mg/l	1,537	1,533	0.3

While both fluoride and orthophosphate show RPDs greater than 20% this is in relation to low concentrations whereby the percentage difference is magnified. In real terms the recorded concentrations are of similar magnitudes and on this basis, it is considered that the laboratory analytical data obtained can be relied upon with a satisfactory degree of confidence, especially when noting that all other RPDs are well within the 20% target.

7.2 DISCUSSION

As per **Section 5.2**, the groundwater flow direction is from south to north. On this basis background groundwater quality is likely best represented by two boreholes located up-gradient of the KPS boundary (AB58 and AB59). The background water quality has been defined by the 95th percentile concentrations of determinants as sourced from the existing Komati Wish database supplied by Eskom.

The groundwater reserve is provided in the WUL, 2014 (Appendix IV, Table 7, Clause 4.1) where it is noted that concentrations of 0 mg/l are presented for sodium and sulphate. It is expected that these will be naturally present in the regional aquifer as is evidenced for the ambient water quality at AB58 and AB59 where ranges of 17–22 mg/l and 8–21 mg/l are noted for sodium and sulphate, respectively. Although the reserve limits specified within the WUL have been adopted as the primary source of reference for those determinants included the zero values for sodium and sulphate are omitted from further consideration – Eskom should, however, liaise with the Department of Water and Sanitation (DWS) in this regard.

In terms of pH and although lower than background (8.8–9.1) the shallow groundwater is generally near neutral (6.62–7.54) and satisfies the lower pH limit (6.6) specified within the WUL. The other determinants provided for within the WUL are also seen as being broadly compliant; however, exceptions are noted as follows:

- A high salt content is recorded at BH03 (BESS C) where, together with elevated concentrations of sodium and sulphate, electrical conductivity, calcium, magnesium and chloride were above their respective reserve limits. This is expected due to the known groundwater plume extending from the up-gradient Ashing Area and concentrations decrease further down-gradient of the KPS (BH02, BESS D) to below the reserve limits. However, increases in the concentrations of a number of determinants are noted at the further down-gradient position (BH01), with magnesium and chloride again above the reserve criteria, albeit at far lower concentrations than BH03.
- Electrical conductivity and magnesium are above their reserve limits at BH08. This is located up-gradient of KPS activities on the southern boundary of PV Site A but slightly down-gradient of the background borehole (AB58).
- Chloride was above its reserve limit at both BH05 (northeast of the Ashing Area and north of Raw Water Dams) and BH04 (BESS B).

The underlying shallow aquifer targeted as part of this investigation is considered a non-aquifer due to the low yield and discontinuous nature. Nonetheless, the possibility of vertical migration of contaminant impacts from this to the regional deeper weathered/fractured rock aquifer is recognised. While appraisal of the quality of water within the deeper aquifer is outside the scope of the current assessment, in recognition of groundwater use within 1 km together with the proximal freshwater aquatic surface water environs, analytical data has also been considered alongside the following:

- South African National Standard (SANS) for Drinking Water, SANS 241-1:2015 Edition 2, or Edition 1 (2011) for determinants omitted from the second version
- South African Water Quality Guidelines (SAWQG) Volume 1, Domestic Use, Second Edition, 1996
- SAWQG Volume 7, Aquatic Ecosystems, Second Edition, 1996

In this context the known plume associated with the Ashing Area expectedly dominates the signature of down-gradient groundwater quality with manganese at a concentration (1,718.3 µg/l) above both the drinking water chronic health standard (400 µg/l) and freshwater aquatic guideline (180 µg/l). While this plume has been shown to extend off-site to the north, seemingly additional contributions from the KPS and particularly the coal stockyard (BESS D) are also observed with a doubling in the concentration of manganese recorded at BH01 (3,269.5 µg/l). The likely lateral dispersivity of this plume is also apparent at BH05 to the northeast and BH06 to the west where manganese concentrations of 809.5 µg/l and 496.8 µg/l were respectively recorded. Manganese was not otherwise recorded above either its freshwater aquatic guideline or chronic health standard for drinking water; although was noted to be above its aesthetic drinking water standard at BH04 (BESS B).

Compared to the background range (6.2–10 µg/l) concentrations of zinc appear elevated within the shallow groundwater across the entire property (16.2–59 µg/l). While far below the drinking water standard of 2 000 µg/l, these are above both the Target Water Quality Range (TWQR) and Chronic Effect Value (CEV) of 2 µg/l and 3.6 µg/l, respectively for aquatic ecosystems, and also above the Acute Effect Value (AEV) of 36 µg/l in four of ten boreholes (40%) sampled under the current scope. This includes positions both up- and down-gradient and therefore the source of zinc remains uncertain.

While absent in the background, lead has been detected within all shallow groundwater samples obtained. Notably, however, this is an approximate order of magnitude greater, and above the drinking water standard, within the west of the property (BH06, BH07 and BH08 [PV Site A] and BH09 [PV Site B]). While the combustion of fossil fuels (i.e. coal) is a recognised source of environmental lead, the reason for the noted distribution is uncertain and therefore remains unconfirmed; however, appears to correlate with typically higher concentrations of lead in soils in the west of the premises (**Section 6.2.2**).

Exceedances of the adopted standards/guidelines does not necessarily confirm the presence of an unacceptable risk but provides a conservative indication of where the shallow groundwater may represent a source of impact for the identified receptors. **It is understood (VPC, 2021) that rehabilitation and management is planned for the plume associated with the Ashing Area and, as such, long term improvements in the quality of shallow groundwater would be expected once this process is implemented. While the sources of lead and zinc cannot be categorically confirmed these are almost certainly related to the activities at both KPS and the neighbouring colliery, and more detailed assessment/s are recommended to ensure appropriate protection of any potential receptors.** Otherwise, the demonstrated impacts to shallow groundwater are not considered to represent substantial constraints to the proposed development specific to the two PV and four BESS sites.

8 CONCLUSIONS

Based on the outcomes of the targeted investigatory works, a number of contaminants largely consisting of metals and nutrients/salts together with localised PAHs have been identified within both soils and/or shallow groundwater that are indicative of impacts related to activities at KPS, and particularly associated with the Ashing Area that lies outside of the proposed development areas that are the focus of this document.

In summary:

Table 7: Summary of findings in soil and groundwater for each area

Area of investigation	Summary of concentrations exceeding screening values	Risk Summary
PV Site A	**Soil:** Cu (in almost all samples) and As, Pb, Mn, and V were locally elevated above the SSV1 in some samples but less than SSV2 screening levels. Sulphate was elevated above SSV in AH15. **Groundwater:** Pb (all), Mn (BH6 only), SO_4 (BH8 and BH6) elevated above SANS 241:2015. Pb (all), Mn (BH6 only), Zn (all), ammoniacal N (all) elevated above SAWQG for aquatic species (SAWQG).	Potential sources: Area was historically used for crops with historical footprints in the eastern portion. Receptors to which an exposure pathway are complete include site workers (human health) and the environment. Soils are largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern. There is an existing groundwater plume from the adjacent Ashing area and seeps to the adjacent wetland are impacted by surface runoff from this area. No 4-coal seam is anticipated to be mined some 20 – 100m below the surface. The risk to these workings from the existing plume is outside this scope of work.
PV Site B	**Soil:** Cu (in all samples) and As, Pb, Mn, and V were locally elevated above the SSV1 in some samples but less than SSV2 screening levels. **Groundwater:** Pb (BH9 only), Mn (BH6 only), SO4 (BH8 and BH6) elevated above SANS 241:2015 and SAWQG. Zn (both) > SAWQG	Potential sources: A coal discard dump footprint is located to the north-west. Backfilled mine workings have been noted to occur at a depth greater than the 10m assessed by this study. Receptors to which an exposure pathway may be complete include site workers (human health), residents of Komati town, and the environment. Soils are largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern but there will, be a requirement to ensure appropriate management of excavations, and especially where these are required within areas proximal to residential dwellings of Komati.

Area of investigation	Summary of concentrations exceeding screening values	Risk Summary
BESS A	**Soil:** Cu in AH9 elevated above the SSV1 but less than SSV2 screening levels. Concentrations were all below SSV1 in the second sample AH10. **Groundwater:** No samples	Area is currently in use with several buildings and contractor's yards. Samples were therefore obtained from the adjacent area. Receptors to which an exposure pathway may be complete include site workers (human health) and the environment. Soils are largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern. The risk from soils is as indicated above for the general site but visual inspection of this area may be necessary following demolition/ decommissioning to ensure there is no local areas of concern.
BESS B	**Soil:** Cu (in all samples), Pb and Mn locally in BH4 elevated above the SSV1 in some samples but less than SSV2 screening levels **Groundwater:** Fe, Mn > SANS 241-2015 aesthetic Mn, Zn > SAWQG	Potential sources: Most of the area is not in use except for a church located in the south-eastern corner. There is no evidence of a graveyard, but this should be confirmed with Eskom. The church is located within a bunker which was historically an old shooting range and there could be spent bullets within the bunker. Receptors to which an exposure pathway may be complete include site workers (human health). Komati town and the environment, specifically the aquatic environment of the Komati stream. Soils are largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern. The risk to the water resources (aquatic and groundwater) are influenced by the surface runoff and groundwater migration from the Ashing Area.
BESS C	**Soil:** Cu (in all samples), As, Pb, Mn and V locally elevated above the SSV1 in some samples but less than SSV2 screening levels. **Groundwater:** EC, Mn, SO4 > SANS241-2015. PO4, Ammoniacal N, Mn, Zn, Pb > SAWQG	Potential sources: KPS, Ashing Area (upgradient), scrap yard and a possible temporary hazardous waste facility. Receptors to which an exposure pathway may be complete include site workers (human health) and the environment, specifically the aquatic environment of the Gelukspruit (and wetland). Soils are largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern. Ground water quality is affected by contamination migrating from the Ashing Area.
BESS D	All surface samples were taken from coal fill. As, Cu, Pb, Zn locally elevated above the SSV1 in some samples but less than SSV2 screening levels. Sulphate elevated above SSV locally in AH1. **Soil** results downgrade of the coal stockyard and KPS area: Cu (both samples), As, Mn and Pb (AH4 only) **Groundwater**: Fe (BH2 only and not downgrade), Mn and ammonical N (both and higher on boundary of KPS site in BH1), Eskom monitoring sites also show elevated Mn in boreholes in coal stockyard and on boundary. SO_4	Potential sources: Site is the coal stockyard currently in use by KPS. Receptors to which an exposure pathway may be complete include site workers (human health), groundwater users (combined impact from KPS area and not solely the coal stockyard) and surface runoff to the streams. Soils were not assessed due to the thickness of the coal layer. Based on the information available, soils are largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern. The groundwater is affected by both the upgradient groundwater plume and the coal stock yard itself. There is a limited risk to groundwater users, but it is understood that the groundwater plume is

Area of investigation	Summary of concentrations exceeding screening values	Risk Summary
	higher than SANS241-2015 and WSP borehole results. Pb, Mn, Zn > SAWQG	the focus of a pending comprehensive groundwater model,

However, when considering the approach to assessment as defined by the Framework for the Management of Contaminated Land and taking cognisance of the CSM, the magnitude of impact is largely not considered to represent a significant source of risk with respect to human health and/or aquatic systems when specifically considering the end-use of the areas of concern. There will, however, be a requirement to ensure appropriate management of excavations, and especially where these are required within areas proximal to residential dwellings of Komati. Further, although contributory impacts to groundwater contamination is evident at the Coal Stockyard (BESS D), this source will be removed during the decommissioning of this facility.

Outside of the two PV and four BESS sites covered by this document, a potentially significant contamination has been highlighted proximal the fuel depot to the north of KPS in relation to the concentration of benzo(a)pyrene in shallow soils and Eskom should ensure that appropriate assessment is undertaken to inform relevant corrective actions.

The NEM: WA provides the following definition of 'contaminated':

> "*the presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely*"

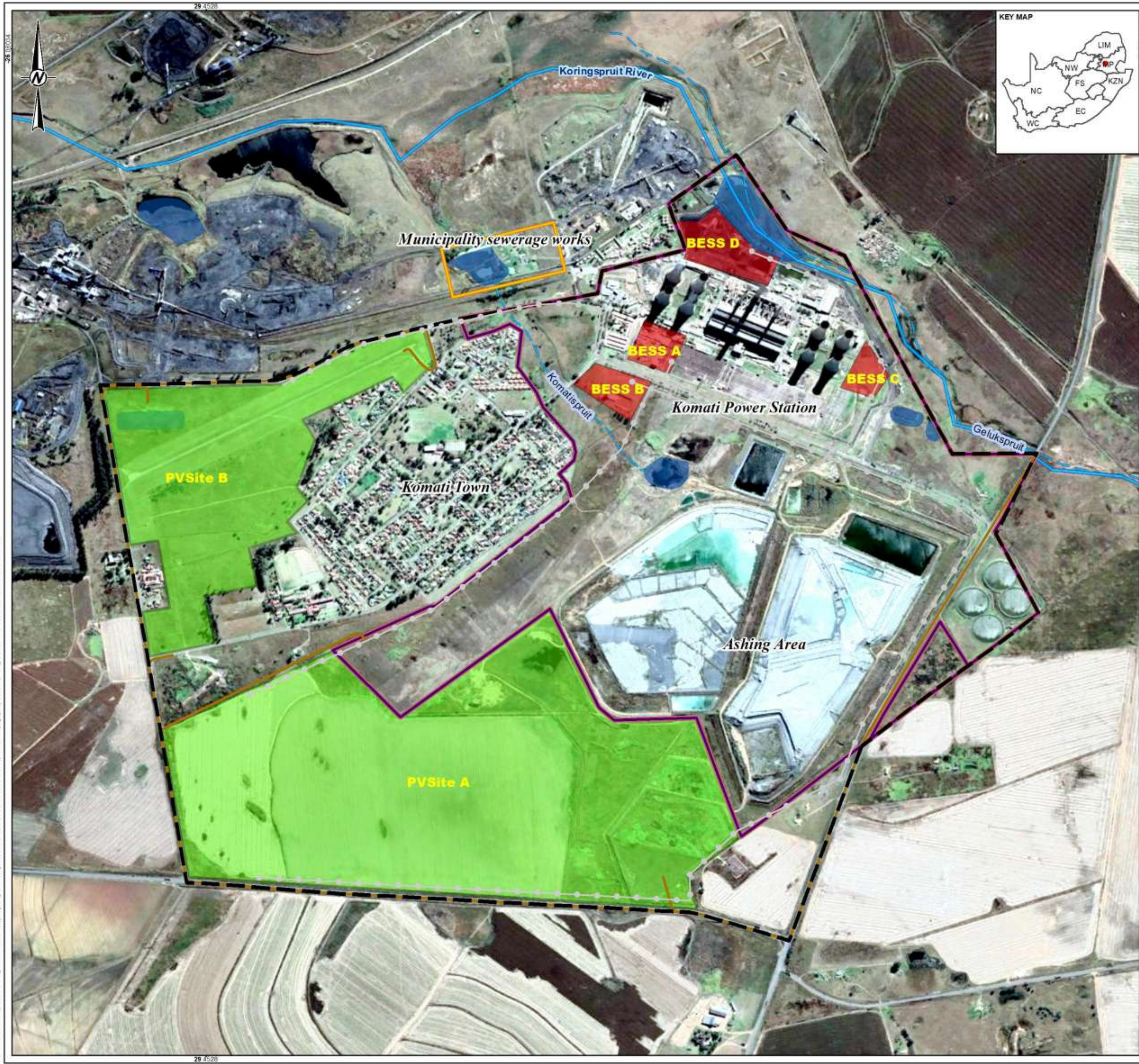
Therefore, and taking cognisance of Section 37(2) of the NEM: WA, it is WSP's opinion that the proposed development areas would likely be regarded as 'contaminated' based on definition, with certain determinants clearly being above a 'normal' level. However, recognising the outcomes of the risk assessment, in terms of Section 38(1)(c) of the NEM: WA it is also considered likely that the demonstrated contamination specific to these areas "*does not present an immediate risk, but that measures are required to address the monitoring and management of that risk*".

As stated above, contaminated groundwater from the Ashing Area has been shown to extend to the north towards the Koringspruit. WSP understands that this is currently under investigation with an updated groundwater model in progress. The potential impact from future undermining of the PV Site A should be considered as part of this study and this may influence the planned remediation of the groundwater plume.

The preliminary nature of this report is again stressed. WSP understands that further geotechnical investigations are planned by Eskom. Additional and more comprehensive intrusive works will almost certainly be necessary to validate the findings herein as well as to prepare a Site Assessment Report (SAR) for authority submission. This may need to be a consolidated submission to the DFFE covering the entirety of the Eskom premises and, as such, liaison with the authorities at the earliest opportunity is recommended. In this regard attention is also drawn to the implications of existing environmental authorisations (i.e. WUL and WML) within the areas of proposed development that will likely require separate management to the process applicable to Part 8 of the NEM: WA (i.e. provision for a Remediation Order).

