





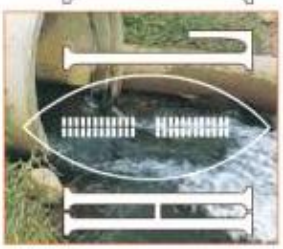
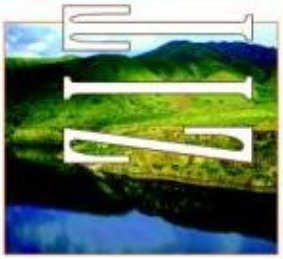

Zitholele Consulting
Reg. No. 2000/000392/07

PO Box 6002 Halfway House 1685
South Africa
Thandanani Park, Matuka Close
Halfway Gardens, Midrand
Tel + (27) 11 207 2060
Fax + (27) 86 674 6121

E-mail : mail@zitholele.co.za

Camden Power Station Ash Disposal Facility Project

FINAL REPORT FOR STAKEHOLDER REVIEW

Proponent:

Eskom Holdings SOC Limited
Megawatt Park
Maxwell Drive, Sunninghill

DEA Reference Number: 12/12/20/2300

November 2014

Zitholele Project No: 12670

FINAL ENVIRONMENTAL IMPACT REPORT

PURPOSE OF THIS DOCUMENT

Eskom is currently operating Camden Power Station as part of its electricity generation fleet. Throughout the operational life of the station, ash is generated at the station. This ash is being disposed of in an existing ash disposal facility within the Camden Power Station premises. The current ash disposal facilities have been providing disposal services since the establishment of the station (~47 years), and are reaching the end of their capacity. It has been established that a new ash disposal facility will be required to accommodate the remaining 17 years of operational life remaining.

To continue the practice of environmentally responsible ash disposal, this Environmental Impact Assessment (EIA) process is being undertaken, with the purpose of identifying, assessing, planning, and licensing the new ash disposal facility and its ancillary infrastructure. In order to comply with the necessary legal requirements of the National Environmental Management Waste Act (No 59 of 2008[NEM:WA]), the new ash disposal facility and associated structures must be appropriately designed and licensed, as ash disposal is a listed waste disposal activity. An integrated Environmental Impact Assessment (EIA) and Waste Management License Application process is being undertaken in line with the requirements of the EIA regulations promulgated under the National Environmental Management Act (No 107 of 1998 [NEMA]).

Eskom Holdings SOC Limited appointed Zitholele Consulting (Pty) Ltd, an independent environmental company, to conduct the EIA process required, to evaluate the potential environmental and social impacts of the proposed project, and undertake the necessary waste licensing processes. The Environmental Assessment Practitioner (EAP) is Ms Sharon Meyer Douglas of Zitholele Consulting.

According to the EIA Regulations, Interested and Affected Parties (I&APs) must have the opportunity to comment on the proposed project, and verify that all the issues raised to date have been recorded and addressed. To date this has been achieved through the public participation process (PPP) undertaken throughout the Scoping phase. The PPP included initial public notification, and a Draft Scoping Report (DSR) including comments from all stakeholders received during the announcement phase of the project was developed, and was available for comment for the period 18 July 2011 to 22 August 2011. Comments received were used to produce the Final Scoping Report, which was submitted to the Competent Authority (CA), the Department of Environmental Affairs (DEA) for review and acceptance. The CA issued an acceptance letter for the FSR on the 13 June 2011, and specialist studies were then commenced.

Thereafter the specialist studies were undertaken and the Draft Environmental Impact Report (Draft EIR) was compiled and made available for stakeholder review and comment during the period **14 March to 24 April 2013**. Comments received as well as changes to the project are addressed in the Revised DEIR. The Revised DEIR was made available for a period of 40 days from the **29 September to 10 November 2014** to allow all parties to review the updated document. All changes and amendments to the document are reflected in this report as follows:

Additions in the text are reflected as underlined text.

For the sake of readability where drawings have been updated or replaced only the new drawings are shown.

Your comments on this FEIR should be sent directly to the DEA.

Summary of what the Final EIR Contains

(adapted from the EIA Regulations [2010])

- All of the information necessary for the authority to make a decision;
- Details of the Environmental Assessment Practitioner, and his expertise to carry out the EIA;
- A detailed description of the proposed activities;
- A description of the location and property on which the development is proposed;
- A description of the receiving environment that may be affected by the activity, including the manner in which it will be affected (physical , biological, social, economic, cultural aspects);
- Details of the Public Participation Process;
- A Description of the need and desirability of the proposed activity;
- A description of the identified potential alternatives to the proposed activity;
- An indication of the impact assessment methodology;
- A description and comparative assessment of all alternatives;
- A summary of specialist findings and recommendations;
- A description of all environmental issues that were identified and an assessment of the significance of each issue;
- An assessment of each identified potentially significant impact;
- A description of any assumptions, uncertainties, and gaps in knowledge;
- A reasoned opinion as to whether the activity should or should not be authorised;
- An environmental impact statement; and
- A draft Environmental Management Programme;
- Copies of any specialist studies must be attached; and
- Specific information required by authorities.

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ABBREVIATIONS

ARL..... Acceptable Risk Levels
ARLP……Acid Rain Leach Procedure
CA.....Competent Authority
CAR ..... Co-ordinated Avifaunal Road count project
CO_2.....Carbon Dioxide
DMR ..... Department of Mineral Resources
DEA ..... Department of Environmental Affairs
DEMIN Demineralisation
DWS .....Department of Water and Sanitation
DWEA..... Department of Water and Environmental Affairs (Ministry)
DI Deionised
EAP ..... Environmental Assessment Practitioner
ECA ..... Environment Conservation Act
EIA.....Environmental Impact Assessment
EIR..... Environmental Impact Report
GCL .....Geo-Synthetic Clay Liner
GIS ..... Geographic Information System
GNR.....Government Notice Regulation
HDPE.....High Density Polyethylene
HDI .....Historically Disadvantaged Individuals
I&APs.....Interested and Affected Parties
IEA.....Integrated Environmental Authorisation
IEM .....Integrated Environmental Management
IEP.....Integrated Energy Plan
ISEP ..... Integrated Strategic Electricity Planning
kV ..... Kilo Volts
LC ……Leach concentration in mg/ℓ
LCT.....Leach Concentration Thresholds
MVA.....Mega Volt Ampere
NEMA .....National Environmental Management Act
NEM:WA.....National Environmental Management: Waste Act
NERSA ..... National Energy Regulator of South Africa
NIRP ..... National Integrated Resource Plan
QDGC.....Quarter-Degree Grid Cell
RO ..... Reverse Osmosis

SABAP1.....Southern African Bird Atlas Project 1
SABAP2.....Southern African Bird Atlas Project 2
SAR .....South African Railways
SIA.....Social Impact Assessment
SO_2 ..... Sulphur Dioxide
SR.....Scoping Report
TC..... Total Concentration
TCT……Total concentration threshold
ToR.....Terms of Reference
WMCO.....Waste Management Control Officer
WMLA..... Waste Management License Application
XRD……..x-ray diffraction

1 INTRODUCTION

1.1 WHO IS THE PROPONENT?

Eskom Holdings SOC (Ltd) is the main South African utility that generates, transmits and distributes electricity. Eskom supplies ~95% of the country's electricity, and ~60% of the total electricity consumed on the African continent. Eskom plays a major role in accelerating growth in the South African economy by providing a high-quality and reliable supply of electricity.

1.2 CAMDEN POWER STATION ASH DISPOSAL FACILITY PROJECT

Eskom is currently operating Camden Power Station as part of its electricity generation fleet. The first of eight units of the Camden Power Station was commissioned in 1967. Half of the station was mothballed in 1988 with the rest of the station following suit in 1990. A decision was however made in 2003 to re-commission the Camden Power Station. Throughout the operational life of the station, ash is generated. This ash is being disposed of in an existing ash disposal facility within the Camden Power Station premises.

The current ash disposal facilities have been providing disposal services for the last 47 years. The increasing national demand for electricity necessitated the re-commissioning of the Camden Power Station in 2005. The re-commissioning of the Camden Power Station allowed for the capatalisation of the production capacity of the power station, thereby contributing to meeting the increased electricity demand. The remaining capacity of the existing Ash Disposal Facility is however not adequate to cater for the remaining extended operational life of the Camden Power Station. It is anticipated that the remaining capacity of the existing Ash Disposal Facility allows for ashing to continue until January 2017, after which an additional ADF will be required.

In order to establish a new ash disposal site within close proximity to the power station property and the current ashing site, a site selection exercise was undertaken in line with the Minimum Requirements for the Disposal of Waste by Landfill (both the 2nd Edition (1998) [1] and the Draft 3rd edition (2005)[2] were taken into account during the identification of the most feasible site alternatives, and design of the facility). Potential locations for the new Ash Disposal Facility were identified using the following criteria:

- Ability to link into existing ash disposal facilities;

[1] Department of Water Affairs & Forestry (DWAF), (1998) *Waste Management Series. Minimum Requirements for Waste Disposal by Landfill,* 2nd Ed, Government Printer, Pretoria.
[2] DWAF, (2005) *Waste Management Series. Minimum Requirements for Waste Disposal by Landfill,* Draft 3rd Ed, Government Printer, Pretoria

- Must be within a 10 km radius from the existing disposal site and its associated facilities; and
- Must have a minimum footprint area of 120 hectares.

The new ash disposal facility will need to cater for an estimated 25 million m^3 of ash up to 2033. It is anticipated that additional structures/ancillary infrastructure will include *inter alia* Ash Water Return Dams (AWRD) and channels, pipelines, roads and fences.

1.3 PROJECT LOCATION

The proposed project area is located adjacent to the Camden Power Station which is approximately 15km South East of the town of Ermelo in the Mpumalanga Province. The area is within the boundaries of the Msukaligwa Local Municipality in the Gert Sibande District Municipality, refer to the project locality map shown in Figure 1-1.

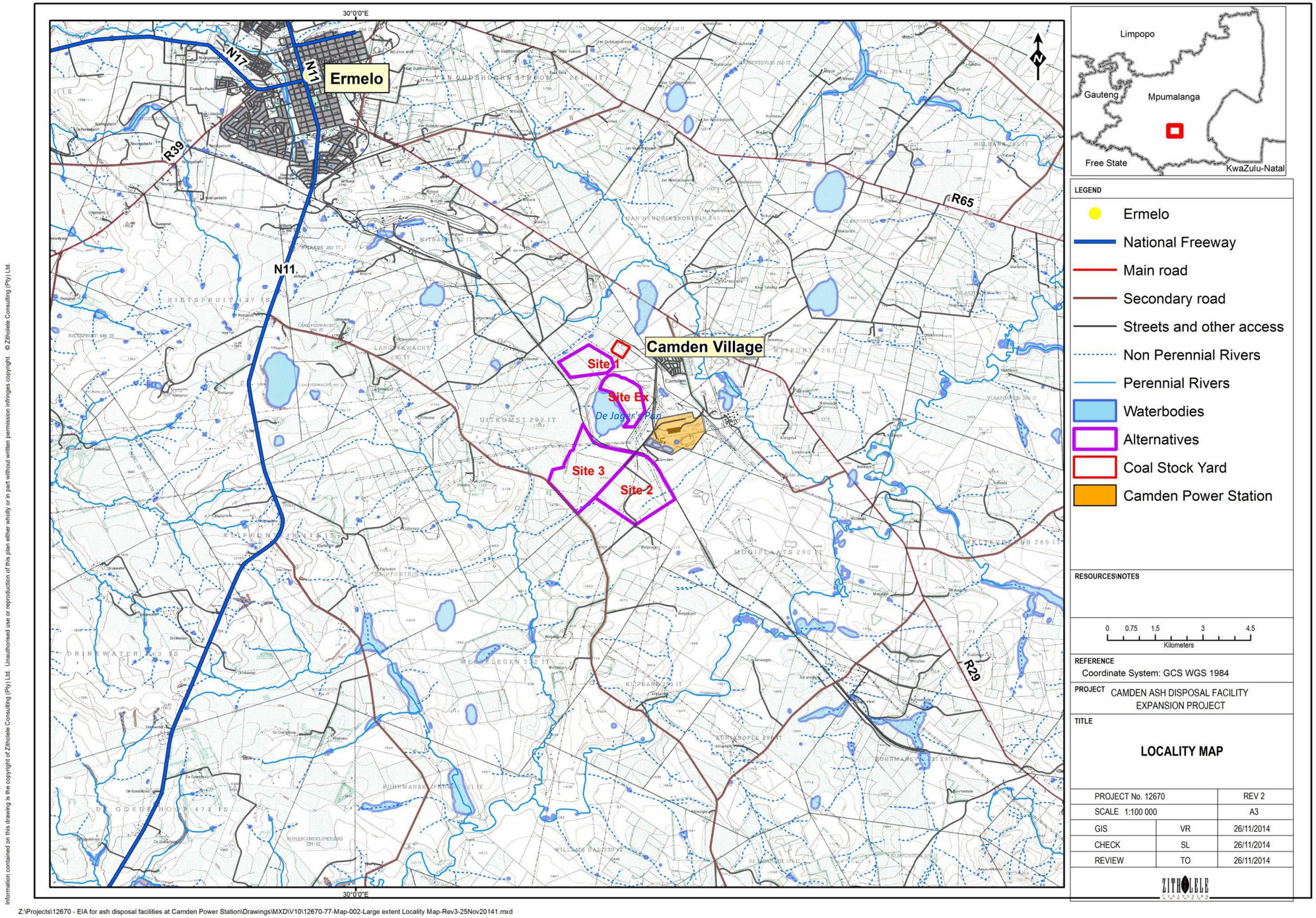

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Figure 1-1: Location of the Camden Ash Disposal Facility Project

1.4 AUTHORISATION PROCESS PROGRESS

The proposed Camden Ash Facility Expansion project triggers listed activities in terms of the National Environmental Management Act ([NEMA] No 107 of 1998) and the National Environmental Management Waste Act ([NEM:WA] Act No 59 of 2008). In terms of these Acts a Waste Management License (WML) and Environmental Authorisation (EA) are required prior to the commencement of construction and operation. In order to obtain these authorisations an Integrated Environmental Impact Assessment (EIA) process must be undertaken. In terms of the aforementioned legislation and associated regulations, Eskom needs to apply to the Department of Environmental Affairs (DEA) for an integrated WML and EA.

The EIA process for this project is divided into four main phases: (1) Scoping; (2) Impact Assessment; (3) Environmental Impact Reporting; and (4) Decision-making.

(1) The Scoping Phase of this project was completed, which included the following:

- Pre-application consultation with relevant stakeholders and authorities;
- Completion and submission of the relevant EIA Application documentation;
- Placement of advertisements;
- Compilation and distribution of a Background Information Document;
- Site selection process
- Hosting public meetings, and allowing public participation;
- Compilation of a Draft Scoping Report; and
- Compilation, submission and acceptance of the Final Scoping Report and Plan of Study for EIA.

(2) The Impact Assessment Phase of the project has also been completed, and consisted of the following:

- Specialist Studies;
- Comparative Impact Assessment of Feasible Alternatives; and
- Conceptual Engineering / Conceptual Project Design.

(3) The project is currently in the Environmental Impact Reporting Phase, which consists of the following:

- Compilation of a Final Environmental Impact Report (EIR) and Final Environmental Management Programme (Draft EMPr);

- Compilation of the waste application supporting documentation;
- Public participation process; and
- Finalisation, submission, and decision-making of the Final EIR and EMP.

(4) The next step in the process will be the Decision-making Phase, and will consist of the following:

- Authority and stakeholder review of the Final EIR and EMPr;
- Issuing of a decision on the finally submitted documentation;
- Notification of I&APs about authority decision; and
- An appeal phase will be allowed to all Interested and Affected Parties (I&APs) to appeal the decision.

1.5 CONTEXT OF THIS REPORT

This report is the Final Environmental Impact Report (Final EIR), a key component of the integrated WML and EA process for the proposed Camden Power Station Ash Disposal Facility Project.

This report addresses the requirements for the Impact Assessment Phase for the EIA as outlined in the NEMA regulations. The aim of this Draft EIR is to:

- Provide information to the authorities as well as Interested and Affected Parties (I&APs) on the proposed project; including details on the:
  - Alternatives that are being considered;
  - Receiving environment; and
  - Assessing and ranking methodology;
- Indicate how I&APs have been, and are still being, afforded the opportunity to contribute to the project, verify that the issues they raised to date have been considered, and comment on the findings of the impact assessments;
- Provide proposed mitigation measures in order to minimise negative impacts and enhance positive impacts; and
- Present the findings of the Impact Assessment Phase in a manner that facilitates decision-making by the relevant authorities.

1.6 ENVIRONMENTAL IMPACT ASSESSMENT PRACTITIONER (EAP) DETAILS

In terms of the NEMA and associated Environmental Impact Assessment (EIA) Regulations (2010), the proponent must appoint an Environmental Assessment Practitioner (EAP) to undertake the environmental assessment of an activity regulated in terms of the aforementioned Act.

In this regard, Eskom appointed Zitholele Consulting to undertake the EIA for the proposed Camden Power Station Ash Disposal Facility Project, in accordance with the EIA Regulations promulgated and amended in June 2010 in terms of the NEMA. This process also complies with the NEM:WA requirements for licensing of waste disposal facilities as the proposed activity is listed in the waste regulations (GNR 921 Category B of November 2013). Since the compilation of the initial draft Environmental Impact Report (EIR), a number of Listed Activities and Waste Management Activities have been identified based on further project panning. Taking the aforementioned into accound an updated Application Form for Integrated Environmental Authorisation and Waste Management License has been included In Appendix B of this Final Environmental Impact Report. Listed Activities and Waste Management Activities which are no longer triggered by the proposed project activities have been removed from the Application Form For Integrated Environmental Authorisation and Waste Management License.

Zitholele Consulting is an empowerment company formed to provide specialist consulting services primarily to the public sector in the fields of Water Engineering, Integrated Water Resource Management, Environmental and Waste Services, Communication (public participation and awareness creation) and Livelihoods and Economic Development.

Zitholele Consulting has no vested interest in the proposed project and hereby declares its independence as required by the EIA Regulations. The details of the EAP representatives are listed below, refer to Appendix A for a copy of their *curricula vitae*.

Sharon Meyer Douglas, MSc. Biological Control / Env Education, Zoology, 2007 University of the Witwatersrand

Name:	Sharon Meyer Douglas
Company Represented:	Zitholele Consulting (Pty) Ltd.
Address:	P O Box 6002, Halfway House, 1685
Telephone:	011 207 2073
Fax:	086 676 9950
E-mail:	sharonm@zitholele.co.za

Sharon Meyer Douglas–is the designated Project Director on behalf of Zitholele. Sharon Meyer Douglas has ensured regulatory compliance, quality assurance and overseeing the Technical Environmental Team. Sharon has 13 years experience in the environmental consulting field, managing environmental authorisation and licensing processes throughout a

range of industries; including power supply, mining operations, foundries, and property developments. She is ideally skilled and experienced to manage this project to its conclusion.

Tania Oosthuizen, Masters Environmental Management, 2009 North West University

Name:	Tania Oosthuizen
Company Represented:	Zitholele Consulting (Pty) Ltd.
Address:	P O Box 6002, Halfway House, 1685
Telephone:	011 088 8462
Fax:	086 676 9950
E-mail:	taniao@zitholele.co.za

Tania Oosthuizen is the Project Manager on behalf of Zitholele. Tania Oosthuizen has worked on the project deliverables and have run the day to day liason and integration with the project team. Tania has 11 years experience in the environmental consulting field, and is certified as an Environmental Assessment Practitioner.

2 LEGAL REQUIREMENTS

Environmental legislation in South Africa was promulgated with the aim of, at the very least, minimising and, at the most, preventing environmental degradation. The Acts and Regulations applicable to the proposed Camden Power Station Ash Disposal Facility Project are summarised in Table 2-1. A discussion of the most relevant legislation is given in the sections that follow.

Table 2-1: Summary of relevant legislation

Legislation	Sections	Relates to
The Constitution Act (No 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property
	Section 27	Health care, food, water and social security
	Section 32	Administrative justice
	Section 33	Access to information
National Environmental Management Act (No 107 of 1998) as amended	Section 2	Defines the strategic environmental management goals, principles and objectives of the government. Applies throughout the Republic to the actions of all organs of state that may significantly affect the environment
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care
National Environmental Management: Waste Act (No 59 of 2008) as amended	Section 43 (1) (A & C)	The minister is the licensing authority/Competent Authority (CA) because the ash is deemed to be waste, and the applicant is a State Owned Company.
	Section 44	This section outlines the requirement for government to consider applications in an integrated manner, and provides for co-operative decision-making wherever possible.
	Section 45	Application must be made to the CA, and may require an application processing fee.
	Section 46	An independent person must be appointed to manage the WML application procedure.
	Section 47	The licensing authority may require additional information in addition to that which is submitted for decision-making purposes. The applicant is allowed to make representation on any adverse statements or objections. Public participation is required to ensure that all parties are able to raise issues and concerns. At a minimum notices are required in 2 newspapers, and must describe the nature of the waste license sought and the activity, where additional information can be obtained, and provide a reasonable time in which to respond.
	Section 48	The licensing authority is obliged to consider the following when making a decision on the WML application: • The need and desireability of the WML activity; • Alternatives that have been considered; • The pollution that will be caused to the environment by the WML activity (including health, social

Legislation	Sections	Relates to
		conditions, economic conditions, and cultural conditions); • Best practicable environmental options to prevent, control, and mitigate pollution and protect the environment; • Increased environmental and health risks associated with the WML activity; • Any reasons for the decisions in terms of Section 24 of NEMA; • Whether the applicant is a fit and proper person as outlined in Section 59; • The applicants submission; • Any submissions received from organs of state, interested persons and the public; • Any guidelines that the authority may wish to issue relevant to the application.
	Section 49	The WML Authority may grant, refuse or reject an application. If granted, concurrence must be received from the Minister of Water Affairs. Any decision to grant a license must be consistent with: • this Act, • any relevant and applicable environmental management policies; • national environmental management principals; • applicable industry waste management plans; • the objectives any applicable waste management plans; and • any standards or requirements set out by this Act. This section of the NEML:WA further stipulates that decisions reached must be notified to the applicant, and thereafter to any persons who may be involved / interested in the WML application. Rejected / refused applications can be amended and resubmitted, and furthermore if additional material information becomes available, a declined application may be resubmitted for decision making.
	Section 50	This section of the Act deals with the issuing of WML, and in summary stipulates that conditions and requirements for a WML may be issued as specified by Section 51, as the licensing authority may deem fit, or as the Minister may prescribe. The licensing authority may issue a single license, even where multiple waste management activities have been applied for to be undertaken at one location. The issuing of WML is subject to the including of any conditions as outlined in a Record of Decision from the Minster of Water Affairs.
	Section 51	Outlines the content of a WML.