APPENDIX

A FIGURES



LEGEND

- Overhead lines
- Access Roads
- Komati Power Station 56 IS
- KPS
- Municipality sewerage works
- PV Installation
- BESS Installation
- Rivers
- Rivers - Non perennial
- Dam

0 200 400 600

1:15,000 METERS

NOTE(S)

REFERENCE(S)
COORDINATE SYSTEM: GCS WGS 1984
SERVICE LAYER CREDITS:

CLIENT
ESKOM

PROJECT
ESKOM KOMATI PV ESIA

TITLE
FIGURE 1: PROPOSED DEVELOPMENT

CONSULTANT		
WSP GOLDER	YYYY-MM-DD	7/18/2022
	DESIGNED	MB
	PREPARED	MB
	REVIEWED	SS
	APPROVED	SS

PROJECT NO.	CONTROL	REV.	FIGURE
41103965		0	0

LEGEND

- Census 2008
- Census 2019
- Site monitoring boreholes
- Komati Power Station 56 IS
- KPS
- Municipality sewerage works
- Goodhope No. 4 Seam
- Proposed Infrastructure
- Kroonfontein UG (Ash filled)
- Kroonfontein UG (Slurry filled)
- Rivers - Perennial
- Rivers - Non perennial

Wetland delineation

- Channelled valley-bottom
- Depression
- Seep

0 200 400 600

1:15,000 METERS

NOTE(S)

REFERENCE(S)
COORDINATE SYSTEM: WGS LO29
SERVICE LAYER CREDITS:

CLIENT
ESKOM

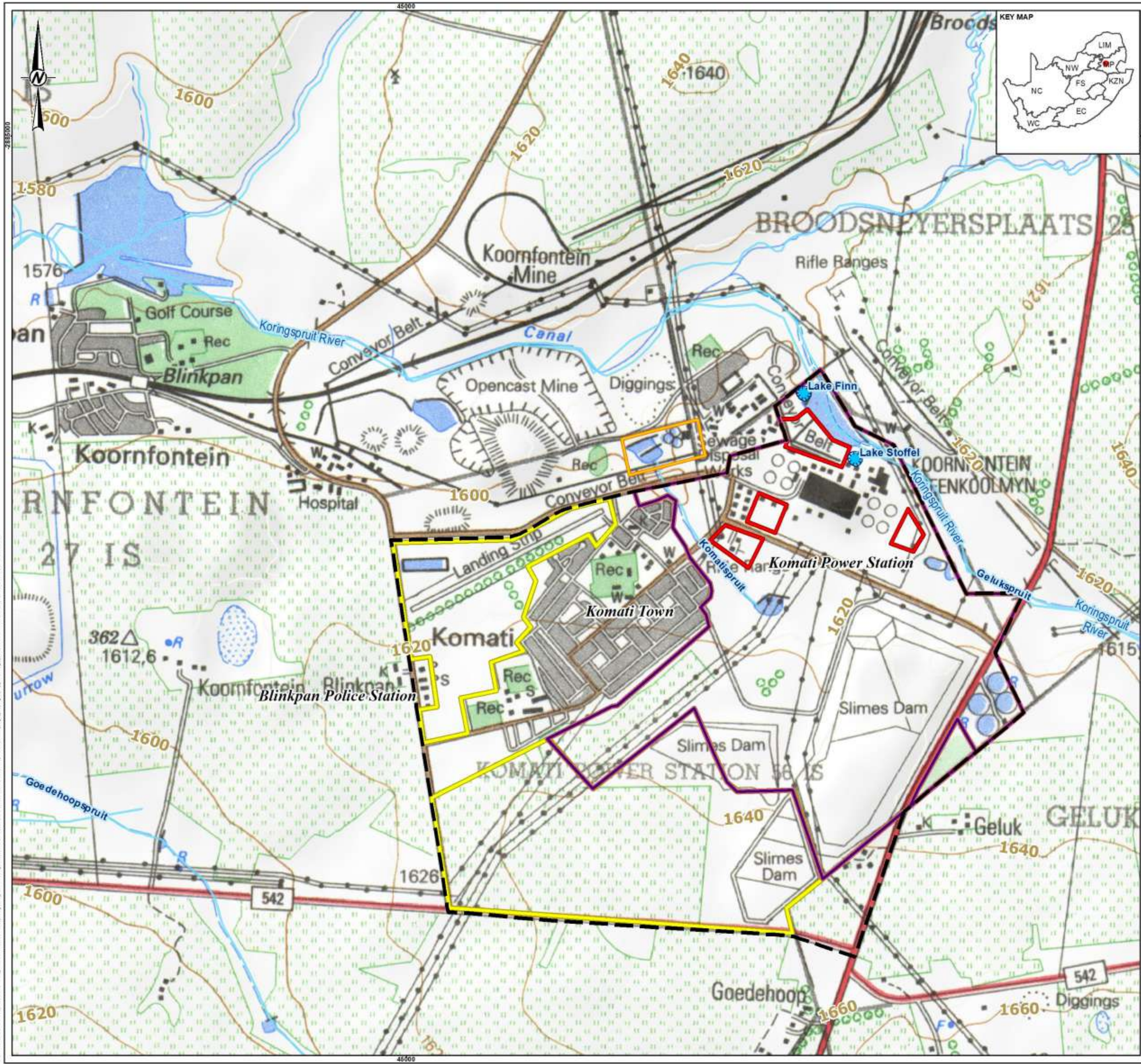
PROJECT
ESKOM KOMATI PV ESIA

TITLE
FIGURE 2: LOCALITY PLAN

CONSULTANT
WSP GOLDER

YYYY-MM-DD	8/16/2022
DESIGNED	MB
PREPARED	MB
REVIEWED	SS
APPROVED	SS

PROJECT NO.	CONTROL	REV.	FIGURE
41103965		0	0



LEGEND

- Lake
- Contours (20m)
- Komati Power Station 56 IS
- KPS
- Municipality sewerage works
- PV Sites
- BESS
- Rivers
- Rivers - Non perennial

0 300 600 900
1:20,000 METERS

NOTE(S)

REFERENCE(S)
COORDINATE SYSTEM: WGS LO29
SERVICE LAYER CREDITS:

CLIENT
ESKOM

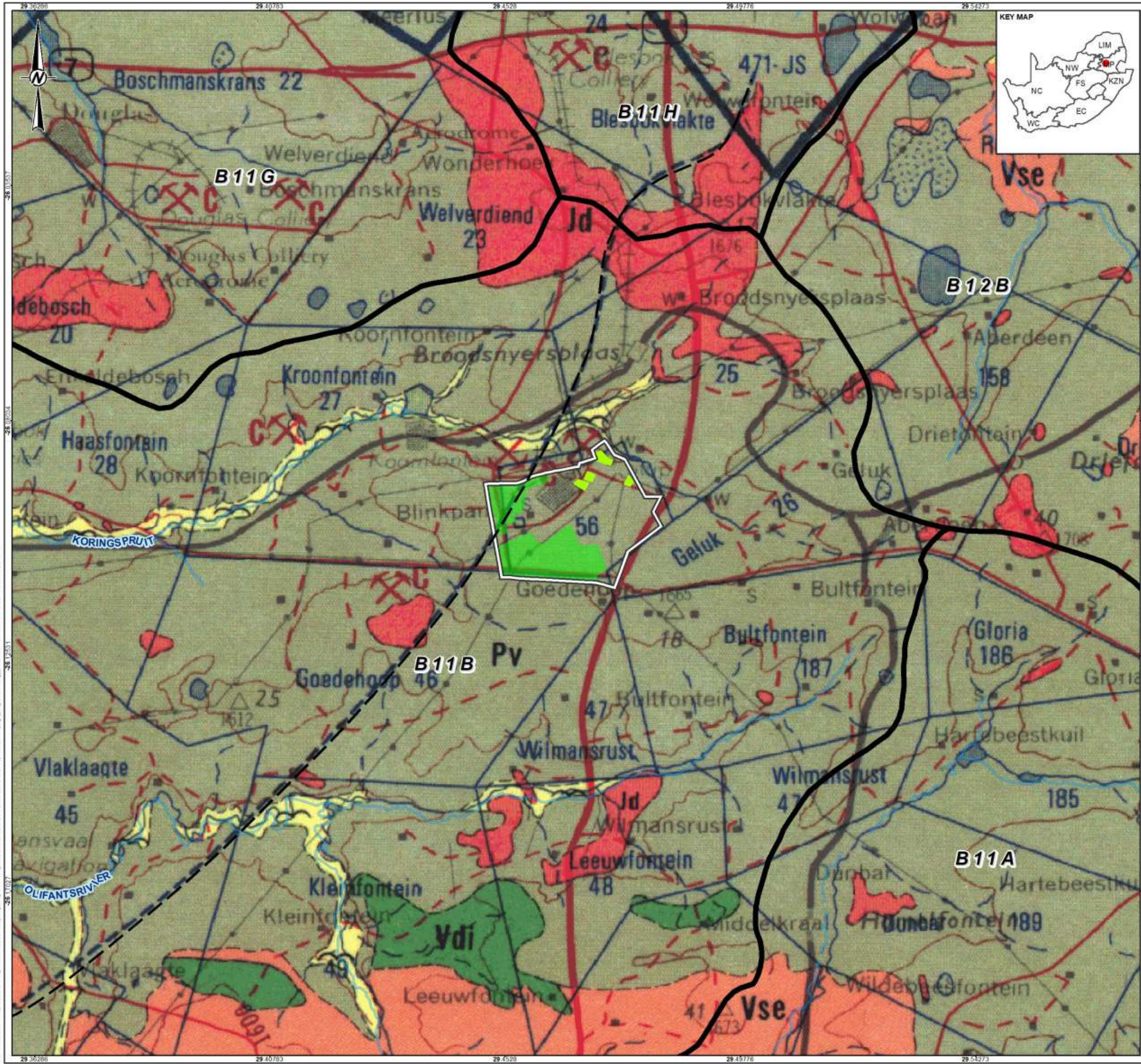
PROJECT
ESKOM KOMATI PV ESIA

TITLE
FIGURE 3: TOPOGRAPHY AND DRAINAGE

CONSULTANT
WSP GOLDER

YYYY-MM-DD	7/18/2022
DESIGNED	MB
PREPARED	MB
REVIEWED	SS
APPROVED	SS

PROJECT NO.	CONTROL	REV.	FIGURE
41103965		0	0



LEGEND

- Komati Power Station 56 IS
- Quaternary catchment
- PV Sites
- BESS
- Fault
- Rivers - Perennial

Lithology

Symbol	Description
	Alluvium
Jd	Dolerite
Pv	Sandstone, shale, coal beds
Vdi	Diabase
Vse	Porphyritic rhyolite with interbedded mudstone and sandstone

0 1 2 3 4
1:80,000 KILOMETERS

NOTE(S)
1:250 000 GEOLOGICAL SERIES
2628 EAST RAND

REFERENCE(S)
COORDINATE SYSTEM: GCS WGS 1984
SERVICE LAYER CREDITS:

CLIENT
ESKOM

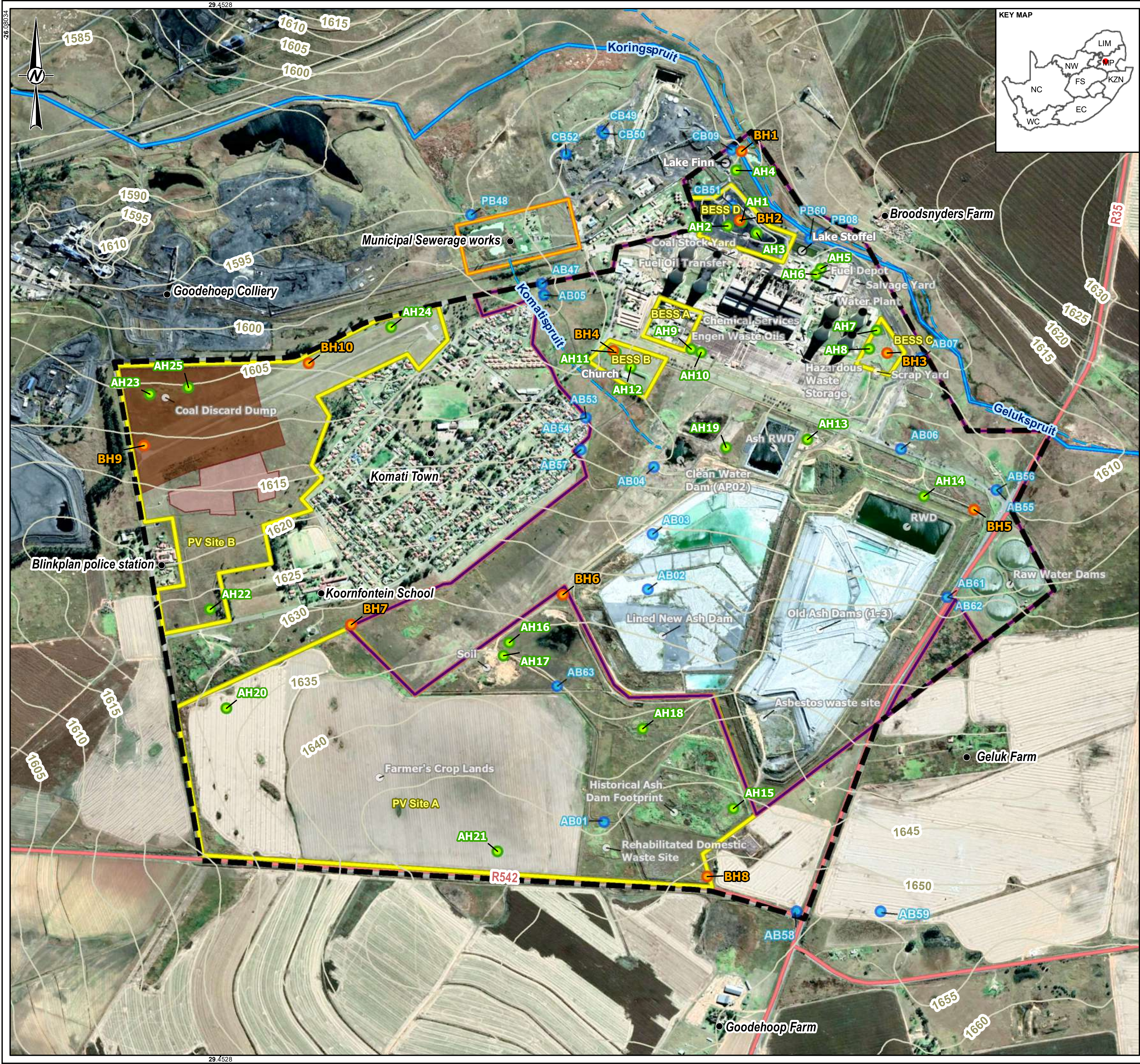
PROJECT
ESKOM KOMATI PV ESIA

TITLE
FIGURE 4: REGIONAL GEOLOGY

CONSULTANT
WSP GOLDER

YYYY-MM-DD	7/13/2022
DESIGNED	MB
PREPARED	MB
REVIEWED	SS
APPROVED	SS

PROJECT NO.	CONTROL	REV.	FIGURE
41103965		0	0



LEGEND

- New boreholes
- Auger boreholes
- Site monitoring boreholes
- Contours (5m)
- Komati Power Station 56 IS
- KPS
- Municipality sewerage works
- Proposed Infrastructure
- Kroonfontein UG (Ash filled)
- Kroonfontein UG (Slurry filled)
- Main road
- Rivers - Perennial
- Rivers - Non perennial

0 200 400 600
1:15,000 METERS

NOTE(S)

REFERENCE(S)
COORDINATE SYSTEM: GCS WGS 1984
SERVICE LAYER CREDITS:

CLIENT
ESKOM

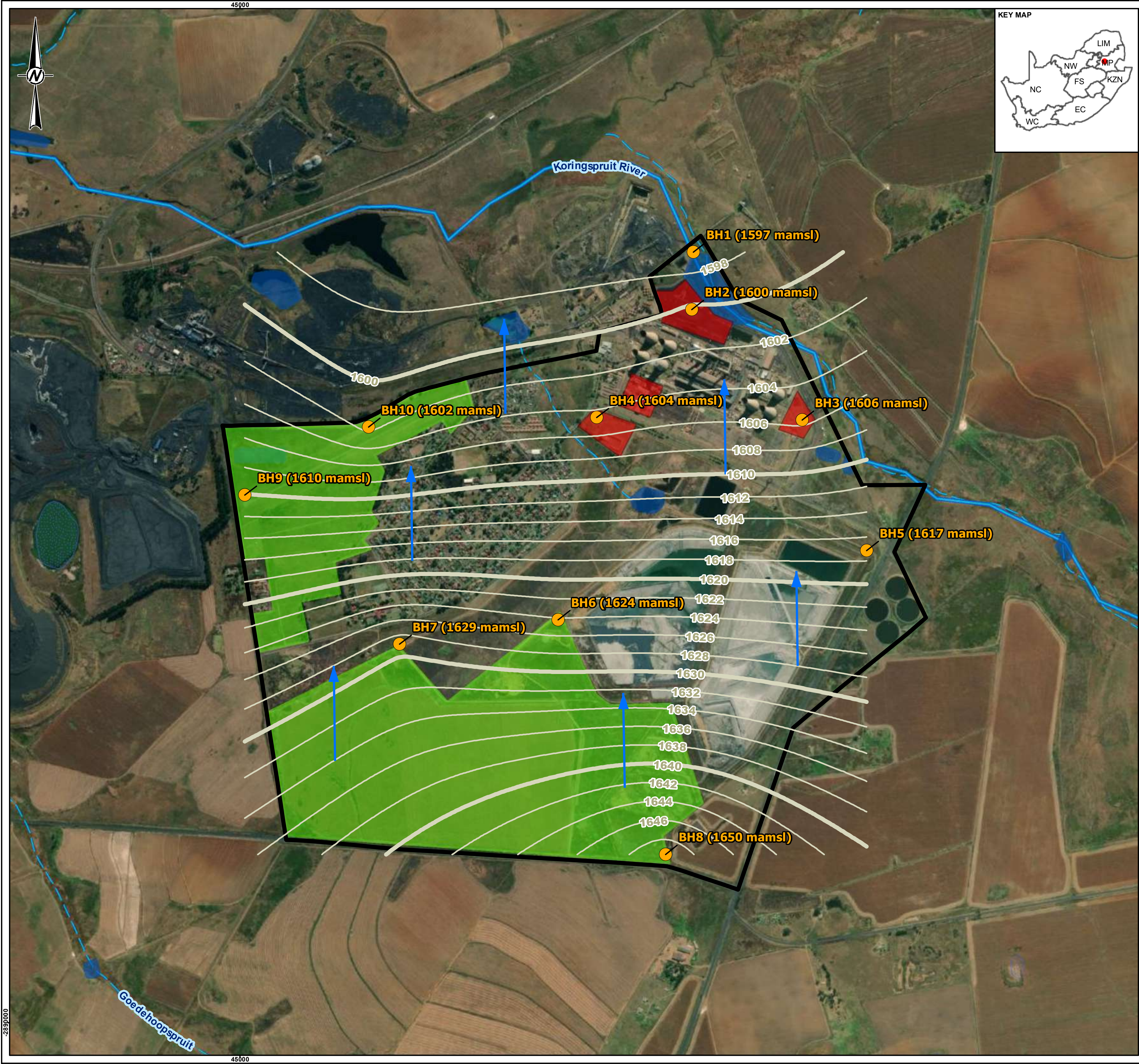
PROJECT
ESKOM KOMATI PV ESIA

TITLE
FIGURE 5: FIELD INVESTIGATIONS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	8/16/2022
DESIGNED	MB
PREPARED	MB
REVIEWED	SS
APPROVED	SS

PROJECT NO.	CONTROL	REV.	FIGURE
41103965		0	0



LEGEND

- Groundwater level (mamsl)
- Groundwater flow direction
- Groundwater piezometric contour (mamsl)
- Komati Power Station 56 IS
- PV Sites
- BESS
- Dam
- Pan
- Rivers
- Rivers - Non perennial

0 300 600 900
1:18,000 METERS

NOTE(S)

REFERENCE(S)
COORDINATE SYSTEM: WGS LO29
SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

CLIENT
ESKOM

PROJECT
ESKOM KOMATI PV ESIA

TITLE
FIGURE 6: PIEZOMETRIC MAP

CONSULTANT

WSP GOLDER

YYYY-MM-DD	7/13/2022
DESIGNED	MB
PREPARED	MB
REVIEWED	SS
APPROVED	SS

PROJECT NO.	CONTROL	REV.	FIGURE
41103965		0	0

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25mm
0

APPENDIX

B BACKGROUND GROUNDWATER QUALITY

Determinant	**Unit**	**Ambient Water Quality**	
		AB58 95th Percentile (October 2011-January 2022)	***AB59 95th Percentile (October 2011-January 2022)***
pH	units	9.1	8.8
EC	mS/m	44	29
Arsenic	µg/l	<10	<10
Total Chromium	µg/l	2	2
Hexavalent Chromium	mg/l	-	<2
Copper	µg/l	11	2
Total Iron	µg/l	10	124
Lead	µg/l	<4	<4
Manganese	µg/l	490	111
Mercury	µg/l	-	<4
Zinc	µg/l	10	6.2
Calcium	mg/l	25	12
Magnesium	mg/l	41	14
Potassium	mg/l	15	11
Sodium	mg/l	22	17
Silicon	µg/l	-	316.8
Fluoride	mg/l	0.4	0.3
Chloride	mg/l	11	10
Sulphate	mg/l	21	8
Nitrate as N	mg/l	1.1	1.4
Ortho Phosphate as P	mg/l	0.02	0.02
Ammoniacal Nitrogen as N	mg/l	1.57	1.09
Total Alkalinity as $CaCO_3$	mg/l	253	122
TDS	mg/l	-	148

APPENDIX

C

SERVICE CLEARANCE REPORT

hydrometrix technologies

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10 June 2022

UTILITIES SURVEY REPORT

ESKOM – KOMATI POWER STATION

INTRODUCTION

Hydrometrix Technologies was appointed by WSP Group PTY Ltd to clear borehole and auger positions as well as survey borehole positions at the Eskom Komati power station in Mpumalanga. The purpose of the survey was to identify buried utilities and depths around proposed drill positions.

Site work was completed on 08 June 2022. The survey area as per image 1 below.

ESKOM KOMATI POWER STATION

SERVICES DETECTION METHODLOGY

Detection of various underground services within the target area is conducted in the following manner:

- **Electrical and Telkom cables, steel pipes and other conductive utilities:** A combination of an electromagnetic transmitter and receiver is used, inducing a signal onto the utility by means of:
  - Direct Connection at valves, lamp post etc.;
  - Clamping inside Telkom chambers, electrical substations etc. if accessible;
  - Induction scan where no contact points on services are available.
- **Storm Water and Sewer lines:** These types of services are located by gaining access at points such as manholes, kerb inlets etc. A self-containing sonde is propelled down the pipe using a fibre flex rod. The sonde transmits a signal, which enables the operator to locate the exact position and depth of the sonde from above ground by using a receiver.
- **Non-metallic pipes and other non-conductive services:** Non-metallic utilities, such as AC water mains and fibre optic cables, are located by means of Ground Penetrating radar (GPR). By scanning the servitude with GPR, changes in ground conductivity are detected. The alignment of several positions of this nature usually indicates the existence of non-metallic services. GPR will only be used to locate services that could not be located by means of electromagnetic methods.

***Note:** Positive ground penetrating radar results are dependent on good soil conditions. If soil conditions are not favourable to good results, this will be noted by the contractor in the survey report.*

Utility line are drawn on the survey report with colour coding unique to each utility type:

Type of Utility	Colour Coding
Electrical Cables	RED
Water Pipes	BLUE
Telkom and Fibre Optic Cables	ORANGE
Storm Water Pipes	PURPLE
Sewer Pipes	GREEN
Product Lines	Yellow
Unknown Utilities	PINK

SURVEY RESULTS

UTILITY LAYOUTS

Image 1: Auger Hole 01

Image 2: Auger Hole 02

Image 3: Auger Hole 03

Image 4: Auger Hole 04

Image 5: Auger Hole 05

Image 6: Auger Hole 06

Image 7: Auger Hole 07

Image 8: Auger Hole 08

Image 9: Auger Hole 11

Image 10: Auger Hole 12

Image 11: Auger Hole 14

Image 12: Auger Hole 15

Image 13: Auger Hole 16

Image 14: Auger Hole 17

Image 15: Auger Hole 18

Image 16: Auger Hole 19

Image 17: Auger Hole 20

Image 18: Auger Hole 21

Image 19: Auger Hole 23

Image 20: Auger Hole 24

Image 21: Borehole 01

Image 22: Borehole 02

Image 23: Borehole 03

Image 24: Borehole 04

Image 25: Borehole 05

Image 26: Borehole 06

Image 27: Borehole 07

Image 28: Borehole 08

Image 29: Borehole 09

Image 30: Borehole 10

APPENDIX

D EXPLORATORY HOLE LOGS

KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

SAMPLES, FIELD TESTS, MEASUREMENTS & RESULTS

TYPE	DESCRIPTION
B	Bulk sample (disturbed)
BLK	Block sample
CORE	Core sample
CBR	California Bearing Ratio mould sample
D	Small tub sample (disturbed)
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
SPT	Standard Penetration Test
(C)	Standard Penetration Test – solid 60° cone
(S)	Standard Penetration Test – Split Spoon
N='x'	'x' blows required to drive 0.3m after seating
N='x'/'y'	'x' blows for 'y' metres within the SPT
U '*x*'	Undisturbed sample of specified diameter '*x*'
'x' blows	'x' blows required to drive 'U' tube 0.45m
HSV	Hand Shear Vane test in kN/m^2
P(*F*),(*P*)	Piston sample, *F* – not recovered, *P* – partially recovered
P.Pen	Hand Pocket Penetrometer test in kN/m^2
PID	Photo-Ionisation Detector test in ppm
NVT	No Valid Test

CORE RECOVERY & ROCK QUALITY

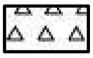
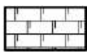
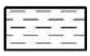
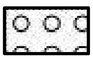
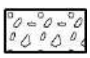
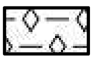
IDENTIFIER	DESCRIPTION
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Designation (%)
UCS	Unconfined Compressive Strengths (kN/m^2)
FI	Fracture Index (discontinuities per metre): NI – non intact, NR – no recovery, NA – non applicable.

GROUNDWATER OBSERVATIONS

SYMBOL	DESCRIPTION
	Groundwater strike
	Groundwater level after defined standing period

SOIL AND ROCK SYMBOLS

(COMBINED AS NECESSARY)

PATTERN	DESCRIPTION
	Ash
	Boulders and Cobbles
	Breccia
	Chalk
	Clay
	Coal
	Concrete / Brick
	Conglomerate
	Gravel
	Calcrete / Gypsum

	Igneous (coarse grained)
	Igneous (fine grained)
	Igneous (medium grained)
	Limestone
	Made Ground
	Metamorphic (massive)
	Metamorphic (schistose)
	Metamorphic (banded)
	Mudstone
	Peat
	Sand
	Sandstone
	Shale
	Silt
	Siltstone
	Tarmac
	Topsoil

INSTALLATION, INSTRUMENTATION & BACKFILL DETAILS

(COMBINED AS NECESSARY)

PATTERN	DESCRIPTION
	Plain pipe with concrete surround
	Plain pipe with bentonite seal
	Slotted pipe with inert surround and filter sock (where necessary)
	Vibrating Wire Piezometer Cable with bentonite seal
	Vibrating Wire Piezometer Tip with sand surround
	Arisings

NOTES AND GENERAL REMARKS FOR INTERPRETATION OF EXPLORATORY HOLE RECORDS

1. Soil and rock descriptions are primarily based on observable materials recovered only
2. Lithostratigraphic classifications (groups, formations etc.) are assigned based on a combination of the available geological map/s, visual observations and the descriptions reported alongside professional judgement

BOREHOLE LOG

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Telephone: +27 11 361 1380
Fax: +27 11 361 1301

Hole No.	AH01	
Project	Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client Eskom Holdings SOC Limited	Date 02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.471 N -26.087	

SAMPLES & TESTS						Water	STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(1.00)	MADE GROUND: Slightly moist black GRAVEL of subangular to subrounded fine to coarse coal.		MG	
1.00	ES		<0.1					1.00	End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	AH02
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.471 N -26.088	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick -ness)	Description	Legend	Geology	Dia. mm
			<0.1					(1.00) 1.00	MADE GROUND: Slightly moist black GRAVEL of subangular to subrounded fine to coarse coal.		MG	
1.00	ES		<0.1						End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd Building C, Knightsbridge, 33 Sloane Street, Bryanston, 2191 Telephone: +27 11 361 1380 Fax: +27 11 361 1301	Project Komati Solar PV & BESS ESIA	Hole No. **AH03** Sheet 1 of 1
Job No 41103965	Client Eskom Holdings SOC Limited	Date 02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.472 N -26.088	

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(1.00)	MADE GROUND: Slightly moist black GRAVEL of subangular to subrounded fine to coarse coal.		MG	
1.00	ES		<0.1					1.00	End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	**AH04**	
Project	Komati Solar PV & BESS ESIA	
Sheet	1 of 1	
Job No	41103965	
Client	Eskom Holdings SOC Limited	
Date	03-06-22	

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.471 N -26.086	

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology		Dia. mm
								(0.30) 0.30	MADE GROUND: Moist dark brown clayey SAND.		MG		
			<0.1										
			<0.1					(0.80) 1.10	Moist orange-brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF		
1.10	ES								End of Exploratory Hole		END		

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	AH05
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.474 N -26.089	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
								(0.20) 0.20	MADE GROUND: Brick.		MG	
			<0.1					(0.60) 0.80	Moist (firm) orange to red sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
0.80	ES		<0.1						End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
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Hole No. AH06	Project: Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client: Eskom Holdings SOC Limited	Date 03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.474 N -26.089	

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick -ness)	Description	Legend	Geology	Dia. mm
								(0.20) 0.20	MADE GROUND: Brick.		MG	
			<0.1					(0.60) 0.80	Moist (firm) orange to red sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
								(0.70) 1.50	Moist (firm) orange to red mottled grey sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
1.50	ES		<0.1						End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No. AH07	Project: Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client: Eskom Holdings SOC Limited	Date 02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.476 N -26.091	

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick -ness)	Description	Legend	Geology		Dia. mm
								(0.30) 0.30	MADE GROUND: Slightly moist brown gravelly SAND. Gravel is angular to subangular fine to coarse weathered shale.		MG		
0.30	ES		<0.1						Exploratory Hole Terminated due to Refusal		END		

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Hole No. AH08	Project: Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client: Eskom Holdings SOC Limited	Date 03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.476 N -26.092	

SAMPLES & TESTS							Water	STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)			Elev. (mAOD)	Depth (Thick -ness)	Description	Legend	Geology	Dia. mm
			<0.1						(0.50) 0.50	MADE GROUND: Moist brown gravelly SAND. Gravel is angular to subangular fine to coarse weathered shale.		MG	
			<0.1						(0.60) 1.10	Slightly moist orange-brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.10	ES									End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
Building C, Knightsbridge,
33 Sloane Street, Bryanston, 2191
Telephone: +27 11 361 1380
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Hole No.	AH09	
Project	Komati Solar PV & BESS ESIA	Sheet: 1 of 1
Job No: 41103965	Client: Eskom Holdings SOC Limited	Date: 04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.470 N -26.092	

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. mm
			<0.1					(0.50) 0.50	Moist (firm) red-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1					(0.80) 1.30	Moist red mottled brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.30	ES		<0.1						End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing

Chiselling / Water Added

From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
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Telephone: +27 11 361 1380
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Hole No.	AH10	
Project	Komati Solar PV & BESS ESIA	Sheet: 1 of 1
Job No: 41103965	Client: Eskom Holdings SOC Limited	Date: 04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.470 N -26.092	

SAMPLES & TESTS								STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm	
			<0.1					(0.50) 0.50	Moist (firm) red-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF		
			<0.1					(0.60) 1.10	Moist red clayey SAND [Probable Weathered VRYHEID FORMATION].		VF		
1.10	ES								End of Exploratory Hole		END		

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
Building C, Knightsbridge,
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Telephone: +27 11 361 1380
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Hole No.	AH11	
Project	Komati Solar PV & BESS ESIA	
Sheet	1 of 1	
Job No	41103965	
Client	Eskom Holdings SOC Limited	
Date	02-06-22	

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.467 N -26.092	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.50) 0.50	Moist (firm) red-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1					(0.50) 1.00	Moist red clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.50	ES								End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	AH12
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.467 N -26.093	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.50) 0.50	Moist (firm) red-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1					(0.50) 1.00	Moist red clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.50	ES								End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd Building C, Knightsbridge, 33 Sloane Street, Bryanston, 2191 Telephone: +27 11 361 1380 Fax: +27 11 361 1301	BOREHOLE LOG	Hole No. AH13
	Project: Komati Solar PV & BESS ESIA	Sheet: 1 of 1
Job No: 41103965	Client: Eskom Holdings SOC Limited	Date: 04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.474 N -26.095	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.60) 0.60	Moist (firm) dark brown to black sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
0.60	ES								Exploratory Hole Terminated due to Refusal		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Telephone: +27 11 361 1380
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Hole No.		AH14
Project	Komati Solar PV & BESS ESIA	
Sheet		1 of 1
Job No	41103965	
Client	Eskom Holdings SOC Limited	
Date		04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.478 N -26.097	

SAMPLES & TESTS: Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	STRATA: Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. mm
								(0.50)	MADE GROUND: Moist grey ASH.		MG	
			<0.1					0.50				
			<0.1					(0.60)	Moist (firm to stiff) orange-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
1.10	ES							1.10	End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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Hole No.	Sheet	Project	Job No	Client	Date
AH15	1 of 1	Komati Solar PV & BESS ESIA	41103965	Eskom Holdings SOC Limited	04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.471 N -26.108	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.60) 0.60	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.00	ES		<0.1					(0.40) 1.00	Moist light brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
									End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP BH LOG 41103965-GINT LOGS.GPJ WSPETEMPLATE1.03.GDT 21/07/22

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BOREHOLE LOG

Hole No.	AH16
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.463 N -26.102	

SAMPLES & TESTS								STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
								(0.30) 0.30	Slightly moist orange to red clayey SAND with occasional weathered ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
0.30	ES		<0.1						Exploratory Hole Terminated due to Refusal		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Telephone: +27 11 361 1380
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Hole No.	AH17
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.463 N -26.103	

SAMPLES & TESTS: Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	STRATA: Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. mm
								(0.40) 0.40	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1					(0.40) 0.80	Moist light brown mottled red clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
0.80	ES		<0.1						Exploratory Hole Terminated due to Refusal		END	

Boring Progress: Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes: Date	Time	Strike	Minutes	Standing	Casing

Chiselling: From	To	Hours	Tool	Water Added: From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
Building C, Knightsbridge,
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Hole No.	AH18	Sheet	1 of 1
Project	Komati Solar PV & BESS ESIA		
Job No	41103965	Date	04-06-22
Client	Eskom Holdings SOC Limited		

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.468 N -26.106	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick -ness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.50) 0.50	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1 <0.1					(1.20) 1.70	Moist light brown mottled red clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.70	ES								End of Exploratory Hole		END	

Boring Progress					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes					
Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.		AH19
Project	Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client: Eskom Holdings SOC Limited	Date 04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.471 N -26.095	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.50) 0.50	Moist orange to red mottled grey clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.00	ES		<0.1					(0.70) 1.20	Moist orange to grey clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
									End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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Hole No.		AH20
Project	Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client Eskom Holdings SOC Limited	Date 03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.453 N -26.105	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(1.00)	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1					1.00				
			<0.1					(0.60)	Moist light brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.60	ES							1.60	End of Exploratory Hole		END	

Boring Progress					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes					
Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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Hole No. **AH21**	Project: Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client: Eskom Holdings SOC Limited	Date 04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.463 N -26.110	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(0.50) 0.50	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1					(0.70) 1.20	Moist brown to red SAND with occasional weathered ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
1.20	ES								End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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Hole No.	Sheet	Project	Job No	Client	Date
AH22	1 of 1	Komati Solar PV & BESS ESIA	41103965	Eskom Holdings SOC Limited	04-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.452 N -26.101	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
			<0.1					(1.00)	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1.00	ES		<0.1					1.00	End of Exploratory Hole		END	

Boring Progress					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Chiselling				Water Added	
From	To	Hours	Tool	From	To

Water Strikes					
Date	Time	Strike	Minutes	Standing	Casing

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Groundwater not encountered.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	AH23	
Project	Komati Solar PV & BESS ESIA	Sheet 1 of 1
Job No 41103965	Client Eskom Holdings SOC Limited	Date 03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.450 N -26.094	

SAMPLES & TESTS							STRATA						Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology		Dia. mm
								(0.50) 0.50	MADE GROUND: Moist (firm to stiff) dark brown gravelly CLAY. Gravel is angular to subangular fine to coarse weathered shale [Suspected Reworked/Transported Natural Material].		MG		
			<0.1			1							
			<0.1					(0.60) 1.10	Moist (firm) orange to brown sandy CLAY with occasional weathered ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF		
1.10	ES								End of Exploratory Hole		END		

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
								0.50			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Seepage at 0.5m bgl.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	AH24
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.459 N -26.091	

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. mm
			<0.1			1		(0.50) 0.50	MADE GROUND: Moist dark brown gravelly SAND. Gravel is angular to subangular medium to coarse weathered sandstone [Suspected Reworked/Transported Natural Material].		MG	
1.10	ES		<0.1					(0.60) 1.10	Moist (firm) orange to brown sandy CLAY with occasional weathered ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
									End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		0.50			

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Seepage at 0.5m bgl.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

08 WSP BH LOG 41103965-GINT LOGS.GPJ WSPETEMPLATE1.03.GDT 21/07/22

BOREHOLE LOG

WSP Group Africa (Pty) Ltd Building C, Knightsbridge, 33 Sloane Street, Bryanston, 2191 Telephone: +27 11 361 1380 Fax: +27 11 361 1301		Hole No. AH25
	Project: Komati Solar PV & BESS ESIA	Sheet: 1 of 1
Job No: 41103965	Client: Eskom Holdings SOC Limited	Date: 03-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Hand Auger	R. Netshirembe	E 29.452 N -26.093	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick -ness)	Description	Legend	Geology	Dia. mm
			<0.1			1		(0.50) 0.50	MADE GROUND: Moist dark brown gravelly SAND. Gravel is angular to subangular medium to coarse weathered sandstone [Suspected Reworked/Transported Natural Material].		MG	
			<0.1					(0.80) 1.30	Moist (firm) orange to brown sandy CLAY with occasional weathered ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
1.30	ES		<0.1						End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
								0.50			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Elevation not surveyed; position digitised by eye only.
2. Seepage at 0.5m bgl.