Legislation	Sections	Relates to
	Section 59	This section outlines the conditions an authority must consider about the applicant to deem if they are fit to receive a license. Such factors as legal contraventions to waste related legislation, whether the applicant has had other licenses or EA's revoked, whether the person has been part of senior management for companies that have been legally non-compliant, whether the person can comply with the NEM:WA, and whether technically competent people will manage the WML if issued.
NEM: Protected Areas Act (No 57 of 2003)	The Act came into operation on 01 November 2004. The aim of the Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes and seascapes. In 2004, the National Environmental Management: Protected Areas Amendment Act 31 of 2004 was promulgated to amend Act 57 of 2003 with regard to the application of that Act to national parks and marine protected areas. The NEM: Protected Areas Amendment Act was published for public information on 11 February 2005 and came into operation on 01 November 2005. The NEM: Protected Areas Act, as amended by the NEM: Protected Areas Act 31 of 2004 repeals sections 16, 17 & 18 of the ECA as well as the National Parks Act with the exception of section 2(1) and Schedule 1.	
The Conservation of Agricultural Resources Act (No 43 of 1983) and regulations	Section 6	Implementation of control measures for alien and invasive plant species
National Heritage Resources Act (No 25 of 1999)	Section 34	No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.
	Section 35	No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
	Section 38	This section provides for Heritage Impact Assessments (HIAs), which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities must be notified of a proposed project and must be consulted during the HIA process. The Heritage Impact Assessment (HIA) will be approved by the authorising body of the provincial directorate of environmental affairs, which is required to take the provincial heritage resources authorities' comments into account prior to making a decision on the HIA.

Legislation	Sections	Relates to
Atmospheric Pollution Prevention Act (No 45 of 1964) and regulations	Sections 27 – 35	Dust control
Atmospheric Pollution Prevention Act (No 45 of 1964) and regulations	Section 36 -40	Air pollution by fumes emitted by vehicles
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of Noise
	Section 35	Control of offensive odours
Occupational Health and Safety Act (No 85 of 1993) and regulations	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA),	Strategy for achieving the objectives of the United Nation's Convention on Biological Diversity, to which South Africa is a signatory	
	Sections 65-69	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
National Forests Act (No 84 of 1998) and regulations	Section 7	No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a licence issued under section 7(4) or section 23; or an exemption from the provisions of this subsection published by the Minister in the Gazette.
	Sections 12-16	These sections deal with protected trees, with the Minister having the power to declare a particular tree, a particular group of trees, a particular woodland, or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.
Fencing Act (No 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.
National Water Act (No 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution.
	Section 20	Control of emergency incidents

Legislation	Sections	Relates to
	Chapter 4	Use of Water and licensing
Hazardous Substances Act (No 15 of 1973) and regulations	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances	
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947) and regulations	Sections 3 to 10	Control of the use of registered pesticides, herbicides (weed killers) and fertilisers. Special precautions must be taken to prevent workers from being exposed to chemical substances in this regard.
All relevant Provincial Legislation and Municipal bylaws		

2.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT 108 OF 1996)

Section 24 of the Constitution states that: Everyone has the right

a) to an environment that is not harmful to their health or well-being; and
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-

- prevent pollution and ecological degradation;
- promote conservation; and
- secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development

The current environmental laws in South Africa concentrate on protecting, promoting, and fulfilling the Nation's social, economic and environmental rights; while encouraging public participation, implementing cultural and traditional knowledge and benefiting previously disadvantaged communities.

Section 27 of the Constitution states that:

1. Everyone has the right to have access to
    a) health care services, including reproductive health care;
    b) sufficient food and water; and
    c) social security, including, if they are unable to support themselves and their dependants, appropriate social assistance.
2. The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights.

2.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The EIA for this proposed project is being conducted in terms of the EIA Regulations that were promulgated in terms of Section 24 (5) of the NEMA, as amended. The NEMA can be regarded as the most important piece of general environmental legislation. It provides a framework for environmental law reform and covers three areas, namely:

- Land, planning and development;
- Natural and cultural resources, use and conservation; and
- Pollution control and waste management.

This law is based on the concept of sustainable development. The objective of the NEMA is to provide for co-operative environmental governance through a series of principles relating to:

- The procedures for state decision-making on the environment; and
- The institutions of state which make those decisions.
- The NEMA principles serve as:
  - A general framework for environmental planning;
  - Guidelines according to which the state must exercise its environmental functions; and
  - A guide to the interpretation of NEMA itself and of any other law relating to the environment.

2.2.1 What are the NEMA principles?

Some of the most important principles contained in NEMA are that:

- Environmental management must put people and their needs first;
- Development must be socially, environmentally and economically sustainable;
- There should be equal access to environmental resources, benefits and services to meet basic human needs;
- Government should promote public participation when making decisions about the environment;
- Communities must be given environmental education;
- Workers have the right to refuse to do work that is harmful to their health or to the environment;

- Decisions must be taken in an open and transparent manner and there must be access to information;
- The role of youth and women in environmental management must be recognised;
- The person or company who pollutes the environment must pay to clean it up;
- The environment is held in trust by the state for the benefit of all South Africans; and
- The utmost caution should be used when permission for new developments is granted.

The National Department Environmental Affairs (DEA) is the Competent Authority (CA) responsible for issuing environmental authorisation for the proposed project. The Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) is a key commenting authority along with the Department of Water Affairs (DWA).

2.2.2 Environmental Impact Assessment Regulations: 543-546 as amended in November 2013

Even though the main activity of the proposed ash disposal facilities triggers the NEM: WA, certain proposed activities (see below) are also listed activities in terms of NEMA regulations. These are described below.

In terms of Government Notice (GN) R. 545 of 2010, the following listed activities require that a full EIA be undertaken and are applicable to this proposed project:

Activity 5: The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.

Activity 6: The construction of facilities or infrastructure for the bulk transportation of dangerous goods:

i) in gas form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 700 tons per day;

ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or

iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.

Activity 15: Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, industrial or institutional use where the total area to be transformed is 20 hectares or more;

Activity 19: The construction of a dam where the highest part of the dam wall, as measured from the toe of the wall to the highest part of the wall, is 5 metres or higher, or where the high water mark of the dam covers an area of 10 hectares or more.

Activity 26: The construction of facilities or infrastructure for any process or activity Commencing of an activity, which requires an atmospheric emission license in terms of S21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), except where [Activity 28 in Notice No. R. 544 of 2010 applies] such commencement requires basic assessment in terms of Notice of No. R544 of 2010.

<u>In terms of Government Notice (GN) R. 544 of 2010, the following listed activities require that a Basic Assessment be undertaken for the proposed project (these activities having a lesser impact than those activities requiring an EIA. This will result in one EIA being undertaken for the proposed project):</u>

Activity 9: The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water –

iv) With an internal diameter of 0.36 metres or more; or

v) With a peak throughput of 120 litres per second or more.

Activity 11: The construction of -

i) canals;

ii) channels;

iii) bridges;

iv) dams;

v) weirs;

vi) bulk storm water outlet structures;

vii) marinas;

viii) jetties exceeding 50 m^2 in size;

ix) slipways exceeding 50m^2 in size;

x) buildings exceeding 50m^2 in size;

xi) infrastructure or structures covering 50m^2 or more;

where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

Activity 18: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from:

i) a watercourse;

ii) the sea;

iii) the seashore;

iv) the littoral active zone, an estuary or a distance of 100 metres inland of the highwater mark of the sea or an estuary, whichever distance is the greater

but excluding where such infilling, depositing , dredging, excavation, removal or moving;

a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or

b) occurs behind the development setback line.

Activity 22: The construction of a road outside urban areas:

i) With a reserve wider than 13,5 metres;

ii) Where no reserve exists where the road is wider than 8 metres, or

iii) For which an EA was obtained for the route determination in terms of Activity 5 of GN 387 of 2006 or Activity 18 of GN 545 of 2010.

Activity 28: The expansion of or changes to existing facilities for any process or activity where such expansion or changes to will result in the need for a permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.

Activity 37: The expansion of facilities or infrastructure for the bulk transportation of water, sewage or storm water where –

i) The facility or infrastructure is expanded by more than 1 000 metres in length; or

ii) Where the throughput capacity of the facility or infrastructure will be increased by 10% or more.

Activity 39: The expansion of -

i) canals;

ii) channels;

iii) bridges;

iv) weirs;

v) bulk storm water outlet structures;

vi) marinas;

within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.

Since the project comprises activities that require both Basic Assessment and EIA levels of investigation, all activities were assessed to the detail required for a Scoping and EIA process. Therefore, for the proposed project, a Scoping and EIA had to be undertaken. NEMA provides for a single integrated process for all the listed activities on site.

2.3 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (NEM:WA) (ACT 59 OF 2008)

With the proclamation (July 2009) of the National Environmental Management: Waste Act (NEM: WA) some waste related activities previously listed under the NEMA EIA listings have been repealed and are now listed in the ambit of the NEM:WA. The Minister of Environmental Affairs published Regulation 921 in terms of Section 19 (1) of the NEM: WA in November 2013. These regulations highlight the waste management activities that require waste licensing. The regulations comprise of three Categories, namely Category A, which identifies activities that require a BAR process; Category B, which identifies activities that require a full S&EIR process to be followed; and Category C which enforces the use of the National Norms and Standards for certain facilities. In terms of these regulations the following activities which require a WML are applicable to this project:

Regulation 921 - Category B

Activity 1: The storage of hazardous waste in lagoons excluding the storage of effluent, wastewater or sewage.

Activity 7: The disposal of any quantity of hazardous waste to land.

Activity 10: The construction of a facility for a waste management activity listed in Category B of this schedule (i.e. Shcedule 19(2) ~ GNR 921 (2013)) not in isolation to associated waste management activity.

As described in Regulation 921 *"a person who wishes to commence, undertake or conduct an activity listed under this Category, must conduct an environmental impact assessment process, as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part of a waste management license application"*.

Therefore the proposed infrastructure requires the submission of a WML Application as well as a full Scoping and EIA to the National Department of Environmental Affairs.

2.4 ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act (ECA) is a law that relates specifically to the environment. Although most of this Act has been replaced by the NEMA there are still some important sections that remain in operation. These sections relate to:

- Protected natural environments;
- Special nature reserves;
- Limited development areas; and
- Regulations on noise, vibration and shock.

2.5 THE NATIONAL WATER ACT (NO. 36 OF 1998)

It should be noted upfront that any water uses that may require licensing in terms of the National Water Act ([NWA] No 36 of 1998) are being addressed by Eskom, and do not form part of this application documentation. The consultant has however included, for the sake of completeness, the potential water uses that may be triggered by this project. The power station's Water Use Licence will have to be amended to include the new ash disposal facility.