Scale 1:12.5

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Building C, Knightsbridge,
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Telephone: +27 11 361 1380
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Hole No. BH01	Project: Komati Solar PV & BESS ESIA	Sheet: 1 of 1
Job No: 41103965	Client: Eskom Holdings SOC Limited	Date: 02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.471 N -26.085	1598.742

SAMPLES & TESTS

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)
			<0.1		
			<0.1		
1.50	ES		<0.1		
			<0.1		
			<0.1		
			<0.1		
			<0.1		
			<0.1		
			<0.1		
			<0.1		

Water: 1 (water strike at 7.00)

STRATA

Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
1597.74	1.00 (1.00)	Moist orange-brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1591.74	7.00 (6.00)	Wet black slightly gravelly clayey SAND. Gravel is subangular to subrounded fine to coarse coal [Probable Weathered VRYHEID FORMATION].		VF	
1588.74	10.00 (3.00)	Wet pale brown mottled black clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
		End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		7.00			

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Seepage at 7m bgl.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
Building C, Knightsbridge,
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Telephone: +27 11 361 1380
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Hole No.	BH02
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.471 N -26.087	1601.869

SAMPLES & TESTS

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water
			<0.1			
1.00	ES		<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			1
			<0.1			
			<0.1			

STRATA

Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
1600.37	(1.50) 1.50	MADE GROUND: Moist black GRAVEL of subangular to subrounded fine to coarse coal.		MG	
1599.37	(1.00) 2.50	Moist orange-brown mottled black clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1596.87	(2.50) 5.00	Moist orange-brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1592.87	(4.00) 9.00	Moist pale brown silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
1591.87	(1.00) 10.00	Moist grey to black silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
		End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		8.00			

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Seepage at 8m bgl.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
Building C, Knightsbridge,
33 Sloane Street, Bryanston, 2191
Telephone: +27 11 361 1380
Fax: +27 11 361 1301

Hole No.	Sheet	Project	Job No	Client	Date
BH03	1 of 1	Komati Solar PV & BESS ESIA	41103965	Eskom Holdings SOC Limited	02-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.477 N -26.092	1607.060

SAMPLES & TESTS / STRATA

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
							1606.56	0.50	MADE GROUND: Moist brown SAND.		MG	
1.50	ES		<0.1, <0.1, <0.1, <0.1				1605.06	2.00 (1.50)	Moist orange-brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1, <0.1, <0.1				1602.06	5.00 (3.00)	Moist pale orange silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1, <0.1, <0.1, <0.1, <0.1			1	1597.06	10.00 (5.00)	Moist light brown silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
									End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		8.00			

Chiselling / Water Added

From	To	Hours	Tool	From	To

General Remarks

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Hole No.	Sheet	Project	Job No	Client	Date
BH04	1 of 1	Komati Solar PV & BESS ESIA	41103965	Eskom Holdings SOC Limited	01-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.467 N -26.092	1605.338

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. 50 mm
							1604.84	0.50	Moist (firm) red-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1									
1.00	ES		<0.1									
			<0.1			1						
			<0.1									
			<0.1					(5.50)	Moist becoming wet red mottled brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1									
			<0.1									
			<0.1				1599.34	6.00				
									End of Exploratory Hole		END	

Boring Progress					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes					
Date	Time	Strike	Minutes	Standing	Casing
		1.50			

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Hole No. **BH05**	Sheet 1 of 1	
Project: Komati Solar PV & BESS ESIA		
Job No: 41103965	Client: Eskom Holdings SOC Limited	Date: 31-05-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.480 N -26.098	1618.645

SAMPLES & TESTS / STRATA

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
			<0.1				1618.15	0.50	MADE GROUND: Moist grey ASH.		MG	
			<0.1				1617.15	1.50 (1.00)	MADE GROUND: Red brown and grey sandy GRAVEL of angular to subrounded fine to coarse brick and concrete.		MG	
1.50	ES		<0.1 <0.1 <0.1			1	1614.65	4.00 (2.50)	Moist red to brown clayey SAND with frequent weathered ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1 <0.1 <0.1 <0.1 <0.1 <0.1 <0.1				1608.65	10.00 (6.00)	Wet brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
									End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		4.00			

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Hole collapsed from 6 - 10 m bgl.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	BH06
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	31-05-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.465 N -26.101	1625.457

SAMPLES & TESTS

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water
			<0.1			
			<0.1			
1.50	ES		<0.1			
			<0.1			
			<0.1			
			<0.1			1 (4.00)
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			

STRATA

Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
1624.96	0.50	MADE GROUND: Moist grey ASH.		MG	
1623.46	2.00 (1.50)	Moist (firm to stiff) orange-brown sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
1621.46	4.00 (2.00)	Moist red-brown clayey SAND with occasional ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
1615.46	10.00 (6.00)	Wet pale brown silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
		End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		4.00			

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks
1. Seepage at 4m bgl.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	BH07
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	01-06-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.457 N -26.102	1630.761

SAMPLES & TESTS / STRATA

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
			<0.1				1629.76	(1.00) 1.00	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1									
			<0.1				1628.76	(1.00) 2.00	Moist light brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
2.00	ES		<0.1									
			<0.1						Moist light brown silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
			<0.1									
			<0.1									
			<0.1					(8.00)				
			<0.1									
			<0.1									
			<0.1				1620.76	10.00				
			<0.1						End of Exploratory Hole		END	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing

Chiselling				Water Added	
From	To	Hours	Tool	From	To

General Remarks
1. Groundwater not encountered.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

WSP Group Africa (Pty) Ltd
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Hole No.	Sheet	Date
BH08	1 of 1	01-06-22

Job No	Project	Client
41103965	Komati Solar PV & BESS ESIA	Eskom Holdings SOC Limited

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.470 N -26.111	1650.798

SAMPLES & TESTS

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water
			<0.1			
1.00	ES		<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			

STRATA

Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
1649.80	(1.00) 1.00	Moist dark brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1648.80	(1.00) 2.00	Moist light brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
1640.80	(8.00) 10.00	Moist light brown silty SAND [Probable Weathered VRYHEID FORMATION].		VF	
		End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing

Chiselling / Water Added

From	To	Hours	Tool	From	To

General Remarks
1. Groundwater not encountered.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

BOREHOLE LOG

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Hole No.	BH09
Project	Komati Solar PV & BESS ESIA
Sheet	1 of 1
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	31-05-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.450 N -26.095	1611.041

SAMPLES & TESTS

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water
			<0.1			
			<0.1			
1.50	ES		<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			1
			<0.1			
			<0.1			
			<0.1			

STRATA

Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
1610.54	0.50	MADE GROUND: Moist (firm) dark brown gravelly CLAY. Gravel is angular to subangular fine to coarse weathered shale [Suspected Reworked/Transported Natural Material].		MG	
1609.04	2.00 (1.50)	Moist (firm) light orange to brown sandy CLAY with occasional ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
1607.04	4.00 (2.00)	Moist (firm) light orange sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
1601.04	10.00 (6.00)	Moist becoming wet light brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
		End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		7.00			

Chiselling

From	To	Hours	Tool

Water Added

From	To

General Remarks

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

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BOREHOLE LOG

Hole No.	BH10
Sheet	1 of 1
Project	Komati Solar PV & BESS ESIA
Job No	41103965
Client	Eskom Holdings SOC Limited
Date	30-05-22

Contractor / Driller	Method/Plant Used	Logged By	Co-Ordinates (DEC)	Ground Level (m AOD)
Soil & Groundwater Remediation Services	Air Percussion	R. Netshirembe	E 29.456 N -26.092	1602.403

SAMPLES & TESTS

Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water
			<0.1			
			<0.1			
1.50	ES		<0.1			
			<0.1			1 (2.00)
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			
			<0.1			

STRATA

Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Install / Backfill Dia. 50 mm
1601.90	0.50	MADE GROUND: Moist (firm) dark brown gravelly CLAY. Gravel is angular to subangular fine to coarse weathered shale [Suspected Reworked/Transported Natural Material].		MG	
1600.40	2.00 (1.50)	Moist (firm) light orange to brown sandy CLAY with occasional ferricrete nodules [Probable Weathered VRYHEID FORMATION].		VF	
1598.40	4.00 (2.00)	Moist (firm) light orange sandy CLAY [Probable Weathered VRYHEID FORMATION].		VF	
1592.40	10.00 (6.00)	Moist light brown clayey SAND [Probable Weathered VRYHEID FORMATION].		VF	
		End of Exploratory Hole		END	

Boring Progress

Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt

Water Strikes

Date	Time	Strike	Minutes	Standing	Casing
		2.00			

Chiselling / Water Added

From	To	Hours	Tool	From	To

General Remarks
1. Seepage at 2m bgl.

Scale 1:68.75

Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.

APPENDIX

E CERTIFICATES OF ANALYSIS

Element Materials Technology
Unit D2 & D5
9 Quantum Road
Firgrove Business Park
Somerset West
7130
South Africa

W: www.element.com

WSP Group Africa
Building C, Knightsbridge
33 Sloane Street
Bryanston
Johannesburg
Gauteng
South Africa
2191

Attention :	Noma Nyoka
Date :	17th June, 2022
Your reference :	
Our reference :	Test Report 22/528 Batch 1
Location :	Eskom Komati Project
Date samples received :	7th June, 2022
Status :	Final report
Issue :	1

Thirty five samples were received for analysis on 7th June, 2022 of which thirty five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Analysis was undertaken at either Element Materials Technology UK, which is ISO 17025 accredited under UKAS (4225) or Element Materials Technology (SA) which is ISO 17025 accredited under SANAS (T0729) or a subcontract laboratory where specified.

NOTE: Under International Laboratory Accreditation Cooperation (ILAC), ISO 17025 (UKAS) accreditation is recognised as equivalent to SANAS (South Africa) accreditation.

Authorised By:	**Organics Laboratory:**	**Inorganics Laboratory:**
Debbie van Wyk	**Greg Ondrejkovic** **Technical Supervisor**	**Greg Ondrejkovic** **Technical Supervisor**

Element Materials Technology South Africa (Pty) Limited
Registered Office: Unit D2/D5, 9 Quantum Road, Firgrove Business Park,
Somerset West, Western Cape, 7130, South Africa
Company Registration No: 2015/025446/07

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4	5	6	7	8	9	10			
Sample ID	AH 1	AH 2	AH 3	AH 4	AH 5	AH 6	AH 7	AH 8	AH 9	AH 10 (8)			
Depth	1M	1M	1M	1.1M	0.8M	1.5M	0.3M	1.1M	1.3M	1.1M			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	02/06/2022	02/06/2022	02/06/2022	03/06/2022	03/06/2022	03/06/2022	02/06/2022	03/06/2022	04/06/2022	04/06/2022			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Antimony*	5	2	2	3	5	2	3	2	4	2	<1	mg/kg	UK_TM30/UK_PM15
Arsenic*	10.0	5.9	4.6	6.8	6.0	4.1	6.1	3.0	5.1	1.6	<0.5	mg/kg	UK_TM30/UK_PM15
Cadmium*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	UK_TM30/UK_PM15
Chromium*	192.9	88.4	81.2	171.8	197.4	81.8	169.6	110.7	190.4	78.8	<0.5	mg/kg	UK_TM30/UK_PM15
Cobalt*	25.0	16.5	10.8	32.0	25.2	14.5	25.0	18.5	10.3	7.6	<0.5	mg/kg	UK_TM30/UK_PM15
Copper*	33	24	521$_{AB}$	37	21	19	29	30	29	13	<1	mg/kg	UK_TM30/UK_PM15
Iron*	51570$_{AB}$	39370	35070	55880$_{AB}$	43890	32340	44670	37180	49310	19340	<20	mg/kg	UK_TM30/UK_PM15
Lead*	24	15	28	45	30	11	20	7	8	6	<5	mg/kg	UK_TM30/UK_PM15
Manganese*	754	663	543	1003	1006	275	1076	445	166	132	<1	mg/kg	UK_TM30/UK_PM15
Mercury*	<0.1	<0.1	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	UK_TM30/UK_PM15
Nickel*	28.2	33.9	44.4	35.0	25.2	30.3	26.2	39.1	23.1	12.3	<0.7	mg/kg	UK_TM30/UK_PM15
Selenium*	2	2	2	3	2	2	2	1	2	<1	<1	mg/kg	UK_TM30/UK_PM15
Vanadium*	130	62	54	123	81	70	91	77	115	45	<1	mg/kg	UK_TM30/UK_PM15
Zinc*	42	67	361	33	31	27	33	32	21	12	<5	mg/kg	UK_TM30/UK_PM15
VOC MS													
Methyl Tertiary Butyl Ether	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/kg	SA_TM15/SA_PM10
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/kg	SA_TM15/SA_PM10
1,1-Dichloroethene (1,1 DCE) [SA]	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
trans-1-2-Dichloroethene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
cis-1-2-Dichloroethene [SA]	<3	<3	17	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Chloroform [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Carbon tetrachloride [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethane [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
Benzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Toluene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Chlorobenzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Ethylbenzene [SA]	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Xylenes (sum of isomers)	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	ug/kg	SA_TM15/SA_PM10
1,1,2,2-Tetrachloroethane	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
1,3,5-Trimethylbenzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
1,2,4-Trimethylbenzene [SA]	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
1,4-Dichlorobenzene [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichlorobenzene [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2,4-Trichlorobenzene	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/kg	SA_TM15/SA_PM10
1,2,3-Trichlorobenzene	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethene (cis & trans)	<6	<6	17	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
Trichlorobenzenes (1,2,3 & 1,2,4)	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	ug/kg	SA_TM15/SA_PM10
1,2,3-Trimethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM15/SA_PM10