The list of potential water uses that will require licensing is given in Table 2-2.

Table 2-2: Potential applicable Section 21 Water Use Licenses

Water Use	Description	Potential Section 21 Water Uses
Section 21 (c)	Impeding or diverting the flow of water in a water course.	The following pipelines will extend through a wetland which is situated south-east of the proposed ADF: • **Slurry Pipe Lines:** Eight (8) 350NB steel pipelines will be installed, extending for a distance of 3km from the existing ash sumps to the proposed Ash Disposal Facility; and • **Ash Water Return Pipe Lines:** Four (4) 600 mm diameter steel return water pipelines will be installed, extending for a distance of 4.8km, from the new Ash Water Return Dam (AWRD) back to the existing AWRD at the Camden Power Station. The proposed slurry pipeline as well as the ash water return pipe lines will be installed above surface and fixed to concrete plinths.
Section 21(i)	Altering the bed, banks, course, or characteristics of a watercourse.	
Section 21 (g)	Disposing of waste in a manner which may impact on a water resource.	Contaminated run-off generated within new ADF footprint captured in the new Ash Water Return Dam.
		Construction of the waste disposal facility.
		Dust suppression from the AWRD on the new ADF.

2.6 THE NATIONAL HERITAGE RESOURCES ACT (NO. 25 OF 1999)

The proposed construction of the waste disposal site comprises certain activities (e.g. changing the nature of a site exceeding 5 000m^2 and linear developments in excess of 300m) that require authorisation in terms of Section 38 (1) of the Act. Section 38 (8) of the Act states that, if heritage considerations are taken into account as part of an application process undertaken in terms of the ECA, there is no need to undertake a separate application in terms of the National Heritage Resources Act. The requirements of the National Heritage Resources Act have thus been addressed as an element of the EIA process, specifically by the inclusion of a Heritage Assessment.

2.7 ADDITIONAL GUIDELINES

In addition to legislation discussed above the following guidelines also have bearing on the proposed project / application process:

Department of Environmental Affairs and Tourism[3] Integrated Environmental Management Information Series

The Department of Environmental Affairs (DEA) Information Series of 2002 and 2006 comprise 23 information documents. The documents were drafted as sources of information about concepts and approaches to Integrated Environmental Management (IEM). The IEM is a key instrument of the NEMA and provides the overarching framework for the integration of environmental assessment and management principles into environmental decision-making. The aim of the information series is to provide general guidance on techniques, tools and processes for environmental assessment and management.

[3] The Department of Environmental Affairs and Tourism is now referred to as the Department of Environmental Affairs (DEA).

3 NEED AND DESIRABILITY

In accordance with the Regulation 31(2)(f) of the National Environmental Management Act (107 of 1998) Environmental Impact Assessment Regulations 2010 (Government Notice No. R.543[4]), this part of the amended final Environmental Impact Report provides a detailed account of the Need and Desirability of the proposed Camden Power Station Ash Disposal Facility Project. In considering the need and desirability of the proposed project, the strategic concept of the project along with the broader societal needs and public interest has been taken into account. In the Guideline on Need and Desirability (DEA , 2010) a number of questions formulated to guide the identification of the Need and Desirability of a proposed development is provided. The information provided in **Table 3.**1 and **Table 3.2** provides answers specific to the project at hand for each of the guiding questions contained in Section 5 of the Guideline on Need and Desirability (DEA, 2010).

The continued operation of the Camden Power Station will contribute to ensuring the generation of sufficient electricity to meet the increasing electricity demand in South Africa. As was explained in Part 1.2 of this document, the Camden Power Station was re-commissioned from 2005 to increase the electricity supply in the country. The need for the continued operation of the Camden Power Station and the provision of the required sufficient supporting infrastructure (e.g. Ash Disposal Facility) is evidenced by the drive of the project proponent (i.e. Eskom SOC Limited) to ensure the optimal lawful operation of all plant that forms part of Eskom's Generation Division. Although limited, the employment opportunities associated with the proposed project will in turn also contribute to reducing the high unemployment rate of the surrounding communities. As such the timing of the proposed development is aligned with the immediate needs of the receiving social environment and national priority infrastructure developments.

Due to nature of the proposed project it anticipated that a number of environmental impacts on the receiving environment will transpire throughout the project life-cycle. Furthermore a number of the anticipated impacts will / may transpire regardless of the location of the proposed project. The placing / selecting of the development area have been guided by numerous factors such as the input provided by specialists and comparative analysis which have been carried out. The preferred location of the proposed Camden Power Station Ash Disposal Facility confines the footprint of Eskom's Power Stations and associated infrastructure to one District Municipality within the Mpumalanga Province as opposed to the distribution thereof in each municipal area within the province. The consideration of additional documents such as municipal Integrated Development Plans and Spatial Development Framework served to also further confirm the benefits which the proposed development holds for the surrounding communities.

[4] South Africa. 2010. National Environmental Management Act (107 of 1998) Environmental Impact Assessment Regulations, 2010. (Notice 543). *Government gazette*, 33306:3, 18 June

Based on the answers that have been provided in **Table 3-1** and **Table 3-2** it is evident that ample consideration have been given to the need and desirability of the proposed project, the proposed Camden Power Station Ash Disposal Facility Project. The determination of the need and desirability project also served as further confirmation that all reasonable measures have been taken to determine the Best Practicable Environmental Option.

Table 3-1: Assessment of the Need of the proposed Camden Power Station Ash Disposal Facility Project

Need ('timing') of the Proposed Project			
No.	**Question**	**Description**	**Answer**
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant authority?	In the Msukaligwa Local Municipality Integrated Development Plan (2014/2015) the provision of electricity is identified as a Community Priority Need. Within a local municipal context, the Msukaligwa Local Municipality Integrated Development Plan (2014/2015) indicates that the electricity supply is rendered by the municipality, where license is held by the municipality and by Eskom in those areas licensed to Eskom. In addition, as indicated in the aforementioned IDP, there are no backlogs with regard to electricity supply, as electricity connections can only be connected to existing structures. Since the connections rely on the houses that are built a backlog on providing electricity to the local municipal area is not anticipated. It should, however, be taken into account that the operation of the Camden Power Station is focussed on ensuring sufficient generation of electricity to meet the national demand.	Yes
2.	Should the development, or if applicable, expansion of the town / area concerned in terms of this land use (associated with the activity being applied for) occurs here at this point in time.	The proposed Camden Power Station Ash Disposal Facility Project was prompted by the need to ensure sufficient capacity for the disposal of ash for the remainder of the operating life of the power station. It is anticipated that the remaining capacity of the existing Ash Disposal Facility allows for ashing to continue unitl January 2017, after which an additional ADF will be required..All Environmental Authorisation Processes must therefore be completed and a decision made by the Competent Authority with regards to granting or refusal of EA by May / June 2014 to allow adequate time for the construction of the supporting infrastructure and preparation for the proposed ADF.	Yes
3.	Does the community / area need the activity and the associated land use concerted (is it a societal priority)?	Please refer to the Description (Answer) provided to No.1 for **Table 3-1**.	Yes
4.	Are the necessary services with adequate capacity currently available or must additional capacity be created to cater for the development?	The proposed project is centred around providing sufficient capacity for the disposal of ash for the remaining operating life of the Camden Power Station. The construction of the additional Ash Disposal Facility will, however, necessitate the construction of additional supporting infrastructure including conveyance infrastructure (e.g. pipelines, pumps and channels) and a new Ash Water Return Dam (AWRD).	No, additional capacity will be created to cater for the development.

Need ('timing') of the Proposed Project			
No.	**Question**	**Description**	**Answer**
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?	The proposed Camden Power Station Ash Disposal Facility Project will not necessitate the construction of additional infrastructure outside the existing footprint of the Camden Power Station. As the Camden Power Station is already accounted for in the Msukaligwa Local Municipality Spatial Development framework, the proposed project is also provided for as existing infrastructure within the boundries of the local municipality.	Yes
6.	Is this project part of a national programme to address an issue of national concern of importance?	As maintained in the Electricity Regulations on the Integrated Resource Plan 2010 – 2030 the South African electricity supply / demand balance will remain under pressure until such time as both the Medupi and Kusile Power Stations become fully operational. It is therefore cardinal to ensure that all operational power stations perform optimally to prevent a further shortfall in supply over the required economic demand, until such time that the Medupi and Kusile Power Stations become fully operational.	Yes

Table 3-2:Assessment of the Desirability of the proposed Camden Power Station Ash Disposal Facility Project

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Description**	**Answer**
7.	Is this development the best practicable environmental option for this land / site?	A Site Selection and Option Analysis was carried out to determine the most feasible site alternative. The Site Selection and Option Analysis Process was also intended to reveal any environmental constraints associated with each of the alternative sites as well as to determine the practicaility of the site location. The potential sites were evaluated based on the following critieria: • Ability to link with the existing Ash Disposal Facility; • The site must be located within a 10km radius of the existing Asdh Disposal Facility and its associated facilities; and • The site must have a minimum footprint of 120 hectares. Although four sites were initially assessed (i.e. Site 1, Site 2, Site 3a and 3b) only three were taken forward in the EIA Process. Owing to the following Site 2 was deemed as fatally flawed: • It falls within the headwaters of a watercourse; • Shallow groundwater seepage; and • Located on the geological contact between the dolerite and host sedimentary rocks; • Fractures and joints associated with the area within wich the site is located. Taking the aforementioned into account it is evident that only the site alternatives which providethe most benefit (i.e. meeting all site selection criteria) and which are least likely to cause unacceptable adverse environmental impacts (e.g. groundwater contamination) are considered as feasible alternatives.	Yes
8.	Would the approval of this application compromise the integrity of this existing approved and credible municipal IDP and SDF as agreed by the relevant authorities?	The proposed Camden Power Station Ash Disposal Facility will contribute towards ensuring that the infrastructure required for the optimum functioning of the Power Station are in place. This will in turn contribute towards the continued generation of electricity at the Camden Power Station and continued electricity supply. Also refer to the description (answer) provided for No.1 of **Table 3-1**.	No

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Description**	**Answer**
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	At the time of the compilation of this EIR the Msukaligwa Local Municipality Evironmental Management Framework had not yet been published in the Government Gazette. As indicated in the Msukaligwa Local Municipality IDP (2013/2014:172) the EMF will be tabled before the Municipal Council for adoption in the near future.	No
10.	Do location factors favour the land use associated with the activity applied for at this place?	The proposed Camden Power Station Ash Disposal Facility Project is largely situated within the existing footprint of the Power Station. As such the proposed construction of the Ash Disposal Facility and required supporting infrastructure will add to the existing Camden Power Station infrastructure and will not necessitate a significant change in the existing surrounding land use.	Yes
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural or cultural areas (built and rural / natural environment)?	It is anticipated that the proposed Ash Disposal Facility may impact on the riparian area associated with the development footprint. These impacts may include the loss of wetland habitat, alteration of stream flow and increased sediment transport into the wetlands. A detailed account of the impact assessment including the methodology as well as the significance assigned to each of the assessed impacts is provided in Part 4.8.2 of this Environmental Impact Report. As seen in Part 10 the significance for most of the assessed impacts is reduced by the implementation of mitigation measures.	Refer to Part 10 of this report.
12.	How will the development impact on people's health and wellbeing?	A number of sensitive receptors in terms of the air quality impacts associated with the proposed development were identified. The identified sensitive receptor includes schools and residential areas which are located in close proximity to proposed ash disposal facility alternative sites. According to the World Health Organisation (cited by Airshed Planning Professionals (Pty) Ltd, 2013:12), the evidence on airborne particulates and public health consistently shows adverse health effects at exposures experienced by urban populations throughout the world. The range of effects is broad, affecting the respiratory and cardiovascular systems and extending from children to adults including a number of large, susceptible groups within the general population. Although sensitive receptors have been identified for the proposed ash disposal facility, fugitive dust and particulate emission will be managed through the implementation mitigation measures. Furthermore regardless of the location of the ash disposal facility the mitigation of dust emissions is critical to maintain Particulate Matter concentrations with the South African National Ambient Air Quality Standards.	Refer to Part 10 of this Environmental Impact Report for a detailed account of the impact assessment including the methodology as well as the significance assigned to each of the assessed impacts.

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Description**	**Answer**
13.	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	Opportunity costs can be defined as the net benefit that would have been yielded by the next best alternative (for example, if farming is the next best alternative for a piece of land, then the foregone benefit of losing the farming option will be the opportunity cost of any other land use, or if not proceeding with the activity, then the foregone benefits of the proposed activity is the opportunity cost of not proceeding). Opportunity costs also relate to the use of limited resources, for example water. If a limited volume of water is available in an area the most desirable use of the water considering the needs in the area must be determined in order to consider the opportunity costs associated with the different uses of the water. The concept of opportunity costs is applicable to project alternatives as well as policy selection. A key part of considering opportunity costs is commonly to comparatively consider and assess the different alternatives in terms of the benefits and/or disadvantages associated with each alternative. A comparative analysis of all identified alternatives in terms of the location where the proposed activities are to be undertaken as well as the technology to be used is provided in Part 10 of this report. The option of not implementing the project activities (i.e. no-go option) has also been included in the comparative analysis. The comparative analysis provides an indication of the risks, disadvantages, advantages and opportunities that are associated with each of the alternatives.	No

Desirability ('placing') of the Proposed Project			
No.	**Question**	**Description**	**Answer**
14.	Will the proposed land use result in unacceptable cumulative impacts?	A cumulative impact is defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations (2010) published in Government Notice No. R 543 as meaning "the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area". It is anticipated that the most significant Cumulative Impact associated with the proposed Ash Disposal Facility will include its contribution to the current poor air quality of the region. The poor regional air quality can be attributed to the particulate emissions emanating from the surrounding mining activities, agricultural activities and power stations. Furthermore the footprint Camden Power Station and associated infrastructure falls within the Highveld Priority Area which is associated with poor air quality, and elevated concentrations of criteria pollutants occur due to the concentration of industrial and non-industrial sources. The implementation of adequate mitigation measures aimed at managing the release of particulate emission will reduce the significance of the anticipated air quality impacts thereby reducing the impact of the ash disposal facility on the surrounding ambient air quality. It is therefore the opinion of the EAP that the proposed ash disposal facility will not result in unacceptable cumulative impacts. A detailed account of the impact assessment including the methodology as well as the significance assigned to each of the assessed impacts is provided in Part 4.8.2 of this Environmental Impact Report. As seen in Part 10 the significance for most of the assessed impacts is reduced by the implementation of mitigation measures.	No

4 ENVIRONMENTAL IMPACT ASSESMENT PROCESS

4.1 STUDY APPROACH AND PROGRESS TO-DATE

The EIA Process being followed for this project complies with the EIA Regulations as amended and administered by the DEA and promulgated in July 2010 in terms of the Section 24 (5) of the NEMA. The technical and public participation process undertaken for this EIA is summarised below and schematically represented in Figure 4-1.

4.2 PRE-APPLICATION CONSULTATION

On notification and receipt of the appointment letter from Eskom, a project inception meeting was held on 13th April 2011 between Eskom and the Zitholele Consulting Project Team. During this project kick-off meeting the following was discussed:

- Project Scope and Requirements;
- Project Schedule;
- Identification of key stakeholders and role players; and
- Analysis of the preliminary ash disposal sites.

4.3 SUBMISSION OF AN APPLICATION FOR AUTHORISATION

The DEA Integrated EIA and WML application form (Appendix B) for the proposed project was submitted to the DEA on 19th May 2011. Copies of the application form and notification of this application form were forwarded to the MDEDET as a key commenting authority. As a point of departure, the I&AP database available from Camden Power Station was used for initial project notification and ground-truthed by the Zitholele team to identify additional I&APs on the 16th May 2011.

4.4 SITE VISIT

A site visit was conducted on the 16th of May 2011 with the objective of familiarising the project team with the area, undertaking the site selection and to distribute BID's to landowners.

4.5 DRAFT SCOPING REPORT AND PLAN OF STUDY FOR EIA

The Draft Scoping Report (Draft SR) was prepared with information and issues identified during the Scoping Phase activities. The Plan of Study (PoS) for EIA and the Terms of Reference (ToR) for the envisaged specialist studies were included in Chapter 8 of that report. The Draft SR and PoS for EIA was then updated with the comments received from key commenting authorities, public review and comments obtained from I&APs.

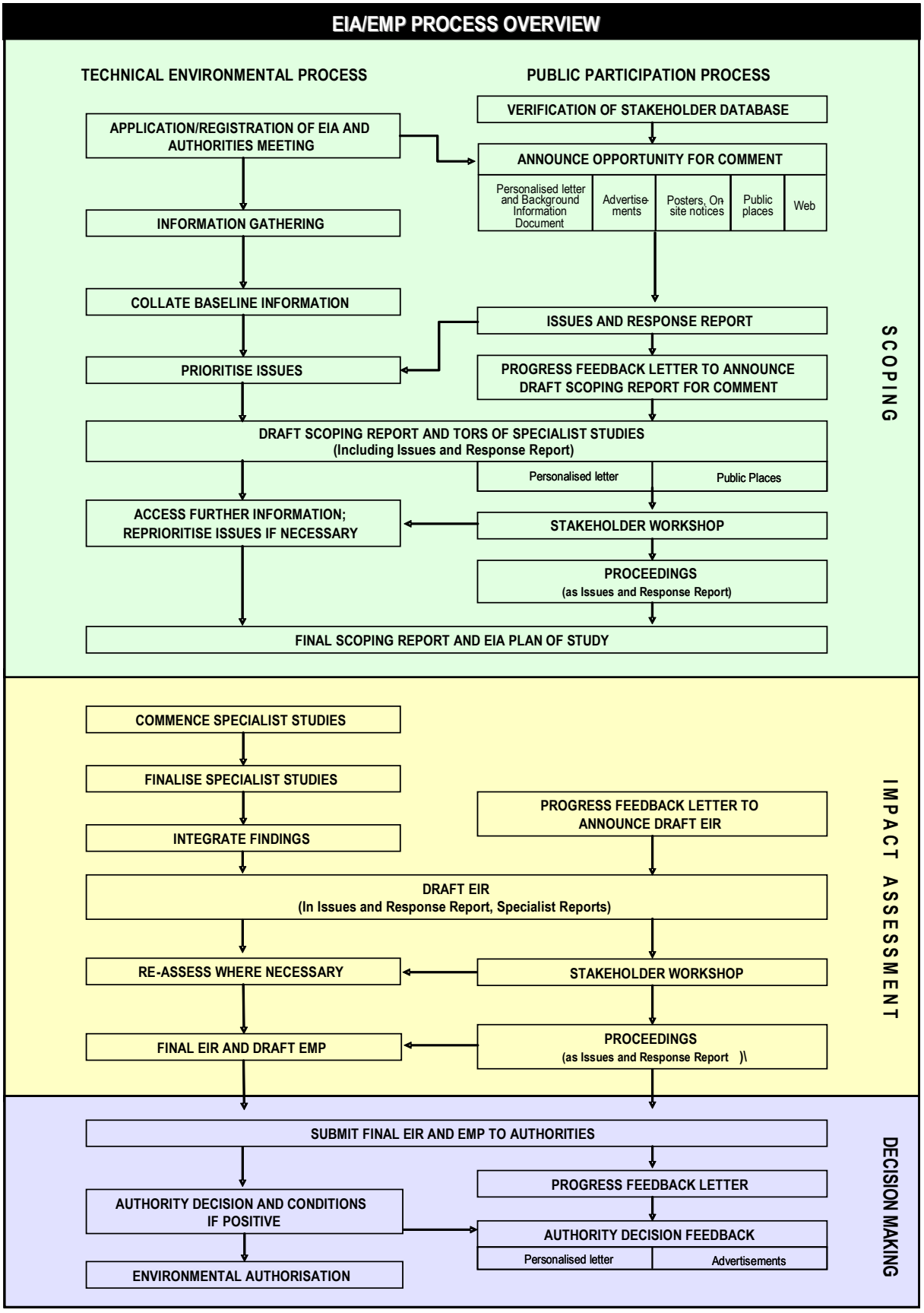

Figure 4-1: Technical and public participation process and activities for this project

4.6 FINAL SCOPING REPORT AND POS EIA

The comments from the review of the Draft SR and PoS for EIA were used to compile a Final Scoping Report (Final SR). The Final SR was submitted to the CA for decision-making. An acceptance letter from the CA was received and is attached in Appendix C.

4.7 SPECIALIST STUDIES

In the PoS for EIA several specialist studies were suggested and accepted by the DEA and the public. These studies have been used to inform the compilation of this report, and include:

- Ash Classification;
- Ash Disposal Facility Conceptual Design and compilation of an Operational Manual;
- Geotechnical Investigations (Phase 1);
- Topographical Survey;
- Soils and Land Capability Assessment;
- Terrestrial Ecology (Fauna and Flora);
- Avifauna Assessment;
- Surface Water and Wetland Delineation and Assessment;
- Groundwater Assessment;
- Traffic Impact Opinion;
- Air Quality Impact Opinion;
- Noise Impact Opinion;
- Heritage and Paleontological Assessment; and
- Visual Assessment.

These studies are attached as Appendix G to Appendix P.

4.8 IMPACT ASSESSMENT PHASE

4.8.1 Approach to Impact Assessment

The impact assessment was not a discrete process happening in isolation, but was rather conducted throughout the entire EIA process. Once a final preferred layout and design for the facility has been proposed, the final impact assessment statement for the various environmental elements was written up in this EIR report.

4.8.2 Impact Assessment Methodology

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Direction of Impact (Positive / Negative);
- Magnitude / Significance;
- Spatial scale;
- Duration / Temporal scale;
- Probability of Impact Occurring; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the afore-mentioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 4-1.

Table 4-1: Quantities rating and equivalent descriptors for the impact assessment criteria.

Rating	Magnitude	Extent scale	Temporal scale
1	VERY LOW	*Isolated Site / Development site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*National*	Permanent

The impact assessment methodology is explained in detail in Section 11.1 of this report.

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Significance or magnitude- IN CAPITALS
- Duration – in underline
- Probability – *in italics and underlined.*
- Degree of certainty - **in bold**
- Spatial Scale – *in italics*

4.8.3 Mitigation and Management Measures

The development of mitigation and management measures was undertaken throughout the course of the process, from the assessment of the first alternative to the selection of a preferred design. Mitigation measures through the design review iterations and development of the preferred options have been recorded. In addition best practices were considered when identifying mitigation and management measures for potential impacts.