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1	2	3	4	5	6	7	8	9	10			
Sample ID	AH 1	AH 2	AH 3	AH 4	AH 5	AH 6	AH 7	AH 8	AH 9	AH 10 (8)			
Depth	1M	1M	1M	1.1M	0.8M	1.5M	0.3M	1.1M	1.3M	1.1M			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	02/06/2022	02/06/2022	02/06/2022	03/06/2022	03/06/2022	03/06/2022	02/06/2022	03/06/2022	04/06/2022	04/06/2022			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
SVOC MS													
Phenols													
2-Chlorophenol [SA]	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
2,4,6-Trichlorophenol [SA]	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
PAHs													
Naphthalene [SA]	549	<10	<10	<10	<10	47	237	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Pyrene [SA]	127	<10	<10	<10	13	78070$_{AC}$	124	14	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Benzo(a)pyrene [SA]	49	<10	<10	<10	<10	26723$_{AC}$	162	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Other SVOCs													
Nitrobenzene [SA]	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
TPH CWG													
Aliphatics													
C7-C9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	SA_TM36/SA_PM12
C10-C14	<4	<4	<4	<4	<4	55	<4	<4	<4	<4	<4	mg/kg	SA_TM5/SA_PM8/PM16
C15-C36	<7	<7	<7	<7	<7	1278	<7	<7	<7	<7	<7	mg/kg	SA_TM5/SA_PM8/PM16
Total aliphatics C7-C36	<12	<12	<12	<12	<12	1333	<12	<12	<12	<12	<12	mg/kg	SA_TM5/TM36/SA_PM8/PM12/PM16
PCBs (Total vs Aroclor 1254)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM17/SA_PM8
Natural Moisture Content	11.1	15.6	58.9	13.1	13.9	16.5	11.9	20.3	24.3	17.7	<0.1	%	SA_PM4/SA_PM0
Fluoride	0.8	0.7	1.0	1.0	2.8	2.4	2.0	0.9	<0.3	<0.3	<0.3	mg/kg	SA_TM27/SA_PM20
Chloride [SA]	7	8	21	3	6	5	5	9	3	<2	<2	mg/kg	SA_TM27/SA_PM20
Nitrite as NO2 [SA]	1.8	<0.5	1.9	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	mg/kg	SA_TM27/SA_PM20
Nitrate as NO3 [SA]	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	mg/kg	SA_TM27/SA_PM20
Sulphate as SO4 (2:1 Ext) [SA]	4173$_{AD}$	286	675$_{AA}$	1228$_{AC}$	61	116	512$_{AA}$	248	217	117	<3	mg/kg	SA_TM27/SA_PM20
Nitrite as N [SA]	0.5	<0.2	0.6	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	SA_TM27/SA_PM20
Nitrate as N [SA]	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	mg/kg	SA_TM27/SA_PM20
Hexavalent Chromium*	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	UK_TM38/UK_PM20
Chromium III*	192.9	88.4	81.2	171.8	197.4	81.8	169.6	110.7	190.4	78.8	<0.5	mg/kg	UK_TM30/TM38/UK_PM15/PM20
Ammoniacal Nitrogen as N	1.4	<0.6	<0.6	<0.6	<0.6	1.5	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	SA_TM27/SA_PM20
Ammoniacal Nitrogen as NH4	1.8	<0.6	<0.6	<0.6	<0.6	1.9	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	SA_TM27/SA_PM20
Total Cyanide*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	UK_TM89/UK_PM45
Electrical Conductivity @25C (5:1 ext)	1224	140	589	374	117	163	300	192	187	<100	<100	uS/cm	SA_TM28/SA_PM58
pH [SA]	7.13	7.29	7.56	7.54	7.92	7.83	7.78	7.76	6.34	5.45	<2.00	pH units	SA_TM19/SA_PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	11	12	13	14	15	16	17	18	19	20	LOD/LOR	Units	Method No.
Sample ID	AH 11	AH 12	AH 13	AH 14	AH 15	AH 16	AH 17	AH 18	AH 19	AH 20			
Depth	1.5M	1.5M	0.6M	1.1M	1M	0.3M	0.8M	1.7M		1.6M			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	03/06/2022	03/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	03/06/2022			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Antimony*	5	4	3	5	3	5	5	3	3	4	<1	mg/kg	UK_TM30/UK_PM15
Arsenic*	3.7	3.6	6.4	6.9	13.8	9.2	10.4	5.4	3.9	5.5	<0.5	mg/kg	UK_TM30/UK_PM15
Cadmium*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	UK_TM30/UK_PM15
Chromium*	198.8	142.0	168.4	208.5	77.5	236.8	195.8	134.2	114.1	169.6	<0.5	mg/kg	UK_TM30/UK_PM15
Cobalt*	35.5	9.8	31.7	45.8	5.3	25.5	9.4	8.5	24.3	140.5	<0.5	mg/kg	UK_TM30/UK_PM15
Copper*	21	20	42	41	246$_{AB}$	41	56	37	30	30	<1	mg/kg	UK_TM30/UK_PM15
Iron*	37430	40390	52830$_{AB}$	79580$_{AB}$	49030	68330$_{AB}$	101500$_{AB}$	56300$_{AB}$	39520	54470$_{AB}$	<20	mg/kg	UK_TM30/UK_PM15
Lead*	19	14	24	49	29	28	15	15	17	100	<5	mg/kg	UK_TM30/UK_PM15
Manganese*	421	240	1209	983	121	850	45	66	831	1804	<1	mg/kg	UK_TM30/UK_PM15
Mercury*	0.1	<0.1	<0.1	0.2	0.9	0.1	0.2	<0.1	0.1	<0.1	<0.1	mg/kg	UK_TM30/UK_PM15
Nickel*	20.2	16.3	48.3	30.0	10.3	29.1	36.7	30.9	22.6	42.5	<0.7	mg/kg	UK_TM30/UK_PM15
Selenium*	2	1	3	2	2	2	1	2	2	1	<1	mg/kg	UK_TM30/UK_PM15
Vanadium*	85	87	128	169	47	159	177	122	76	92	<1	mg/kg	UK_TM30/UK_PM15
Zinc*	19	18	38	24	13	30	25	21	24	18	<5	mg/kg	UK_TM30/UK_PM15
VOC MS													
Methyl Tertiary Butyl Ether	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/kg	SA_TM15/SA_PM10
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/kg	SA_TM15/SA_PM10
1,1-Dichloroethene (1,1 DCE) [SA]	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
trans-1-2-Dichloroethene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
cis-1-2-Dichloroethene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Chloroform [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Carbon tetrachloride [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethane [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
Benzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Toluene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Chlorobenzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Ethylbenzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Xylenes (sum of isomers)	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	ug/kg	SA_TM15/SA_PM10
1,1,2,2-Tetrachloroethane	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
1,3,5-Trimethylbenzene [SA]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
1,2,4-Trimethylbenzene [SA]	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
1,4-Dichlorobenzene [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichlorobenzene [SA]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2,4-Trichlorobenzene	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/kg	SA_TM15/SA_PM10
1,2,3-Trichlorobenzene	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethene (cis & trans)	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
Trichlorobenzenes (1,2,3 & 1,2,4)	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	ug/kg	SA_TM15/SA_PM10
1,2,3-Trimethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM15/SA_PM10

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Element Materials Technology

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	11	12	13	14	15	16	17	18	19	20			
Sample ID	AH 11	AH 12	AH 13	AH 14	AH 15	AH 16	AH 17	AH 18	AH 19	AH 20			
Depth	1.5M	1.5M	0.6M	1.1M	1M	0.3M	0.8M	1.7M		1.6M			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	03/06/2022	03/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	04/06/2022	03/06/2022			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
SVOC MS													
Phenols													
2-Chlorophenol ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
2,4,6-Trichlorophenol ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
PAHs													
Naphthalene ^{SA}	<10	<10	<10	<10	337	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Pyrene ^{SA}	<10	<10	<10	<10	72	19	<10	<10	18	<10	<10	ug/kg	SA_TM16/SA_PM8
Benzo(a)pyrene ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Other SVOCs													
Nitrobenzene ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
TPH CWG													
Aliphatics													
C7-C9	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	SA_TM36/SA_PM12
C10-C14	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	SA_TM5/SA_PM8/PM16
C15-C36	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	SA_TM5/SA_PM8/PM16
Total aliphatics C7-C36	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	mg/kg	SA_TM5/TM36/SA_PM8/PM12/PM16
PCBs (Total vs Aroclor 1254)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM17/SA_PM8
Natural Moisture Content	21.7	23.6	14.6	14.7	19.6	8.0	17.1	22.4	14.7	22.7	<0.1	%	SA_PM4/SA_PM0
Fluoride	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	mg/kg	SA_TM27/SA_PM20
Chloride ^{SA}	6	10	33	6	32	6	<2	5	19	7	<2	mg/kg	SA_TM27/SA_PM20
Nitrite as NO_2 ^{SA}	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	SA_TM27/SA_PM20
Nitrate as NO_3 ^{SA}	<2.5	<2.5	<2.5	<2.5	6.8	<2.5	<2.5	<2.5	10.0	<2.5	<2.5	mg/kg	SA_TM27/SA_PM20
Sulphate as SO_4 (2:1 Ext) ^{SA}	311	185	534_{AA}	338	4302_{AD}	412	54	172	2723_{AD}	51	<3	mg/kg	SA_TM27/SA_PM20
Nitrite as N ^{SA}	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	SA_TM27/SA_PM20
Nitrate as N ^{SA}	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	mg/kg	SA_TM27/SA_PM20
Hexavalent Chromium*	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	UK_TM38/UK_PM20
Chromium III*	198.8	142.0	168.4	208.5	77.5	236.8	195.8	134.2	114.1	169.6	<0.5	mg/kg	UK_TM30/TM38/UK_PM15/PM20
Ammoniacal Nitrogen as N	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	SA_TM27/SA_PM20
Ammoniacal Nitrogen as NH_4	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	SA_TM27/SA_PM20
Total Cyanide*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	UK_TM89/UK_PM45
Electrical Conductivity @25C (5:1 ext)	158	109	287	194	2640	222	<100	103	1047	<100	<100	uS/cm	SA_TM28/SA_PM58
pH ^{SA}	5.48	5.33	6.31	6.60	6.76	6.96	6.59	6.13	7.00	6.92	<2.00	pH units	SA_TM19/SA_PM11

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Element Materials Technology

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	21	22	23	24	25	26	27	28	29	30			
Sample ID	AH 21	AH 22	AH 23	AH 24	AH 25	BH 1	BH 2	BH 3	BH 4	BH 5			
Depth	1.2M	1M	1.1M	1.1M	1.3M	1.5M	1M	1.5M	1M	1.5M			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	04/06/2022	04/06/2022	03/06/2022	03/06/2022	03/06/2022	02/06/2022	02/06/2022	02/06/2022	01/06/2022	31/05/2022			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Antimony*	$<5_{AB}$	$<5_{AB}$	$<5_{AB}$	2	3	2	<1	$<5_{AB}$	3	$<5_{AB}$	<1	mg/kg	UK_TM30/UK_PM15
Arsenic*	28.6	14.0	14.8	2.6	4.5	3.2	3.5	7.6	3.0	9.3	<0.5	mg/kg	UK_TM30/UK_PM15
Cadmium*	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	UK_TM30/UK_PM15
Chromium*	610.3_{AB}	341.6_{AB}	388.9_{AB}	83.6	133.6	86.5	11.0	313.1_{AB}	156.5	301.3_{AB}	<0.5	mg/kg	UK_TM30/UK_PM15
Cobalt*	103.7	28.2	8.6	66.7	3.9	8.0	5.3	16.5	74.2	38.8	<0.5	mg/kg	UK_TM30/UK_PM15
Copper*	99	63	48	20	19	21	14	40	28	47	<1	mg/kg	UK_TM30/UK_PM15
Iron*	176900_{AB}	127300_{AB}	77500_{AB}	31800	24840	29140	3903	77050_{AB}	36030	88420_{AB}	<20	mg/kg	UK_TM30/UK_PM15
Lead*	64	25	11	23	<5	<5	16	12	93	24	<5	mg/kg	UK_TM30/UK_PM15
Manganese*	885	397	55	1104	21	104	70	238	2680_{AB}	926	<1	mg/kg	UK_TM30/UK_PM15
Mercury*	0.3	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	mg/kg	UK_TM30/UK_PM15
Nickel*	57.7	43.8	24.5	39.6	12.6	24.8	10.4	40.2	20.0	36.2	<0.7	mg/kg	UK_TM30/UK_PM15
Selenium*	3	2	2	1	<1	1	<1	1	1	2	<1	mg/kg	UK_TM30/UK_PM15
Vanadium*	371_{AB}	247_{AB}	293_{AB}	76	140	71	22	175	97	202	<1	mg/kg	UK_TM30/UK_PM15
Zinc*	28	22	13	21	9	24	16	21	18	26	<5	mg/kg	UK_TM30/UK_PM15
VOC MS													
Methyl Tertiary Butyl Ether	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/kg	SA_TM15/SA_PM10
Vinyl Chloride	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/kg	SA_TM15/SA_PM10
1,1-Dichloroethene (1,1 DCE) ^{SA}	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
trans-1-2-Dichloroethene ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
cis-1-2-Dichloroethene ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Chloroform ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Carbon tetrachloride ^{SA}	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethane ^{SA}	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
Benzene ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Toluene ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Chlorobenzene ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Ethylbenzene ^{SA}	<3	<3	<3	<3	<3	<3	4	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
Xylenes (sum of isomers)	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	ug/kg	SA_TM15/SA_PM10
1,1,2,2-Tetrachloroethane	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
1,3,5-Trimethylbenzene ^{SA}	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/kg	SA_TM15/SA_PM10
1,2,4-Trimethylbenzene ^{SA}	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
1,4-Dichlorobenzene ^{SA}	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichlorobenzene ^{SA}	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/kg	SA_TM15/SA_PM10
1,2,4-Trichlorobenzene	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/kg	SA_TM15/SA_PM10
1,2,3-Trichlorobenzene	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethene (cis & trans)	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	ug/kg	SA_TM15/SA_PM10
Trichlorobenzenes (1,2,3 & 1,2,4)	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	ug/kg	SA_TM15/SA_PM10
1,2,3-Trimethylbenzene	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM15/SA_PM10

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	21	22	23	24	25	26	27	28	29	30			
Sample ID	AH 21	AH 22	AH 23	AH 24	AH 25	BH 1	BH 2	BH 3	BH 4	BH 5			
Depth	1.2M	1M	1.1M	1.1M	1.3M	1.5M	1M	1.5M	1M	1.5M			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	04/06/2022	04/06/2022	03/06/2022	03/06/2022	03/06/2022	02/06/2022	02/06/2022	02/06/2022	01/06/2022	31/05/2022			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
SVOC MS													
Phenols													
2-Chlorophenol ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
2,4,6-Trichlorophenol ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
PAHs													
Naphthalene ^{SA}	<10	<10	<10	<10	<10	<10	934	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Pyrene ^{SA}	<10	<10	<10	<10	<10	<10	540	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Benzo(a)pyrene ^{SA}	<10	<10	<10	<10	<10	<10	321	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
Other SVOCs													
Nitrobenzene ^{SA}	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM16/SA_PM8
TPH CWG													
Aliphatics													
C7-C9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	SA_TM36/SA_PM12
C10-C14	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	SA_TM5/SA_PM8/PM16
C15-C36	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	SA_TM5/SA_PM8/PM16
Total aliphatics C7-C36	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	mg/kg	SA_TM5/TM36/SA_PM8/PM12/PM16
PCBs (Total vs Aroclor 1254)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/kg	SA_TM17/SA_PM8
Natural Moisture Content	10.2	18.4	14.1	16.9	18.7	13.2	7.7	14.6	24.7	15.2	<0.1	%	SA_PM4/SA_PM0
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	1.3	0.4	0.4	<0.3	0.3	<0.3	mg/kg	SA_TM27/SA_PM20
Chloride ^{SA}	<2	3	4	6	2	3	2	9	17	74	<2	mg/kg	SA_TM27/SA_PM20
Nitrite as NO2 ^{SA}	<0.5	<0.5	<0.5	<0.5	0.9	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	SA_TM27/SA_PM20
Nitrate as NO3 ^{SA}	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	2.6	<2.5	mg/kg	SA_TM27/SA_PM20
Sulphate as SO4 (2:1 Ext) ^{SA}	448$_{AA}$	85	88	216	67	56	1997$_{AC}$	280	34	584$_{AB}$	<3	mg/kg	SA_TM27/SA_PM20
Nitrite as N ^{SA}	<0.2	<0.2	<0.2	<0.2	0.3	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	SA_TM27/SA_PM20
Nitrate as N ^{SA}	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	mg/kg	SA_TM27/SA_PM20
Hexavalent Chromium*	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	UK_TM38/UK_PM20
Chromium III*	610.3$_{AB}$	341.6$_{AB}$	388.9$_{AB}$	83.6	133.6	86.5	11.0	313.1$_{AB}$	156.5	301.3$_{AB}$	<0.5	mg/kg	UK_TM30/TM38/UK_PM15/PM20
Ammoniacal Nitrogen as N	1.0	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	SA_TM27/SA_PM20
Ammoniacal Nitrogen as NH4	1.3	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	SA_TM27/SA_PM20
Total Cyanide*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	UK_TM89/UK_PM45
Electrical Conductivity @25C (5:1 ext)	172	<100	<100	127	<100	<100	729	187	<100	228	<100	uS/cm	SA_TM28/SA_PM58
pH ^{SA}	4.58	5.44	6.31	6.24	6.04	6.96	6.91	6.99	6.32	6.55	<2.00	pH units	SA_TM19/SA_PM11

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Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	31	32	33	34	35								
Sample ID	BH 6	BH 7	BH 8	BH 9	BH 10								
Depth	1.5M	2M	1M	1.5M	1.5M								
COC No / misc													
Containers	B	B	B	B	B								
Sample Date	31/05/2022	01/06/2022	01/06/2022	31/05/2022	30/05/2022								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1						LOD/LOR	Units	Method No.
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022								
Antimony*	1	2	$<5_{AB}$	6	4						<1	mg/kg	UK_TM30/UK_PM15
Arsenic*	1.6	1.9	23.0	10.1	8.0						<0.5	mg/kg	UK_TM30/UK_PM15
Cadmium*	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	UK_TM30/UK_PM15
Chromium*	75.3	68.9	279.0_{AB}	244.7	190.7						<0.5	mg/kg	UK_TM30/UK_PM15
Cobalt*	3.6	7.4	69.5	58.1	121.2						<0.5	mg/kg	UK_TM30/UK_PM15
Copper*	12	17	39	60	50						<1	mg/kg	UK_TM30/UK_PM15
Iron*	12680	20020	92300_{AB}	71270_{AB}	68530_{AB}						<20	mg/kg	UK_TM30/UK_PM15
Lead*	<5	5	50	29	53						<5	mg/kg	UK_TM30/UK_PM15
Manganese*	43	101	968	967	5196_{AB}						<1	mg/kg	UK_TM30/UK_PM15
Mercury*	<0.1	<0.1	0.2	0.1	0.2						<0.1	mg/kg	UK_TM30/UK_PM15
Nickel*	15.6	18.3	60.6	51.0	59.5						<0.7	mg/kg	UK_TM30/UK_PM15
Selenium*	<1	<1	<1	1	3						<1	mg/kg	UK_TM30/UK_PM15
Vanadium*	33	44	188	201	185						<1	mg/kg	UK_TM30/UK_PM15
Zinc*	16	18	40	19	26						<5	mg/kg	UK_TM30/UK_PM15
VOC MS													
Methyl Tertiary Butyl Ether	<2	<2	<2	<2	<2						<2	ug/kg	SA_TM15/SA_PM10
Vinyl Chloride	<2	<2	<2	<2	<2						<2	ug/kg	SA_TM15/SA_PM10
1,1-Dichloroethene (1,1 DCE) ^{SA}	<6	<6	<6	<6	<6						<6	ug/kg	SA_TM15/SA_PM10
trans-1-2-Dichloroethene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
cis-1-2-Dichloroethene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
Chloroform ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
Carbon tetrachloride ^{SA}	<4	<4	<4	<4	<4						<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethane ^{SA}	<4	<4	<4	<4	<4						<4	ug/kg	SA_TM15/SA_PM10
Benzene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
Toluene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
Chlorobenzene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
Ethylbenzene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
Xylenes (sum of isomers)	<8	<8	<8	<8	<8						<8	ug/kg	SA_TM15/SA_PM10
1,1,2,2-Tetrachloroethane	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
1,3,5-Trimethylbenzene ^{SA}	<3	<3	<3	<3	<3						<3	ug/kg	SA_TM15/SA_PM10
1,2,4-Trimethylbenzene ^{SA}	<6	<6	<6	<6	<6						<6	ug/kg	SA_TM15/SA_PM10
1,4-Dichlorobenzene ^{SA}	<4	<4	<4	<4	<4						<4	ug/kg	SA_TM15/SA_PM10
1,2-Dichlorobenzene ^{SA}	<4	<4	<4	<4	<4						<4	ug/kg	SA_TM15/SA_PM10
1,2,4-Trichlorobenzene	<7	<7	<7	<7	<7						<7	ug/kg	SA_TM15/SA_PM10
1,2,3-Trichlorobenzene	<7	<7	<7	<7	<7						<7	ug/kg	SA_TM15/SA_PM10
1,2-Dichloroethene (cis & trans)	<6	<6	<6	<6	<6						<6	ug/kg	SA_TM15/SA_PM10
Trichlorobenzenes (1,2,3 & 1,2,4)	<14	<14	<14	<14	<14						<14	ug/kg	SA_TM15/SA_PM10
1,2,3-Trimethylbenzene	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM15/SA_PM10