4.9 DRAFT EIR AND EMP COMPILATION

4.9.1 Revised Draft Environmental Impact Report

Upon completion of the specialist studies and impact assessment the results of the studies were documented in a DEIR and made available for stakeholder review. Considerable changes to the proposed project, largely concerning technical aspects, resulted in the need to compile a Revised DEIR. Due to these changes, the Revised DEIR was made available again for public review. A detailed account of the proposed project acticities was provided in Part 7 of the RDEIR. To ensure that the reader was provided with an holistic view of the proposed project, both activities which require Environmental Authorisation (EA) and those which may proceed without EA were described in Part 7 of the REIR. A clear distinction was drawn between the project activities which fall within the ambit of the NEM:WA and the NEMA (requiring EA to proceed) and the project activities which do not require EA.

The contents of the (Revised and Final) EIR are determined by the NEMA EIA Regulations and at a minimum include the following:

- Introduction (details of the EAP who prepared the report and his/her expertise);
- Motivation for the proposed project based on economic and environmental considerations;
- A detailed description of the proposed development;
- A detailed description of the proposed development site;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of all alternatives identified during the environmental impact assessment process;
- A summary of the findings of the specialist studies;

- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An opinion by the EAP as to whether the development is suitable for approval within the proposed site;
- An environmental management plan that complies with Regulation 34 of Act 107 of 1998;
- Copies of all specialist reports appended to the EIA report;
- An environmental awareness plan; and
- Any further information that will assist in decision making by the authorities.

In addition, as required by the EIA Regulations, the PPP report will be attached to the final EIR as an appendix and will include:

- details of the public participation process conducted, *inter alia* –
  - a list of all the potential interested and affected parties that were notified;
  - the steps that were taken to notify potentially interested and affected parties;
  - proof that notice boards, advertisements and notices notifying potentially interested and affected parties, and (if applicable) the owner or person in control of the land, of the application have been displayed, placed or given;
  - a list of all persons, organisations and organs of state that were registered as interested and affected parties in relation to the application;
  - Comments and Response Reports containing summaries of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues (or the reason for not addressing an issue); and
  - copies of all the comments received from Interested and Affected Parties.

4.9.2 Environmental Management Programme (EMPr)

EMPr, in the context of the EIA Regulations, is a tool that takes a project from a high level consideration of issues, down to detailed workable mitigation measures that can be implemented in a cohesive and controlled manner.

The objectives of an EMPr are to minimise disturbance to the environment, present mitigation measures for identified impacts, maximise potential environmental benefits, assign responsibility for actions to ensure that the pre-determined aims are met, and to act as a “cradle to grave” document.

The EMPr has been drafted according to the findings of this FEIR and is published as a separate report which can be found in Appendix R of this report.

4.10 FINAL EIR AND EMP COMPILATION

The **Revised** DEIR and EMPr was made available for review by stakeholders for **40 calender days** from the 29th of September to the 10th of November 2014. The comments received from the review phase was used to finalise the reports, into FEIR and EMPr.

4.11 SUBMISSION AND DECISION-MAKING

Upon finalisation, the EIR and EMPr was submitted to the CA for decision-making and approval.

4.12 PUBLIC PARTICIPATION PROCESS (PPP)

Public participation is an essential and legislative requirement for EA process. The principles that demand communication with society at large are best embodied in the principles of the NEMA (Act 107 of 1998, Chapter 1), South Africa's overarching environmental law. In addition, Section 24 (5), Regulation 54-57 of Government Notice Regulation (GNR) 543 under the NEMA, guides the public participation process that is required for an Environmental Impact Assessment (EIA) process. The PPP undertaken during the scoping phase of the EIA also took the Integrated Environmental Management Guideline Series (Guideline 7) – Public Participation in the Environmental Impact Assessment Process, GN234, promulgated 10 October 2012).

The public participation process for the proposed extension of the Camden Power Station's ash disposal facili**y** has been designed to satisfy the requirements laid down in the above legislation and guidelines. Figure 4-1 provides an overview of the EIA technical and public participation processes, and shows how issues and concerns raised by the public are used to inform the technical investigations of the EIA at various milestones during the process.

4.12.1 Objectives of public participation in an EIA

The objectives of public participation in an EIA are to provide access to sufficient information to I&APs in an objective manner so as to:

- During Scoping:
  - Assist I&APs to identify issues of concern, and providing suggestions for enhanced benefits and alternatives;
  - Contribute their local knowledge and experience;
  - Verify that their issues have been considered and to help define the scope of the technical studies to be undertaken during the Impact Assessment;

- During Impact Assessment:

  - Verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere; and
  - Comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation is to ensure transparency throughout the process and to promote informed decision making.

4.12.2 Identification of Interested and Affected Parties (I&APs)

The identification of stakeholders is on-going and is refined throughout the process. As the "on-the-ground" understanding of affected stakeholders improves through interaction with various stakeholders in the area the database is updated. The identification of key stakeholders and community representatives (land owners and occupiers) for this project is important as their contributions are valued. The identification of key stakeholders was done in collaboration with Eskom (through the I&AP database for the EIAs in the area), the local municipalities and other organisations in the study area.

The stakeholders' details are captured in an electronic database management software programme that automatically categorises every mailing to stakeholders, thus providing an on-going record of communications - an important requirement by the authorities for public participation. In addition, comments and contributions received from stakeholders are recorded, linking each comment to the name of the person who made it.

According to the NEMA EIA Regulations, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and is being kept updated with the details of involved I&APs throughout the process (See Appendix D)

4.12.3 Announcement of opportunity to become involved

The opportunity to participate in the EIA was announced on the 16th May 2011 as follows:

- Distribution of a letter of notification to the neighbours of Camden Power Station, a letter of invitation to stakeholders to become involved was distributed, which was addressed to individuals and organisations, accompanied by a Background Information Document (BID) containing details of the proposed project, including a map of the project area, and a registration sheet (Appendix E and Figure 4-2).

Figure 4-2: BID documents placed on neighbouring landowners

- Advertisements were placed in the following newspapers as seen in Table 4-2 and included in Appendix D; and

Table 4-2: Advertisements placed during the announcement phase

NEWSPAPER	DATE
Ekasi News	20 May 2011
Highvelder	19 May 2011
Highveld Tribune	24 May 2011
Beeld	23 May 2011
Citizen	20 May 2011

- Site notice boards, as per EIA Regulation 54(2)(a)(i), were positioned at prominent localities during May 2011 on all roads around the Camden Power Station. These notice boards were placed at conspicuous places and at various public places (Figure 4-3).

Figure 4-3: Site notice boards were put up in the study area

4.12.4 Obtaining comment and contributions

The following opportunities to contribute were available to I&APs during the Scoping Phase:

- Completing and returning the registration / comment sheets on which space was provided for comment;
- Providing comments telephonically or by email to the public participation office; and
- Attending the Open House sessions and Public Meeting that were widely advertised (see Table 4-3 below) and raise comments there.

Table 4-3: A Stakeholder meeting was advertised and was held as part of the public review period of the Draft Scoping Report

DATE	TIME	AREA	VENUE AND ADDRESS
27 July 2011	11:00 – Open House	ERMELO	Indawo Lodge
27 July 2011	16:00 – Public Meeting	ERMELO	Indawo Lodge

4.12.5 Comments and Response Report

The issues / comments /concerns raised in the announcement phase and Scoping Phase of the project were captured in an Comments And Responses Report (CRR) Version 1 and appended to the DSR. The report was updated to include additional I&AP contributions received throughout the Scoping Phase. The issues and comments raised during the public review period of the DSR were added to the report as Version 2 of the CRR. Version 3 of the CRR were attached to the Draft EIR and Version 4 will be attached to the Final EIR.

4.12.6 Draft Scoping Report

The purpose of the DSR was to enable I&APs an opportunity to verify that their contributions had been captured, understood and correctly interpreted, and to raise further issues. At the end of the Scoping Phase, the issues identified by the I&APs and by the environmental technical specialists, were used to define the Terms of Reference for the Specialist Studies that have been conducted during the Impact Assessment Phase of the EIA.

In addition to media advertisements and site notices that announced the opportunity to participate in the EIA, the opportunity for public review was announced as follows:

- In the Background Information Document (May 2011).
- In advertisements published (see Table 4-4 below and Appendix D).
- to announce the review of the D SR and inviting stakeholders to attend a public meeting; and

- In a letter sent out in May 2011, and addressed personally to all individuals and organisations on the stakeholder database.

Table 4-4:-The public meetings were advertised and was held as part of the public review period of the Draft Scoping Report

NEWSPAPER	DATE
Ekasi News	15 July 2011
Highvelder	21 July 2011
Highveld Tribune	19 July 2011
Beeld	14 July 2011
Citizen	14 July 2011

The DSR, including the **CRR**-Version 1, were distributed for comment as follows:

- Left in public venues within the vicinity of the project area (these are listed in Table 4-5 below);
- Published on the Eskom and Zitholele websites;
- Mailed to stakeholders;
- Mailed to I&APs who requested the report; and
- Copies have been made available at the stakeholder meeting.

I&APs could comment on the report in various ways, such as completing the comment sheet accompanying the report, and submitting individual comments in writing or by email.

Table 4-5: List of public places where the Draft Scoping Report was available

PLACE	CONTACT PERSON	TELEPHONE	ADDRESS
Ermelo Public Library	Mr Stanley Dondolo	(017) 801-3621	Cnr Church and Taute Street, Civic Centre, ERMELO
Visitor Centre, Camden Power Station	Ms Thandiwe Mzoyi	017 827 8000	Camden Power Station

4.12.7 Final Scoping Report

The Final Scoping Report (FSR) was updated with additional issues raised by I&APs. The FSR was submitted to the Competent Authority (CA) (the Department of Environmental Affairs (DEA) and I&APs, and to those individuals who specifically requested a copy.

4.12.8 Public participation during the Impact Assessment

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Draft Environmental Impact Assessment Report (DEIR) is made available to the public for comments. I&APs were requested to comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

4.12.9 Comments and Response Report

The DEIR included the CRR (Version 3), which lists every issue raised with an indication of where the issue is dealt with in the technical evaluations, and the relevant findings. It also included a full description of the EIA process, including the necessary appendices.

The DEIR was reviewed by the public as described for the Scoping Phase above. In summary, stakeholders were notified of the availability of the DEIR and afforded an opportunity to review the content of the DEIR.

Public Meetings were held during which the environmental findings and the mitigation measures as documented in the DEIR was presented.

Table 4-6: List of public places where the DEIR was available

PLACE	CONTACT PERSON	TELEPHONE	ADDRESS
Ermelo Public Library	Mr Stanley Dondolo	(017) 801-3621	Cnr Church and Taute Street, Civic Centre, ERMELO
Visitor Centre, Camden Power Station	Ms Thandiwe Mzoyi	017 827 8000	Camden Power Station

The DEIR was also made available in electronic format to those I&APs who requested an electronic copy. The DEIR was also made available on Eskom and Zitholele websites.