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Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka
EMT Job No: 22/528

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	31	32	33	34	35						LOD/LOR	Units	Method No.
Sample ID	BH 6	BH 7	BH 8	BH 9	BH 10								
Depth	1.5M	2M	1M	1.5M	1.5M								
COC No / misc													
Containers	B	B	B	B	B								
Sample Date	31/05/2022	01/06/2022	01/06/2022	31/05/2022	30/05/2022								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022								
SVOC MS													
Phenols													
2-Chlorophenol [SA]	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM16/SA_PM8
2,4,6-Trichlorophenol [SA]	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM16/SA_PM8
PAHs													
Naphthalene [SA]	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM16/SA_PM8
Pyrene [SA]	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM16/SA_PM8
Benzo(a)pyrene [SA]	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM16/SA_PM8
Other SVOCs													
Nitrobenzene [SA]	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM16/SA_PM8
TPH CWG													
Aliphatics													
C7-C9	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	mg/kg	SA_TM36/SA_PM12
C10-C14	<4	<4	<4	<4	<4						<4	mg/kg	SA_TM5/SA_PM8/PM16
C15-C36	<7	<7	<7	<7	<7						<7	mg/kg	SA_TM5/SA_PM8/PM16
Total aliphatics C7-C36	<12	<12	<12	<12	<12						<12	mg/kg	SA_TM5/TM36/SA_PM8/PM12/PM16
PCBs (Total vs Aroclor 1254)	<10	<10	<10	<10	<10						<10	ug/kg	SA_TM17/SA_PM8
Natural Moisture Content	20.9	19.8	15.8	15.1	18.4						<0.1	%	SA_PM4/SA_PM0
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3						<0.3	mg/kg	SA_TM27/SA_PM20
Chloride [SA]	3	6	3	<2	4						<2	mg/kg	SA_TM27/SA_PM20
Nitrite as NO2 [SA]	0.9	<0.5	<0.5	<0.5	<0.5						<0.5	mg/kg	SA_TM27/SA_PM20
Nitrate as NO3 [SA]	<2.5	<2.5	<2.5	<2.5	<2.5						<2.5	mg/kg	SA_TM27/SA_PM20
Sulphate as SO4 (2:1 Ext) [SA]	34	51	247	60	27						<3	mg/kg	SA_TM27/SA_PM20
Nitrite as N [SA]	0.3	<0.2	<0.2	<0.2	<0.2						<0.2	mg/kg	SA_TM27/SA_PM20
Nitrate as N [SA]	<2.5	<2.5	<2.5	<2.5	<2.5						<2.5	mg/kg	SA_TM27/SA_PM20
Hexavalent Chromium*	<0.3	<0.3	<0.3	<0.3	<0.3						<0.3	mg/kg	UK_TM38/UK_PM20
Chromium III*	75.3	68.9	279.0$_{AB}$	244.7	190.7						<0.5	mg/kg	UK_TM30/TM38/UK_PM15/PM20
Ammoniacal Nitrogen as N	<0.6	<0.6	<0.6	<0.6	<0.6						<0.6	mg/kg	SA_TM27/SA_PM20
Ammoniacal Nitrogen as NH4	<0.6	<0.6	<0.6	<0.6	<0.6						<0.6	mg/kg	SA_TM27/SA_PM20
Total Cyanide*	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	mg/kg	UK_TM89/UK_PM45
Electrical Conductivity @25C (5:1 ext)	<100	<100	126	<100	<100						<100	uS/cm	SA_TM28/SA_PM58
pH [SA]	6.91	6.46	6.73	6.44	7.21						<2.00	pH units	SA_TM19/SA_PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: WSP Group Africa
Reference:
Location: Eskom Komati Project
Contact: Noma Nyoka

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/528						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

EMT Job No.: 22/528

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x2 Dilution
AB	x5 Dilution
AC	x10 Dilution
AD	x20 Dilution

EMT Job No: 22/528

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	SA_PM0	No preparation is required.			AR	
SA_TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds by Headspace GC-MS.	SA_PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
SA_TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds by Headspace GC-MS.	SA_PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
SA_TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
SA_TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
SA_TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	SA_PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
SA_TM19	Determination of pH by bench pH meter	SA_PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
SA_TM27	Major ions by Ion Chromatography	SA_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a orbital shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a orbital shaker.			AD	Yes
SA_TM27	Major ions by Ion Chromatography	SA_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a orbital shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a orbital shaker.	Yes		AD	Yes
SA_TM27	Major ions by Ion Chromatography	SA_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a orbital shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a orbital shaker.			AR	Yes

EMT Job No: 22/528

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM28	Determination of Electrical Conductivity with hand held manual conductivity probe.	SA_PM58	Dried and ground solid samples are extracted with water in a 5:1 water to solid ratio, the samples are shaken on an orbital shaker.			AD	Yes
SA_TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12, MTBE and BTEX by headspace GC-FID.	SA_PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
SA_TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	SA_PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
SA_TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of BTEX and calculation of Aliphatic fractions	SA_PM8/PM12/PM16	please refer to SA_PM8/PM16 and SA_PM12 for method details			AR	Yes
UK_TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	UK_PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.				Yes
UK_TM30/TM38	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009 / Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	UK_PM15/PM20	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. / Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.				Yes
UK_TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	UK_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.				Yes
UK_TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	UK_PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.				Yes

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33 Sloane Street
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2191

Attention :	Sarah Skinner
Date :	29th June, 2022
Your reference :	41103965
Our reference :	Test Report 22/556 Batch 1
Location :	Eskom Komati Power Station (ESIA and WULA
Date samples received :	10th June, 2022
Status :	Final report
Issue :	1

Eleven samples were received for analysis on 10th June, 2022 of which eleven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Analysis was undertaken at either Element Materials Technology UK, which is ISO 17025 accredited under UKAS (4225) or Element Materials Technology (SA) which is ISO 17025 accredited under SANAS (T0729) or a subcontract laboratory where specified.

NOTE: Under International Laboratory Accreditation Cooperation (ILAC), ISO 17025 (UKAS) accreditation is recognised as equivalent to SANAS (South Africa) accreditation.

Authorised By:

Debbie van Wyk

Organics Laboratory:

Greg Ondrejkovic
Technical Supervisor

Inorganics Laboratory:

Greg Ondrejkovic
Technical Supervisor

Client Name:	WSP Group Africa	**Report :**	**Liquid**
Reference:	41103965		
Location:	Eskom Komati Power Station (ESIA and WULA project)		
Contact:	Sarah Skinner	**Liquids/products:**	V=40ml vial, G=glass bottle, P=plastic bottle
EMT Job No:	22/556		H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70			
Sample ID	BH 1	BH 2	BH 3	BH 4	BH 5	BH 6	BH 7	BH 8	BH 9	BH 10			
Depth													
COC No / misc													
Containers	V HN P G	V P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G			
Sample Date	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022			
Dissolved Antimony*	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	UK_TM170/UK_PM14
Dissolved Arsenic*	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	ug/l	UK_TM170/UK_PM14
Dissolved Cadmium*	<0.03	<0.03	<0.03	<0.03	0.04	0.03	<0.03	0.04	<0.03	<0.03	<0.03	ug/l	UK_TM170/UK_PM14
Total Dissolved Chromium*	<0.2	4.3	<0.2	1.4	0.4	<0.2	<0.2	0.2	0.3	<0.2	<0.2	ug/l	UK_TM170/UK_PM14
Dissolved Cobalt*	12.2	25.6	11.1	4.6	4.6	6.6	0.2	0.5	0.7	<0.1	<0.1	ug/l	UK_TM170/UK_PM14
Dissolved Copper*	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	UK_TM170/UK_PM14
Total Dissolved Iron*	292.0	1692.1$_{AB}$	164.4	492.9	12.6	25.6	11.2	7.9	43.9	9.9	<4.7	ug/l	UK_TM170/UK_PM14
Dissolved Lead*	1.5	2.1	4.6	1.6	7.8	12.8	38.1	33.0	28.3	2.7	<0.4	ug/l	UK_TM170/UK_PM14
Dissolved Manganese*	3269.5$_{AB}$	1241.8$_{AB}$	1718.3$_{AB}$	114.8	809.5	496.8	15.7	68.8	18.3	6.8	<1.5	ug/l	UK_TM170/UK_PM14
Dissolved Mercury*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	UK_TM170/UK_PM14
Dissolved Nickel*	4.7	8.2	12.8	6.3	5.5	7.0	4.5	23.6	1.7	3.2	<0.2	ug/l	UK_TM170/UK_PM14
Dissolved Selenium*	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	ug/l	UK_TM170/UK_PM14
Dissolved Vanadium*	<0.6	4.8	1.0	1.5	1.1	<0.6	<0.6	<0.6	2.2	1.5	<0.6	ug/l	UK_TM170/UK_PM14
Dissolved Zinc*	16.2	30.7	37.9	29.4	37.8	46.4	34.5	59.0	32.4	24.5	<1.5	ug/l	UK_TM170/UK_PM14
Dissolved Calcium ^{SA}	73.1	27.7	141.0	11.0	46.3	42.4	13.6	83.0	17.0	8.0	<0.3	mg/l	SA_TM27/SA_PM0
Dissolved Magnesium ^{SA}	50.0	22.5	125.4$_{AB}$	11.2	26.4	34.6	9.1	74.3	11.2	5.0	<0.2	mg/l	SA_TM27/SA_PM0
Dissolved Potassium ^{SA}	4.2	7.0	6.2	3.6	11.2	6.9	7.9	18.5	3.2	2.3	<0.1	mg/l	SA_TM27/SA_PM0
Dissolved Sodium ^{SA}	71.6	85.8	136.4	15.2	82.6	44.2	26.3	48.4	46.5	25.6	<0.1	mg/l	SA_TM27/SA_PM0
Dissolved Silicon*	21309$_{AB}$	28801$_{AB}$	19617$_{AB}$	10607$_{AB}$	8902	9616	6005	9986	23415$_{AB}$	9350	<100	ug/l	UK_TM30/UK_PM14

Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=HNO_3

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70			
Sample ID	BH 1	BH 2	BH 3	BH 4	BH 5	BH 6	BH 7	BH 8	BH 9	BH 10			
Depth													
COC No / misc													
Containers	V HN P G	V P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G			
Sample Date	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022			
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Methyl Tertiary Butyl Ether	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	SA_TM15/SA_PM10
Chloromethane SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Vinyl Chloride	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	SA_TM15/SA_PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM15/SA_PM10
Chloroethane SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Trichlorofluoromethane SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,1-Dichloroethene (1,1 DCE) SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Dichloromethane (DCM) SA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	SA_TM15/SA_PM10
trans-1-2-Dichloroethene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,1-Dichloroethane SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
cis-1-2-Dichloroethene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM15/SA_PM10
Bromochloromethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Chloroform SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,1,1-Trichloroethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,1-Dichloropropene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Carbon tetrachloride SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,2-Dichloroethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Benzene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM15/SA_PM10
Trichloroethene (TCE) SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,2-Dichloropropane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Dibromomethane SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Bromodichloromethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Toluene SA	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	SA_TM15/SA_PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,1,2-Trichloroethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Tetrachloroethene (PCE) SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,3-Dichloropropane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Dibromochloromethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,2-Dibromoethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Chlorobenzene SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,1,1,2-Tetrachloroethane SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Ethylbenzene SA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM15/SA_PM10
p/m-Xylene SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
o-Xylene SA	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM15/SA_PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Bromoform SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
Isopropylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/l	SA_TM15/SA_PM10
Bromobenzene SA	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,2,3-Trichloropropane SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name:	WSP Group Africa	**Report :**	**Liquid**
Reference:	41103965		
Location:	Eskom Komati Power Station (ESIA and WULA project)		
Contact:	Sarah Skinner	**Liquids/products:**	V=40ml vial, G=glass bottle, P=plastic bottle
EMT Job No:	22/556		H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70			
Sample ID	BH 1	BH 2	BH 3	BH 4	BH 5	BH 6	BH 7	BH 8	BH 9	BH 10			
Depth													
COC No / misc													
Containers	V HN P G	V P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G			
Sample Date	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022			
VOC MS Continued													
Propylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
2-Chlorotoluene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,3,5-Trimethylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
4-Chlorotoluene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
tert-Butylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,2,4-Trimethylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
sec-Butylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
4-Isopropyltoluene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,3-Dichlorobenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,4-Dichlorobenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
n-Butylbenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,2-Dichlorobenzene SA	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	SA_TM15/SA_PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	SA_TM15/SA_PM10
VOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	SA_TM15/SA_PM10
SVOC MS													
Phenols													
2-Chlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
2-Methylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
2,4-Dichlorophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
2,4,5-Trichlorophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
4-Chloro-3-methylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	SA_TM16/SA_PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30

Client Name:	WSP Group Africa	**Report :**	**Liquid**
Reference:	41103965		
Location:	Eskom Komati Power Station (ESIA and WULA project)		
Contact:	Sarah Skinner	**Liquids/products:**	V=40ml vial, G=glass bottle, P=plastic bottle
EMT Job No:	22/556		$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HNO_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70	LOD/LOR	Units	Method No.
Sample ID	BH 1	BH 2	BH 3	BH 4	BH 5	BH 6	BH 7	BH 8	BH 9	BH 10			
Depth													
COC No / misc													
Containers	V HN P G	V P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G			
Sample Date	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022			
SVOC MS													
PAHs													
2-Chloronaphthalene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
2-Methylnaphthalene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Naphthalene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Acenaphthylene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Acenaphthene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Fluorene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Phenanthrene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Anthracene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Fluoranthene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Pyrene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Benzo(a)anthracene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Chrysene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Benzo(b)fluoranthene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Benzo(k)fluoranthene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Benzo(a)pyrene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Indeno(123cd)pyrene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Dibenzo(ah)anthracene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Benzo(ghi)perylene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Phthalates													
Bis(2-ethylhexyl) phthalate [SA]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	SA_TM16/SA_PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Di-n-butyl phthalate [SA]	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	SA_TM16/SA_PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Diethyl phthalate [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Dimethyl phthalate [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30

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Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70			
Sample ID	BH 1	BH 2	BH 3	BH 4	BH 5	BH 6	BH 7	BH 8	BH 9	BH 10			
Depth													
COC No / misc													
Containers	V HN P G	V P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G			
Sample Date	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022			
SVOC MS													
Other SVOCs													
1,2-Dichlorobenzene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
1,2,4-Trichlorobenzene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
1,3-Dichlorobenzene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
1,4-Dichlorobenzene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
2,4-Dinitrotoluene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
4-Bromophenylphenylether [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
4-Chlorophenylphenylether [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Azobenzene [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Bis(2-chloroethoxy)methane [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Bis(2-chloroethyl)ether [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Carbazole [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Dibenzofuran [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Hexachlorobenzene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Hexachlorobutadiene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Hexachlorocyclopentadiene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Hexachloroethane [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
Isophorone [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
N-nitrosodi-n-propylamine [SA]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	SA_TM16/SA_PM30
Nitrobenzene [SA]	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	SA_TM16/SA_PM30
SVOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	SA_TM16/SA_PM30
TPH CWG													
Aliphatics													
C7-C9	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	SA_TM36/SA_PM12
C10-C14	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	SA_TM5/SA_PM16/PM30
C15-C36	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	SA_TM5/SA_PM16/PM30
Total aliphatics C7-C36	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	SA_TM5/TM36/SA_PM12/PM16/PM30
PCBs (Total vs Aroclor 1254)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ug/l	SA_TM17/SA_PM30
Fluoride [SA]	0.4	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	mg/l	SA_TM27/SA_PM0
Chloride [SA]	32.1	22.1	73.9	53.0	67.6	19.0	29.7	25.6	3.4	11.7	<0.3	mg/l	SA_TM27/SA_PM0
Sulphate [SA]	133.1	183.6_{AA}	983.1_{AB}	5.4	213.0_{AA}	234.8_{AA}	67.3	446.0_{AB}	51.1	55.4	<0.5	mg/l	SA_TM27/SA_PM0
Nitrate as N [SA]	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	0.36	<0.05	1.27	<0.05	<0.05	mg/l	SA_TM27/SA_PM0

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-9	10-14	15-21	22-28	29-35	36-42	43-49	50-56	57-63	64-70	LOD/LOR	Units	Method No.
Sample ID	BH 1	BH 2	BH 3	BH 4	BH 5	BH 6	BH 7	BH 8	BH 9	BH 10			
Depth													
COC No / misc													
Containers	V HN P G	V P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G			
Sample Date	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022	07/06/2022			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022	10/06/2022			
Ortho Phosphate as P	0.046	0.039	0.055	0.033	0.029	0.023	0.036	0.046	0.039	0.026	<0.015	mg/l	SA_TM191/SA_PM31
Ammoniacal Nitrogen as N SA	2.60	0.47	0.75	<0.03	0.47	0.19	<0.03	0.05	<0.03	<0.03	<0.03	mg/l	SA_TM27/SA_PM0
Hexavalent Chromium*	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/l	UK_TM38/UK_PM0
Total Alkalinity as CaCO3 SA	396	132	260	18	92	64	23	116	124	20	<3	mg/l	SA_TM32/SA_PM0
Electrical Conductivity @25C SA	981	684	1849	248	835	679	304	1133	370	125	<2	uS/cm	SA_TM28/SA_PM0
pH SA	7.44	7.44	7.25	7.10	7.54	6.67	7.00	7.42	7.54	6.62	<2.00	pH units	SA_TM19/SA_PM0
Total Dissolved Solids SA	616	541	1537	205	563	486	187	894	250	136	<35	mg/l	SA_TM20/SA_PM31
Total Organic Carbon*	<2	<2	<2	<2	<2	<2	<2	2	<2	<2	<2	mg/l	UK_TM60/UK_PM0

Element Materials Technology

Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	71-77												
Sample ID	BH 10-01												
Depth													
COC No / misc													
Containers	V HN P G												
Sample Date	07/06/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	10/06/2022										LOD/LOR	Units	Method No.
Dissolved Antimony*	<2										<2	ug/l	UK_TM170/UK_PM14
Dissolved Arsenic*	<0.9										<0.9	ug/l	UK_TM170/UK_PM14
Dissolved Cadmium*	<0.03										<0.03	ug/l	UK_TM170/UK_PM14
Total Dissolved Chromium*	<0.2										<0.2	ug/l	UK_TM170/UK_PM14
Dissolved Cobalt*	11.0										<0.1	ug/l	UK_TM170/UK_PM14
Dissolved Copper*	<1										<1	ug/l	UK_TM170/UK_PM14
Total Dissolved Iron*	163.7										<4.7	ug/l	UK_TM170/UK_PM14
Dissolved Lead*	4.6										<0.4	ug/l	UK_TM170/UK_PM14
Dissolved Manganese*	1639.4$_{AB}$										<1.5	ug/l	UK_TM170/UK_PM14
Dissolved Mercury*	<0.5										<0.5	ug/l	UK_TM170/UK_PM14
Dissolved Nickel*	12.6										<0.2	ug/l	UK_TM170/UK_PM14
Dissolved Selenium*	<1.2										<1.2	ug/l	UK_TM170/UK_PM14
Dissolved Vanadium*	1.0										<0.6	ug/l	UK_TM170/UK_PM14
Dissolved Zinc*	37.0										<1.5	ug/l	UK_TM170/UK_PM14
Dissolved Calcium [SA]	141.5										<0.3	mg/l	SA_TM27/SA_PM0
Dissolved Magnesium [SA]	116.5$_{AB}$										<0.2	mg/l	SA_TM27/SA_PM0
Dissolved Potassium [SA]	6.0										<0.1	mg/l	SA_TM27/SA_PM0
Dissolved Sodium [SA]	137.1										<0.1	mg/l	SA_TM27/SA_PM0
Dissolved Silicon*	20135$_{AB}$										<100	ug/l	UK_TM30/UK_PM14

Client Name: WSP Group Africa
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EMT Job No: 22/556

Report : **Liquid**

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H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	71-77										LOD/LOR	Units	Method No.
Sample ID	BH 10-01												
Depth													
COC No / misc													
Containers	V HN P G												
Sample Date	07/06/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	10/06/2022												
VOC MS													
Dichlorodifluoromethane	<2										<2	ug/l	SA_TM15/SA_PM10
Methyl Tertiary Butyl Ether	<0.1										<0.1	ug/l	SA_TM15/SA_PM10
Chloromethane ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
Vinyl Chloride	<0.1										<0.1	ug/l	SA_TM15/SA_PM10
Bromomethane	<1										<1	ug/l	SA_TM15/SA_PM10
Chloroethane ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
Trichlorofluoromethane ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
1,1-Dichloroethene (1,1 DCE) ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
Dichloromethane (DCM) ^{SA}	<5										<5	ug/l	SA_TM15/SA_PM10
trans-1-2-Dichloroethene ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
1,1-Dichloroethane ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
cis-1-2-Dichloroethene ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
2,2-Dichloropropane	<1										<1	ug/l	SA_TM15/SA_PM10
Bromochloromethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Chloroform ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
1,1,1-Trichloroethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
1,1-Dichloropropene ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
Carbon tetrachloride ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
1,2-Dichloroethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Benzene	<0.5										<0.5	ug/l	SA_TM15/SA_PM10
Trichloroethene (TCE) ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
1,2-Dichloropropane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Dibromomethane ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
Bromodichloromethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
cis-1-3-Dichloropropene	<2										<2	ug/l	SA_TM15/SA_PM10
Toluene ^{SA}	<5										<5	ug/l	SA_TM15/SA_PM10
trans-1-3-Dichloropropene	<2										<2	ug/l	SA_TM15/SA_PM10
1,1,2-Trichloroethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Tetrachloroethene (PCE) ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
1,3-Dichloropropane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Dibromochloromethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
1,2-Dibromoethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Chlorobenzene ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
1,1,1,2-Tetrachloroethane ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Ethylbenzene ^{SA}	<1										<1	ug/l	SA_TM15/SA_PM10
p/m-Xylene ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
o-Xylene ^{SA}	<1										<1	ug/l	SA_TM15/SA_PM10
Styrene	<2										<2	ug/l	SA_TM15/SA_PM10
Bromoform ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
Isopropylbenzene ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10
1,1,2,2-Tetrachloroethane	<4										<4	ug/l	SA_TM15/SA_PM10
Bromobenzene ^{SA}	<2										<2	ug/l	SA_TM15/SA_PM10
1,2,3-Trichloropropane ^{SA}	<3										<3	ug/l	SA_TM15/SA_PM10

Element Materials Technology

Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	71-77											
Sample ID	BH 10-01											
Depth												
COC No / misc												
Containers	V HN P G											
Sample Date	07/06/2022											
Sample Type	Ground Water											
Batch Number	1										LOD/LOR	Units	Method No.
Date of Receipt	10/06/2022												
VOC MS Continued												
Propylbenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
2-Chlorotoluene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
1,3,5-Trimethylbenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
4-Chlorotoluene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
tert-Butylbenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
1,2,4-Trimethylbenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
sec-Butylbenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
4-Isopropyltoluene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
1,3-Dichlorobenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
1,4-Dichlorobenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
n-Butylbenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
1,2-Dichlorobenzene [SA]	<3										<3	ug/l	SA_TM15/SA_PM10
1,2-Dibromo-3-chloropropane	<2										<2	ug/l	SA_TM15/SA_PM10
1,2,4-Trichlorobenzene	<3										<3	ug/l	SA_TM15/SA_PM10
Hexachlorobutadiene	<3										<3	ug/l	SA_TM15/SA_PM10
Naphthalene	<2										<2	ug/l	SA_TM15/SA_PM10
1,2,3-Trichlorobenzene	<3										<3	ug/l	SA_TM15/SA_PM10
VOC TICs	ND											None	SA_TM15/SA_PM10
SVOC MS													
Phenols													
2-Chlorophenol	<1										<1	ug/l	SA_TM16/SA_PM30
2-Methylphenol	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
2-Nitrophenol	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
2,4-Dichlorophenol	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
2,4-Dimethylphenol	<1										<1	ug/l	SA_TM16/SA_PM30
2,4,5-Trichlorophenol	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
2,4,6-Trichlorophenol	<1										<1	ug/l	SA_TM16/SA_PM30
4-Chloro-3-methylphenol	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
4-Methylphenol	<1										<1	ug/l	SA_TM16/SA_PM30
4-Nitrophenol	<10										<10	ug/l	SA_TM16/SA_PM30
Pentachlorophenol	<1										<1	ug/l	SA_TM16/SA_PM30
Phenol	<1										<1	ug/l	SA_TM16/SA_PM30

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Element Materials Technology

Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HNO_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	71-77										LOD/LOR	Units	Method No.
Sample ID	BH 10-01												
Depth													
COC No / misc													
Containers	V HN P G												
Sample Date	07/06/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	10/06/2022												
SVOC MS													
PAHs													
2-Chloronaphthalene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
2-Methylnaphthalene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Naphthalene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Acenaphthylene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Acenaphthene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Fluorene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Phenanthrene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Anthracene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Fluoranthene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Pyrene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Benzo(a)anthracene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Chrysene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Benzo(b)fluoranthene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Benzo(k)fluoranthene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Benzo(a)pyrene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Indeno(123cd)pyrene [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Dibenzo(ah)anthracene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Benzo(ghi)perylene [SA]	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Phthalates													
Bis(2-ethylhexyl) phthalate [SA]	<5										<5	ug/l	SA_TM16/SA_PM30
Butylbenzyl phthalate	<1										<1	ug/l	SA_TM16/SA_PM30
Di-n-butyl phthalate [SA]	<1.5										<1.5	ug/l	SA_TM16/SA_PM30
Di-n-Octyl phthalate	<1										<1	ug/l	SA_TM16/SA_PM30
Diethyl phthalate [SA]	<1										<1	ug/l	SA_TM16/SA_PM30
Dimethyl phthalate [SA]	<1										<1	ug/l	SA_TM16/SA_PM30

Element Materials Technology

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Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	71-77										LOD/LOR	Units	Method No.
Sample ID	BH 10-01												
Depth													
COC No / misc													
Containers	V HN P G												
Sample Date	07/06/2022												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	10/06/2022												
SVOC MS													
Other SVOCs													
1,2-Dichlorobenzene SA	<1										<1	ug/l	SA_TM16/SA_PM30
1,2,4-Trichlorobenzene SA	<1										<1	ug/l	SA_TM16/SA_PM30
1,3-Dichlorobenzene SA	<1										<1	ug/l	SA_TM16/SA_PM30
1,4-Dichlorobenzene SA	<1										<1	ug/l	SA_TM16/SA_PM30
2-Nitroaniline	<1										<1	ug/l	SA_TM16/SA_PM30
2,4-Dinitrotoluene SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
2,6-Dinitrotoluene	<1										<1	ug/l	SA_TM16/SA_PM30
3-Nitroaniline	<1										<1	ug/l	SA_TM16/SA_PM30
4-Bromophenylphenylether SA	<1										<1	ug/l	SA_TM16/SA_PM30
4-Chloroaniline	<1										<1	ug/l	SA_TM16/SA_PM30
4-Chlorophenylphenylether SA	<1										<1	ug/l	SA_TM16/SA_PM30
4-Nitroaniline	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Azobenzene SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Bis(2-chloroethoxy)methane SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Bis(2-chloroethyl)ether SA	<1										<1	ug/l	SA_TM16/SA_PM30
Carbazole SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Dibenzofuran SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Hexachlorobenzene SA	<1										<1	ug/l	SA_TM16/SA_PM30
Hexachlorobutadiene SA	<1										<1	ug/l	SA_TM16/SA_PM30
Hexachlorocyclopentadiene SA	<1										<1	ug/l	SA_TM16/SA_PM30
Hexachloroethane SA	<1										<1	ug/l	SA_TM16/SA_PM30
Isophorone SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
N-nitrosodi-n-propylamine SA	<0.5										<0.5	ug/l	SA_TM16/SA_PM30
Nitrobenzene SA	<1										<1	ug/l	SA_TM16/SA_PM30
SVOC TICs	ND											None	SA_TM16/SA_PM30
TPH CWG													
Aliphatics													
C7-C9	<10										<10	ug/l	SA_TM36/SA_PM12
C10-C14	<10										<10	ug/l	SA_TM5/SA_PM16/PM30
C15-C36	<10										<10	ug/l	SA_TM5/SA_PM16/PM30
Total aliphatics C7-C36	<10										<10	ug/l	SA_TM5/TM36/SA_PM12/PM16/PM30
PCBs (Total vs Aroclor 1254)	<0.2										<0.2	ug/l	SA_TM17/SA_PM30
Fluoride SA	0.4										<0.3	mg/l	SA_TM27/SA_PM0
Chloride SA	69.9										<0.3	mg/l	SA_TM27/SA_PM0
Sulphate SA	837.9 AB										<0.5	mg/l	SA_TM27/SA_PM0
Nitrate as N SA	<0.05										<0.05	mg/l	SA_TM27/SA_PM0

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Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner
EMT Job No: 22/556

Report : **Liquid**

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=HNO_3

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	71-77	LOD/LOR	Units	Method No.
Sample ID	BH 10-01			
Depth				
COC No / misc				
Containers	V HN P G			
Sample Date	07/06/2022			
Sample Type	Ground Water			
Batch Number	1			
Date of Receipt	10/06/2022			
Ortho Phosphate as P	0.042	<0.015	mg/l	SA_TM191/SA_PM31
Ammoniacal Nitrogen as N SA	0.36	<0.03	mg/l	SA_TM27/SA_PM0
Hexavalent Chromium*	<0.006	<0.006	mg/l	UK_TM38/UK_PM0
Total Alkalinity as CaCO3 SA	256	<3	mg/l	SA_TM32/SA_PM0
Electrical Conductivity @25C SA	1850	<2	uS/cm	SA_TM28/SA_PM0
pH SA	6.62	<2.00	pH units	SA_TM19/SA_PM0
Total Dissolved Solids SA	1533	<35	mg/l	SA_TM20/SA_PM31
Total Organic Carbon*	<2	<2	mg/l	UK_TM60/UK_PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: WSP Group Africa
Reference: 41103965
Location: Eskom Komati Power Station (ESIA and WULA project)
Contact: Sarah Skinner

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
22/556	1	BH 1		1-9	SVOC	Sample holding time exceeded
22/556	1	BH 2		10-14	SVOC	Sample holding time exceeded
22/556	1	BH 3		15-21	SVOC	Sample holding time exceeded
22/556	1	BH 4		22-28	SVOC	Sample holding time exceeded
22/556	1	BH 5		29-35	SVOC	Sample holding time exceeded
22/556	1	BH 6		36-42	SVOC	Sample holding time exceeded
22/556	1	BH 7		43-49	SVOC	Sample holding time exceeded
22/556	1	BH 8		50-56	SVOC	Sample holding time exceeded
22/556	1	BH 9		57-63	SVOC	Sample holding time exceeded
22/556	1	BH 10		64-70	SVOC	Sample holding time exceeded
22/556	1	BH 10-01		71-77	SVOC	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

EMT Job No.: 22/556

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x2 Dilution
AB	x5 Dilution

EMT Job No: 22/556

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds by Headspace GC-MS.	SA_PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
SA_TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds by Headspace GC-MS.	SA_PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
SA_TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
SA_TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
SA_TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	SA_PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
SA_TM19	Determination of pH by bench pH meter	SA_PM0	No preparation is required.	Yes			
SA_TM191	Orthophosphate as PO4 by Colorimetric Measurement v1	SA_PM31	Sample is filtered				
SA_TM20	Modified BS 1377-3: 1990 Gravimetric determination of Total Dissolved Solids	SA_PM31	Sample is filtered	Yes			
SA_TM27	Major ions by Ion Chromatography	SA_PM0	No preparation is required.	Yes			
SA_TM28	Determination of Electrical Conductivity with hand held manual conductivity probe.	SA_PM0	No preparation is required.	Yes			

EMT Job No: 22/556

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM32	Determination of Alkalinity by titration of the sample with a standard solution of acid by visual detection of end points.	SA_PM0	No preparation is required.	Yes			
SA_TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12, MTBE and BTEX by headspace GC-FID.	SA_PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
SA_TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	SA_PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
SA_TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID. Including determination of BTEX and calculation of Aliphatic fractions	SA_PM12/PM16/PM30	please refer to SA_PM16/PM30 and SA_PM12 for method details				
UK_TM170	Determination of Trace Metal elements by ICP-MS (Inductively Coupled Plasma - Mass Spectrometry) modified USEPA 200.8/6020A and BS EN ISO 17294-2 2016	UK_PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
UK_TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	UK_PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
UK_TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	UK_PM0	No preparation is required.				
UK_TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	UK_PM0	No preparation is required.				

APPENDIX

E-14 *GEOTECHNICAL DESKTOP STUDY*

Eskom	Standard	Technology

Title: **GEOTECHNICAL DESKTOP STUDY REPORT FOR KOMATI POWERSTATION**

Unique Identifier:	**GxKomatiPS-DS1**
Alternative Reference Number:	**n/a**
Area of Applicability:	**Engineering**
Documentation Type:	**Standard**
Revision:	**1.0**
Total Pages:	**9**
Next Review Date:	**N/A**
Disclosure Classification:	**Controlled Disclosure**

Compiled by	**Checked by**	**Approved by**
Nkosazana Leseka Pr.Sci.Nat	**Sithembiso Mabena**	**Andile Maneli**
Senior Geologist Substation Engineering	**Civil Engineer Substation Engineering**	**Middle Manager Substation Engineering**
Date: 11/07/2022	Date: 11/07/2022	Date: 11 - 07 - 2022

PCM Reference: **240-53459042**

SCOT Study Committee Number/Name: Click here to enter text.