The notification of the availability of the DEIR and invitation to the Public Meetings were advertised in the newspapers listed in Table 4-6:

Table 4-7: The Public Meetings and availability of the DEIR were advertised

NEWSPAPER	DATE
Highvelder	11 April 2013
Highveld Tribune	16 April 2013
Beeld	12 April 2013
Citizen	15 April 2013

The Revised DEIR was made available at the public places listed above and made available in electronic format on the Zitholele website.

4.12.10 Public Meetings

Table 4-8: Public Meetings held during the DEIR review period

DATE	TIME	AREA	VENUE AND ADDRESS
17 April 2013	14h00 – Public Meeting	ERMELO	Indawo Lodge
17 April 2013	16:00 – Public Meeting	ERMELO	Indawo Lodge

No public meetings were held during the review period of the Revised DEIR as the additional information included in the Revised DEIR was not of such significance that it warrants a public meeting to present the technical information.

A meeting was held with the Department of Defence (DOD) on the 25th of August 2014. Personnel from the DOD currently reside at the Camden Village, and they are also planning to relocate more employees to this village in the near future. During this meeting, the DOD leaders requested a site vist to the Camden Power Station to view the existing ADF operations as well as the preferred site for the proposed new ADF. This site visit took place on the 3rd of October 2014. Refer to Appendix D6 for the minutes of these meetings.

4.12.11 Notification to I&APs of the Submission of the Final EIR

Once the FEIR and FEMPr reports are submitted to the DEA (the CA), a letter will be sent to all registered I&APs on the project database that the reports have been submitted and are available for review and comments. The FEIR and FEMPr will be placed in the same public places as used throughout the EIA process for a 30 day review period as required by the NEMA.

The letter will inform the I&APs:

- Of the additional information included in the FEIR; and
- Outline the next steps in the process.

4.12.12 Announcement of Environmental Authorisation/ Decision reached by Competent Authority

Once the DEA's decision is issued Eskom must, in writing, within 12 days of the date of the decisions (i.e. within 12 days after the date the decision was made by the DEA and not within 12 days of having been notified of the decisions) notify the registered I&APs of the outcome of the decisions, refer to the DEA's reasons for the decisions as contained in the DEA's decisions and the Environmental Authorisation be attached to the notice. The notification letter, which will be send to I&APs by registered mail, will draw their attention to the fact that appeals may be lodged against the decisions and a copy of the Appeal Process as per the EIA Regulations.

In addition to the notice to the registered I&APs, Eskom must also within 12 days of the date of the decisions place notice in the same newspaper(s) used for the placing of notices during the PPP that was undertaken, informing I&APs of the DEA's decision, where the I&APs can access copies of the DEA's decision (note that the proponent must give access to copies of the decision to I&APs), and draw their attention to the fact that appeals may be lodged against the decision, and the manner in which to lodge appeals against the decision.

5 ISSUES AND CONCERNS RAISED

A detailed list of the issues and concerns raised is attached in the Comments and Response Report (Appendix F). A list of the issues raised during the project is given in Table 5-1 below along with a reference to where the issue is addressed in this report.

Table 5-1: List of issues raised through the various phases of the project, and where they are addressed in this report.

Issue / comment Raised	Response / Report Reference
Project Phasing	
Eskom notified stakeholders at the public meeting that an Environmental Control Officer will be appointed in the construction phase of the project. This must be documented in the EMPr.	*An Environmental Control Officer (ECO) or Waste Management Control Officer (WMCO) will be appointed as per the EMPr. Refer to Appendix R.*
Alternatives	
Alternative ash disposal options must be investigated which will also allow for business opportunities.	*Eskom are always open to new uses of their ash, and on-going investigations are undertaken by Eskom. The volume of ash is too large to re-use or recycle through alternative uses. Approximately 5% of Eskom's Ash is disposed of through other uses.*
The option of constructing the facility on an incline must be put forward as an alternative.	*Noted. Refer to the attached Conceptual Engineering report that investigated site alternatives. Refer to Appendix J.*
Placement of the facility to take existing infrastructure into account must be an alternative.	*Noted. Refer to the attached Conceptual Engineering report that investigated site alternatives. Refer to Appendix J.*
Description of the receiving environment	
Which municipalities are involved?	*Msukaligwa Local Municipality in the Gert Sibande District Municipality.* *Refer to Section 1.3 of this report.*
What comments have been received?	*Refer to the attached Issues and Response Report, Appendix F*.
Why have the officials from the municipalities not attended the public meetings?	*Authorities are invited and attend as and when they are able to. Authorities are however part of the process but are able to contribute in a variety of other means. Authorities often prefer written submissions to attendance at public meetings.*
Concerns with erosion - mitigation measures have to be included in EMP.	*Noted. Refer to* *Appendix R of this report.*
Concerns with seepage – the lining must be	*Noted. Refer to Section 7.7.6 of this report.*

Issue / comment Raised	Response / Report Reference
adequate to minimize any seepage and possible groundwater pollution.	
Specific fish species no longer occur in the De Jagers Pan.	*Noted. The De Jagers pan will not be used as the AWRD for the proposed new facility. A separate AWRD will be constructed, preventing polluted water from leaving the site, seeping through the site and entering the de Jagers Pan. See Section 7.8.2 of this report.*
The Ash from the current facility pollutes the air and has a negative impact on buildings, farming activities and human health.	*Noted. Air quality impacts associated with ash disposal facilities is widely reported. Current literature indicates that if managed the extent of the impact can be severely limited, and thus health related impacts can be reduced significantly. Refer to Appendix N.*
Dust suppression needs to be more effective and alternative methods of dust suppression must be investigated.	*Noted. Camden continuously tries to use dust suppression processes to mitigate dust.*
What is the impact to land use and agricultural potential, including such factors as loss of land, loss of income, loss of land value, reduction in crop production,	*A total 138.2 ha of arable land will be lost, and 76.1 ha of grazing land will be lost.* ***<u>Site 1</u> is located on soils with a limited depth for 50% of the alternative, 45% agricultural land and 5% wetland soils that are only suitable for grazing. The grazing land is mostly located on Eskom property and used by the Camden village residents as grazing for their livestock. The agricultural land is privately owned and used for the farming of maize.*** ***<u>Alternative 3</u> comprises 65% agricultural land and 5% grazing land. Here the agricultural use dominates the alternative as a large private farming operation is found over the bulk of the site.*** *This impact is assessed in Section 11.2.3 of this report. Also see the Biophysical Specialist Study that addresses this impact in more detail, refer to*

Issue / comment Raised	Response / Report Reference
	Appendix I.
Visual Impact of the facility.	*The visual impact was assessed and is addressed in Sectios 11.2.14, 11.3.14, 11.4.14, and 11.5.14 of this report.*
Windblown dust / ash is a concern.	*This impact was assessed and is addressed in Sections 11.2.8, 11.3.8, 11.4.8, 11.5.8 of this report. Refer to Appendix N.*
Water pollution due to the overflow of the De Jagers Pan.	*Noted. The de Jagers pan will not be used as the AWRD for the proposed new facility. A separate AWRD will be constructed, preventing polluted water from leaving the site and entering the de Jagers Pan. See the attached Conceptual Engineering Report, refer to Appendix J.*
Potential increase in crime and security concerns.	*This impact was assessed and is addressed in Section 0, 11.3.10, 11.4.10, and 11.5.10 of this report. Also see social impact study, refer to Appendix M.*
Infrastructure	
The return water dam does not make provision for de-silting and maintenance.	*The return water dam was redesigned and two compartments created. The dam footprint did not change and the impact assessment thus did not need to be amended.* *This is considered to be an inconsequential change.*
The pipeline infrastructure provided for the new facility did not provide sufficient redundancy to cater for Camden's operational procedures and would need to be revised.	*The number of return water and slurry pipelines were increased, and additional design detail incorporated in the engineering report, and the EIR was updated. The impact assessment was reconsidered and it was found that the additional number of pipes did not result in a substantial change in the footprint or the significance rating – the impact assessment section and calculations thus remains unchanged.* *This is therefore considered to be an inconsequential change.*
Alternative 3 is not suitable because of the water pipeline, transmission line, and railway line	*Noted. Both Site 1 and Site 3 were evaluated equally by all specialists, and the*

Issue / comment Raised	Response / Report Reference
running through the proposed site.	*preferred/recommended alternative finally selected is Site Alternative 1.*
Socio-Economic Environment	
Camden Village refurbished and repopulated.	*At the outset of the project Camden Village was being decommissioned. Recent comment received has indicated that the village is earmarked for upgrade by the South African National Defence Force. The upgrading of the village changes the potential risk profile of the ash disposal facility on residents in the area.* *In response the Site 1 alternative was remodelled to include a 500m buffer zone between the village and the facility. A 500m buffer should be adequate provided that proper dust suppression is implemented.* *This site will not result in an increase of potential impacts, and thus the overall impact assessment is retained as a potential worst case scenario; and not considered to be a substantial change to the project.* *Refer to Appendix N for Air Quality Study.*
Sense of place.	*This impact was assessed and is addressed in Sections 0, 11.3.10, 11.4.10, and 11.5.10 of this report. Also see social impact study, Appendix M.*
San rock paintings and figures near the alternative sites.	*A heritage assessment was undertaken, and the preferred alternative selected will not result in impacts to any such features. Refer to the attached Heritage Report, Appendix L.*
Public Participation	
Illiteracy	*People unable to read and write were able to raise their comments / concerns or ask questions verbally at public meetings that were held or telephonically to the PP officer. Translators were available.*
Inclusion throughout the whole EIA process must happen	*A thoroughly inclusive stakeholder engagement process was undertaken in line with the*

Issue / comment Raised	Response / Report Reference
	requirements of the NEMA. Refer to Section 4.12 for all measures taken to consult with stakeholders.
Impact Assessment	
Request for an economic assessment, agriculture vs. waste facility.	*All potential alternative sites will result in similar impacts to agricultural activities. Thus agricultural economics do not play a differential role in ultimately recommending a site.* *The issue then becomes whether the economics of constructing a waste disposal facility outweigh the economics of alternative land uses. In all circumstances the impact is again the same, the waste facility does not generate any income. However, without the waste facility the Camden Power station will need to close down. Without the Camden power station other economic activities in the region and the country will also not be possible. This latter scenario is covered in the NO-GO Assessment, and therefore the EAP does not see the value of a separate Economic Assessment Specialist study.*
Request for a palaeontological assessment.	*Noted. Refer to attached Heritage Impact Assessment specialist report , Appendix L.*
Request for a wetland delineation assessment.	*Noted. Refer to attached Biophysical Assessment specialist report, Appendix I as well as two aquatic Assesment Reports in Appendix H.*

6 ALTERNATIVES IDENTIFIED

Alternatives considered for the proposed Camden Ash Disposal Facility project can be divided into the following categories:

- Waste disposal alternatives;
- Site alternatives;
- Operation alternatives, and
- The No-Go (no development) alternative.

These are discussed in the sections below.

6.1 WASTE DISPOSAL ALTERNATIVES

The waste management hierarchy is an internationally accepted guide to prioritise waste management options and aims to achieve optimal environmental results, and is also a General Duty of a Holder of Waste in NEMWA. The first priority should be to prevent the generation of waste. If not possible, waste should be minimised or re-used as far as possible. Refer to Figure 6-1 for an illustration of the waste hierarchy.