Content

Figures

1. Introduction

A desktop study is required as a pre-feasibility investigation, so that the consultant/contractors appointed to carry out a geotechnical investigation may efficiently choose suitable sites for a preliminary geotechnical investigation. It is also used to plan and develop the necessary investigation methods required to obtain parameters that can be used to choose a final site to be developed and also during the design and construction phase of a Substation related project.

Eskom supports a diversified and balanced energy mix, with renewables forming an integral part of this diversified energy mix. Eskom therefore aspires to expand its renewables portfolio through Battery storage, Wind turbines and PV systems at Eskom owned power stations and selected greenfield sites.

The proposed Solar PV plant, Battery Storages and Wind turbines for Komati Power Station is located within the boundary of Eskom-owned land. The area is in Mpumalanga province between Middleburg and Bethal. The area is 1623 m above the sea level. Suitable areas for renewable energy project was identified considering the wetlands, ash dams, existing underground and above ground services (electrical cables and overhead lines). The site is generally flat and partially identified as suitable for the installation of a Solar PV plants, Battery storages and Wind turbines.

2. Supporting clauses

2.1 Scope

The desktop study covers a short description of the site, its topographical features, vegetation that is on the site, Climate considerations in relation to the Weinert N-value, seismic assessment of the site, geological information and geotechnical constraints on the proposed site. The information can be obtained from perusal of available maps, relevant literature and information obtained from site walkover surveys.

2.1.1 Purpose

The purpose of this document is to record all necessary and required information used to choose a suitable site/s and plan a geotechnical investigation efficiently for Substation development related projects.

2.1.2 Applicability

This document shall apply to the Substation Engineering Department in Transmission Technology.

2.2 Normative/informative references

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

[2] TMH1:1979. Standard methods of testing road construction materials.

[3] SAICE Site Investigation Code of Practice

[4] SAICE Code of practice for the safety of persons working in small diameter Shafts and test pits for Civil Engineering Purposes.

[5] SAIEG Guidelines for Soils and Rock profiling in South Africa.

[6] SANS 1936 Part 1 – 5. Development on Dolomite Land.

[7] SANS 10160: Basis of structural design and actions for buildings; Part 5: Basis for geotechnical design and actions.

[8] SANS 10160-4:2011: Seismic actions and general requirements for buildings

2.2.2 Informative

[1] Brink A.B.A. (1979) Engineering Geology of Southern Africa. Volume 1 – 4. Building Publications, Pretoria.

[2] 1:250 000 Geological Series 2628 EAST RAND Map

2.3 Definitions

2.3.1 General

Definition	Description
Weinert N-value	Climatic descriptor with respect to the weatherability of rocks

2.3.2 Disclosure classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
SANS	South African National Standards
SAICE	South African Institution of Civil Engineering

2.5 Roles and responsibilities

The appointed Technician/Technologist/Engineer shall ensure that this document is compiled using the standards noted in this document or any other approved appropriate form of literature and shall also ensure that the document is issued with all required associated documentation.

2.6 Process for monitoring

Not applicable.

2.7 Related/supporting documents

Not applicable.

3. Geotechnical Investigation Desktop Study Information

3.1 INTRODUCTION

The main aim of the investigation is to conduct a desk study for the proposed site to evaluate if the site is suitable for a proposed substation development.

For the evaluation of the proposed site during the desk study, factors such as the geology, vegetation, topography and drainage were considered. Information collected during this investigation is suitable for the site selection and verification purposes, once the final design is required, a detailed geotechnical investigation will be required to provide design parameters and confirm findings of this investigation.

3.1.1 Proposed Development

The proposed Solar PV plant, Battery Storages and Wind turbines for Komati Power Station is located within the boundary of Eskom-owned land. The area is in Mpumalanga province between Middleburg and Bethal. The area is 1623m above the sea level. Suitable areas for renewable energy project were identified considering the wetlands, ash dams, existing underground and above ground services (electrical cables and overhead lines). The site is generally flat and partially identified as suitable for the installation of a Solar PV plants, Battery storages and Wind turbines.

The proposed development would include the installation of the following equipments:

- Solar PV plants
- Battery Storages
- Wind Turbines
- Power Transformers.
- High Voltage Switchgear.
- Low Voltage switchgear.
- Instrument Transformers
- Surge Arrestors
- Control Building and ancillary buildings
- Platforms
- Steel Structures and foundations
- Access roads

3.1.2 Objective of the Investigation

The primary objective of this investigation is to conduct intensive desk study of the proposed site selected to determine if it is suitable for the proposed green energy initiative.

3.1.3 Method of Investigation

The desk study includes perusal of available information, such as Aerial photographs, Topographical maps, Geological maps and review of available geotechnical reports in the surrounds of the proposed site.

3.2 SITE DESCRIPTION

3.2.1 LOCATION

Komati power station is situated in Mpumalanga halfway between Middelburg and Bethe, corner of R35 and R542.

Site	Latitude (S)	Longitude (E)	Comments
Proposed Site	26°05'26.4"	29°28'18.0"	N/A

Figure 1: Insert satellite image figure for Komati Power Station area for Geotechnical Investigation

3.2.2 VEGETATION

There is farming vegetation on the proposed site. The vegetation on the selected site would have to be cleared during construction for the proposed development. Tree cutting to be conducted in accordance with environmental regulations and relevant authorities should be consulted.

3.2.3 CLIMATE

According to the Engineering Geology of Southern Africa, Volume 1, the proposed site is in the climate zone which is referred to as “Sub-humid moist zone”. In this zone the soil are potentially highly compressible.

The “Weinert N-Value” that describes the climatic environment of the area is less than 5. Where “N” is less than “5”, chemical decomposition is predominant.

In this study area, rocks anticipated to be particularly deeply weathered, often to depth of several tens of meters, and decomposition is pronounced.

3.2.4 SEISMICITY

The SANS code (Seismic actions and general requirements for buildings) SANS 10160-4:2011, shows that the site is situated in the area where the peak ground acceleration has a probability of being exceeded in 50 year period is 0.1g.

Figure 2 also shows the zone (zone 1) where compliance with the minimum requirements is specified by the code. Zone 1 is defined as “Regions of natural seismic activity”.

A more recent data produced by the Council of Geoscience is presented in Figure 3, showing peak ground acceleration with a 10% probability of being exceeded in 50 years. On this figure, the five sites are classified with ground acceleration of 0.1g (98cm/sec^2)

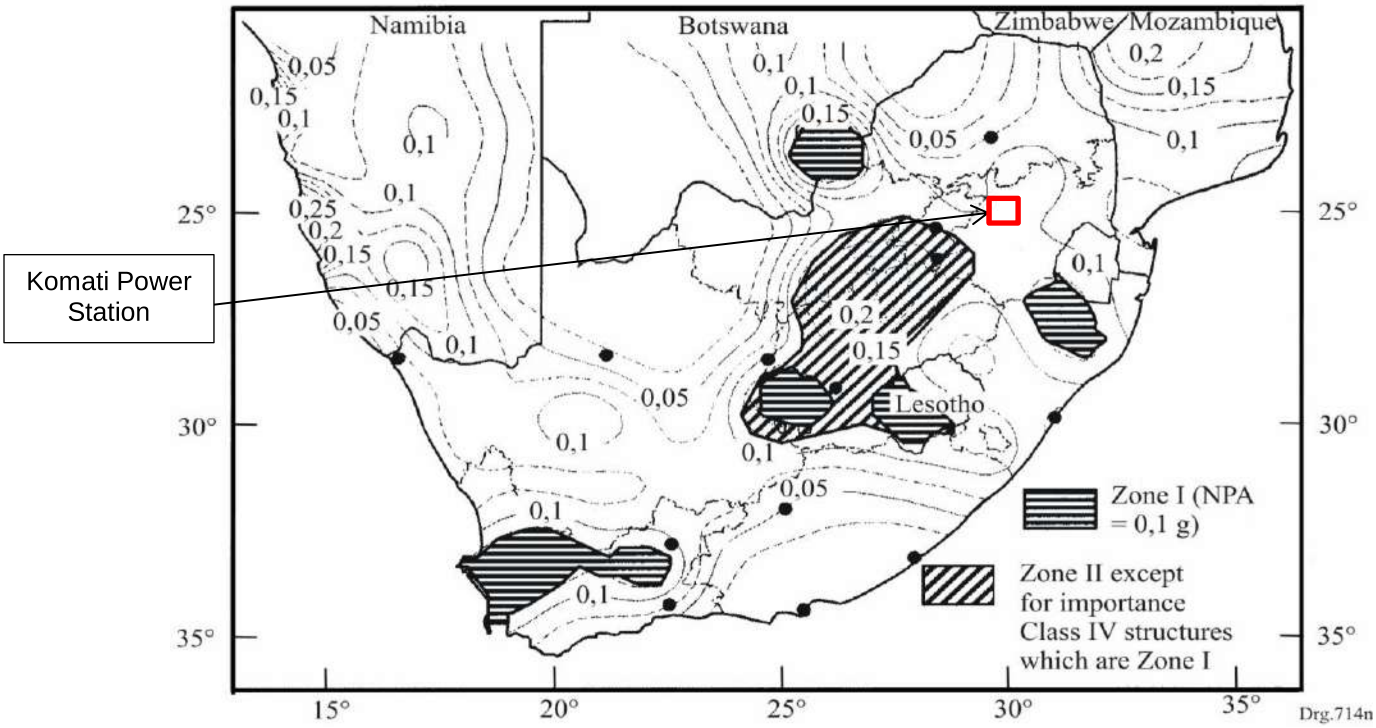

Figure 2: Seismic Hazard map and Zones [1]

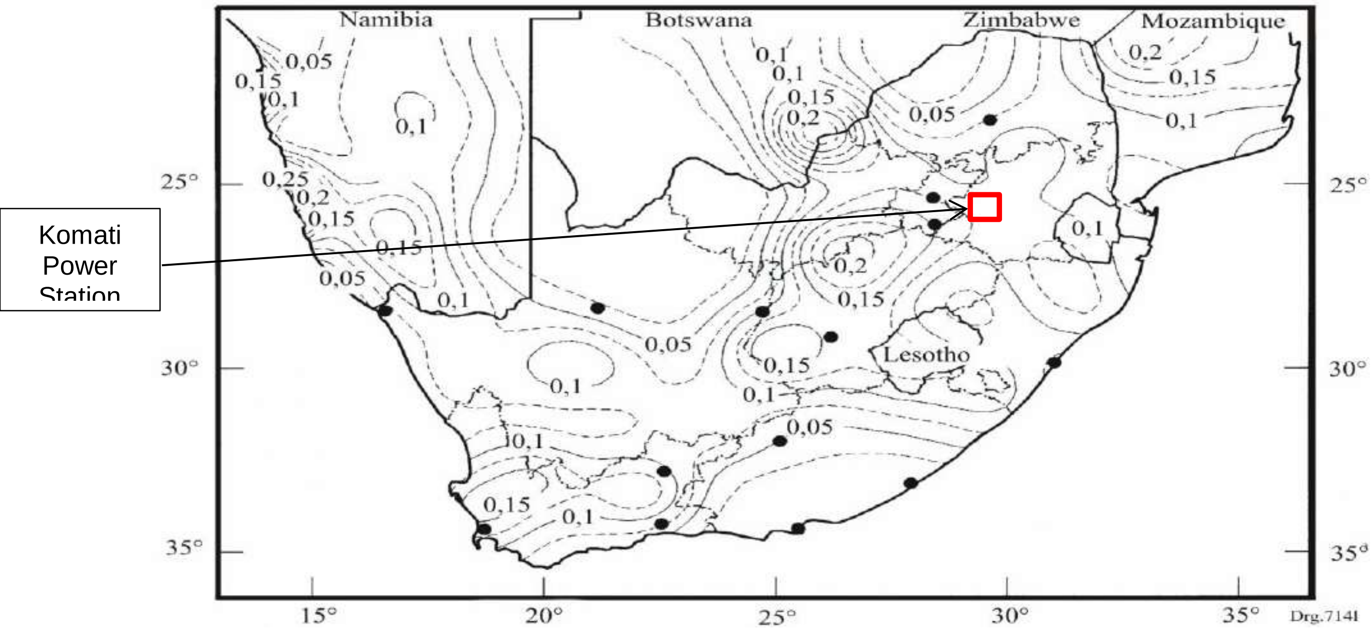

Figure 3: A recent seismic hazard map (2003) obtained from the Council for Geoscience [1]

3.3 REGIONAL GEOLOGY AND GROUND WATER

3.3.1 GEOLOGY

According to the geological map, 1:250 000 Geological Series 2628 EAST RAND map the regional geology of the site comprises of Sandstone, Shale and Coal Beds (**Pv**), the site may have pockets of Dolerite dykes and sills(Jd) from the Vryheid Formation, from the Ecca Group of the Karoo Sequence, as shown in Figure 4 below.

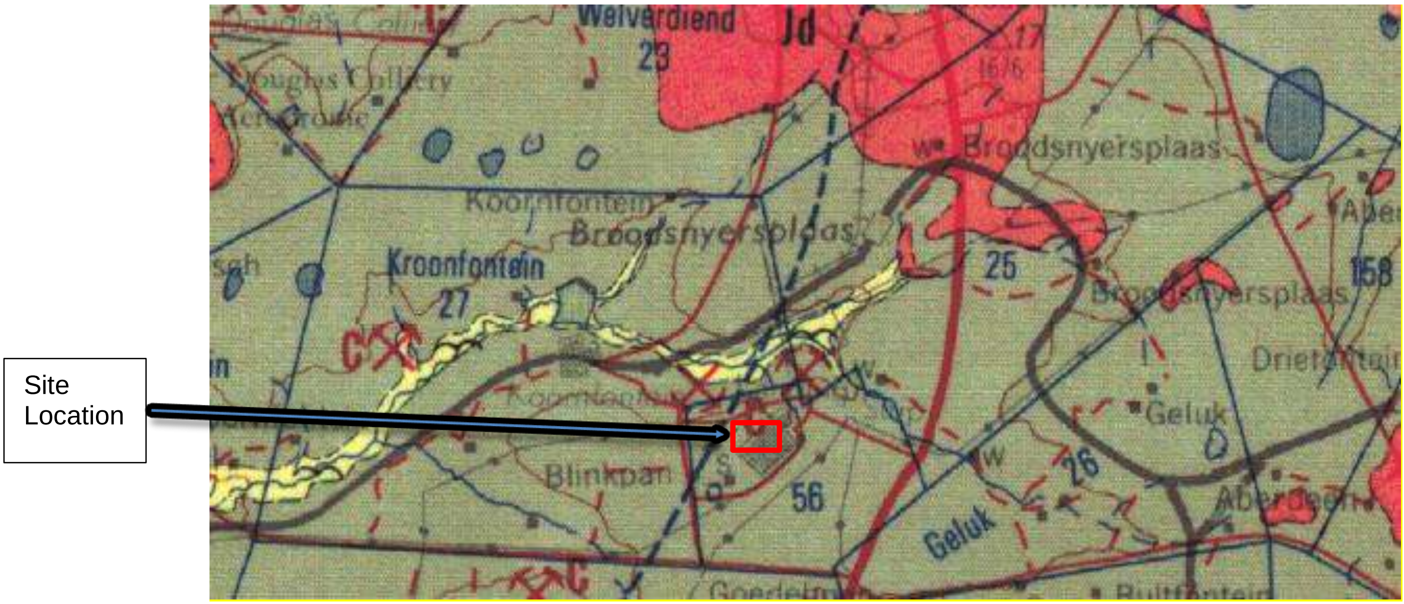

Figure 4: The Regional Geology of Komati Power Station

3.3.2 GROUNDWATER

There is a perennial river above the site and pockets of perennial pans running across or around the site, thus a shallow water table to be expected at some areas of the site. The depth of the water level can be confirmed during a detailed geotechnical investigation phase.

3.4 GEOTECHNICAL PROPERTIES INFLUENCING THE DEVELOPMENT

3.4.1 SOIL PROPERTIES

The area predominantly consists of sandstone, shale and coal beds, sedimentary rock origin. Sandstone can be hard and form a strong hanging wall however in the presence of intercalation with mudrock, it could result in slope stability issues and rock falls in cases when the mudrock disintegrates or slake resulting in the exposure of the sandstone layers. Sandstone intercalating with siltstone in the Vryheid Formation are notorious for porewater pressures in the interfaces, which may result in sliding of the rock.

The engineering properties of coal are not significant in conventional civil engineering applications of engineering geology. It is however important to assess the stability of underground workings and rehabilitation of the area. It is imperative to know the underground mining methods/quality of work or planned mining methods in areas deemed for surface development to not compromise the surface structures during pillar extractions with controlled goafing of the strata, in board and pillars mining method, for example. It is also important to know the rehabilitation strategy once the Life of Mine (LOM) has been reached, to avoid underground fires, which will result in surface subsidences, dolines and sinkholes which are prominent in the Mpumalanga area, a danger for surface developments.

Dolerite, a basic igneous rock origin, which often results in onion skin weathering. This makes the area susceptible to producing problematic soils such as Clay (turf); silty clay changing to sandy clay with depth; corestones; gravel, cobbles and boulders. The engineering impacts associated with these weathered material are expansive clays; low shear strength semi- to impervious soils; poor compaction and workability; unstable slopes and uneven bedrock surface.

3.4.2 EXISTING STRUCTURES NEARBY SITE

The site has various development such as underground mining nearby, surface mining, towns, powerlines, HV yard and a power station undergoing decommissioning, pipe lines, coal stockyard, ashdams and roads.

3.5 CONCLUSION AND RECOMMENDATIONS

Based on the above, it is recommended a feasibility geotechnical study to be conducted before any developments.

4. AUTHORIZATION

This document has been seen and accepted by:

Name and surname	**Designation**
Sithembiso Mabena	Civil Engineer Substation Engineering
Nkosazana Leseka	Senior Geologist Substation Engineering
Andile Maneli	Middle Manager Substation Engineering