Ash from coal-fired power stations provides a unique challenge to waste minimisation. Ash in its various forms can be utilised in the building industry as a cement extender or aggregate. The sheer volume of ash produced by power stations far exceeds the potential market for recycled ash products. At present there is no feasible recycling or reuse alternative for the ash being produced at Camden Power Station.

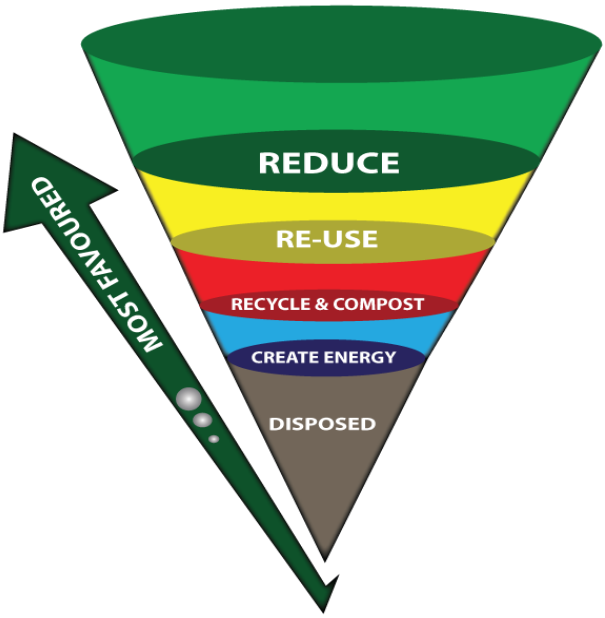

Figure 6-1: Waste Hierarchy

The Camden Ash Disposal Facility will form an integral part of the handling, reuse and disposal of water and waste at the Camden Power Station operations. The ash disposal facility is the last resort in the ash waste stream as it is a final disposal facility. Water from the wet ashing process is recycled via ash water return dams, from where the water is pumped to the power station and re-used in the process of ash transportation rather than using clean water. In the case of the ash, the waste disposal is currently the most feasible alternative for the Camden power station due to the fact that the combined sales of the aforementioned uses would not reduce the waste stream by noticeable volume (less than 0.05%), or even reduce the footprint of a facility required to store the waste stream.

6.2 SITE ALTERNATIVES

A site identification and evaluation exercise was undertaken in line with the Minimum Requirements for the Disposal of Waste by Landfill, both the 2nd Edition (1998)1 and the Draft 3rd Edition (2005)2 were taken into account, technical engineering requirements were also used in the initial identification of the site alternatives and refined later in the conceptual engineering of the feasible alternatives. The identification and evaluation of site alternatives is a phased approach consisting primarily of the following:

- Identification of potential sites against a set of technical criteria;
- Fatal flaw analysis of potential site alternatives; and
- Screening and ranking of sites against economic, environmental and public criteria.

The site identification and evaluation exercise was undertaken by the environmental consultants (environmental, geotechnical and engineering) and Eskom personnel (site engineer, environmental manager station and environmental advisor head office).

6.2.1 Initial Site Identification

Potential sites alternatives were identified in a one day workshop at Camden Power Station using the government published 1:50 000 topo-cadastral maps of the area, site knowledge and available aerial photographs of the area surrounding the power station. Once the workshop was completed the sites were visited to confirm their feasibility.

The initial technical conditions utilised to identify potential sites were:

- It should be able to link easily into existing ash disposal infrastructure i.e. use existing pipelines and roads wherever possible;
- It must be within a 10 km radius of the station to minimise the distance that ash slurry needs to be transported; and

- Had to have a minimum footprint size of 120 ha[5] (including associated infrastructure) to accommodate a worse case growth rate in waste volumes over the next 17 years.

Four site alternatives were identified meeting the aforementioned criteria during a screening exercise hosted at the power station. The four site alternatives identified are shown in Figure 6-2 and are described briefly below.

Site 1

This site is located immediately north of the existing ash disposal facility and approximately 2.8 km north-west of the Camden Power Station. The proposed site is to be positioned 750m from the Camden Village. The total area identified is ~272 hectares in size. The terrain is mostly sloping in the northerly direction (away from De Jagers Pan) at 2.6%.

Site 2

The second site is located ~1.2 km south of the Camden power Station and immediately south of the South African Railways (SAR) servitude for the Richards Bay Coal Line. There is an active coal mine located to adjacent and to the east of this site. The total area of this site is ~291 hectares. Natural drainage over the site is split in the north easterly and south easterly directions at approximately 4%. The site is situated within the headwaters of a non-perennial north flowing stream that flows into the Witpuntspruit approximately 3 km to the north-east.

[5] This initial footprint of 120 ha had to be revised upward (Site 1= ~216.7 ha and Site 3= ~259.4 ha) in size once the topography of the area was taken into account.

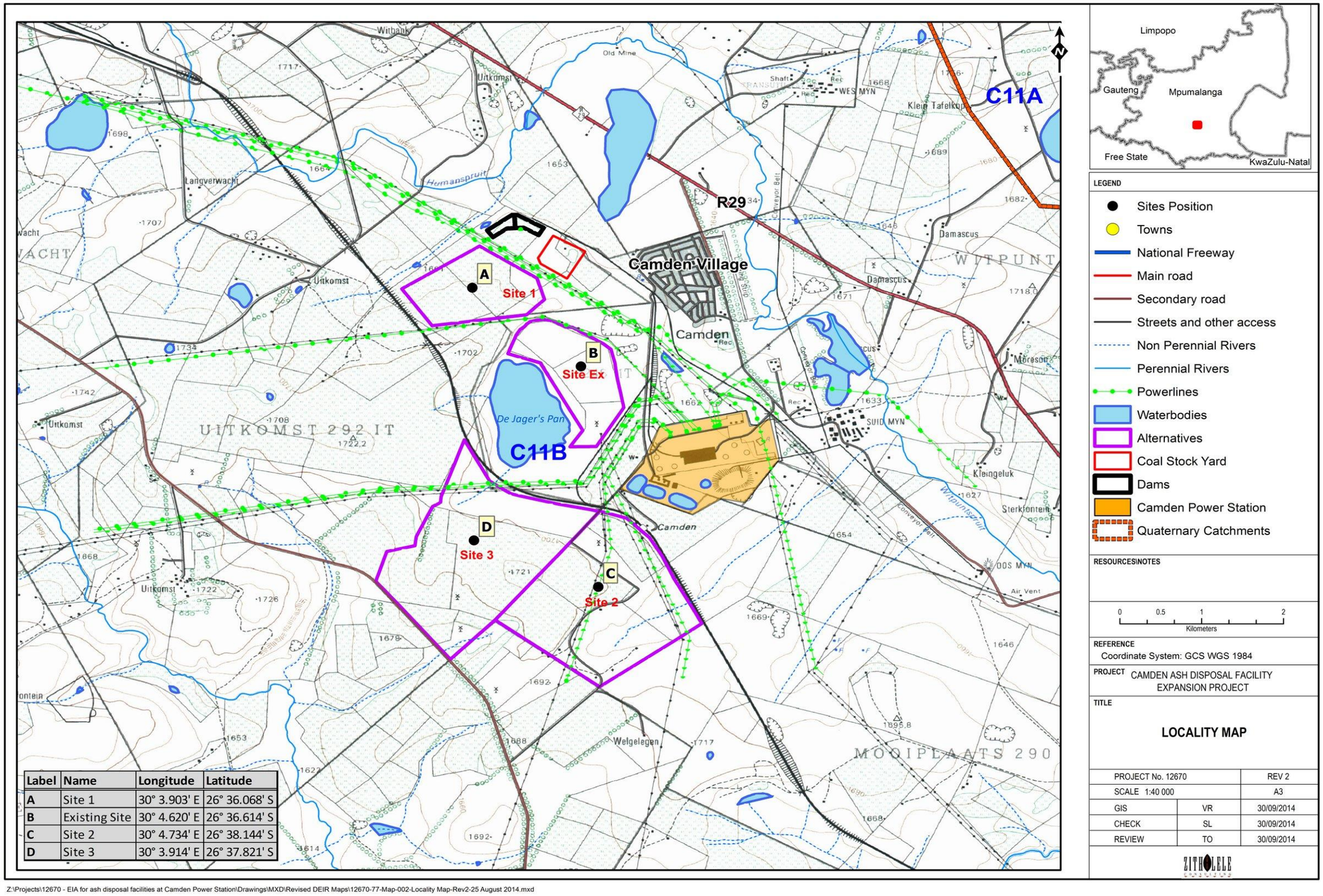

Figure 6-2: Site alternative locality map

Site 3

This site is located immediately south of De Jagers Pan and the SAR servitude, and ~1 km south west of the Camden Power Station. Site 3 is adjacent and west of Site 2. The total area available for development is 322 hectares. A natural watershed divides the site, sloping in a north easterly direction towards De Jagers Pan and in a south westerly direction away from the Pan at a constant grade of 4%.

Site 4

Site 4 is located immediately south-south east of the Camden Power Station. The site is north of the SAR servitude. The non-perennial stream originating on Site 2 flows directly through this site and joins the Witpuntspruit just to the northeast of the boundary of this site. The Witpuntspruit is a perennial water resource flowing in a northerly direction and is located within 1,2 km of the site. Coal is currently being mined immediately to the south of the site. The total area of Site 4 is ~135 ha.

6.2.2 Fatal Flaw Identification

Fatal flaws are features that would prevent the site alternative being utilised for an ash disposal site. These were extracted and adapted from the Minimum Requirements 2nd Ed (1998) and 3rd Ed (2005) and are shown in Table 6-1 below.

Table 6-1: Fatal Flaws used in the site selection

Ranking Component	
Fatal Flaws	500m from an airfield
	Within the 1:100 year flood line
	Areas in close proximity to significant surface water bodies
	Unstable / undermined areas
	Sensitive ecological and/or historical areas
	Areas of flat gradients, shallow or emergent ground water
	Areas within the secure power station area (National Keystone Infrastructure)
	Areas characterized by shallow bedrock with little soil cover
	Areas in close proximity to land-uses that are incompatible with disposal sites
	Areas immediately upwind of a residential area in the prevailing wind direction(s).
	Areas over which servitudes are held that would prevent the establishment of a ash disposal facility e.g. Eskom, Transnet, Water Board

The results of the fatal flaw assessment are show in Table 6-2. As indicated two sites identified (Site 2 and Site 4) have fatal flaws preventing them from being used for development of the Ash Disposal Facility:

- Site 2 was fatally flawed because of the presence of unstable geology, as reported in the attached Engineering Report, as well as the geotechnical report; and

- Site 4 was fatally flawed because it was located within the 1:100 year floodline of the Witpuntspruit surface water resource. Engineers from Camden Power Station also reported that based on their local knowledge Site 4 was likely undermined by historic coal mining activities in the area. This could not be verified, however the EAP felt it prudent to be cautious and has avoided the site.

Table 6-2: Presence of Fatal Flaws on each of the identified site alternatives (indicated by a Red Cross)

Fatal Flaw Criteria	Site 1	Site 2	Site 3	Site 4
Airfield	✓	✓	✓	✓
1:100 year flood line	✓	✘	✓	✘
Significant surface water bodies	✓	✓	✓	✓
Unstable / undermined areas	✓	✘	✓	✘
Sensitive ecological / historical areas	✓	✓	✓	✓
Flat gradients, Shallow groundwater	✓	✓	✓	✓
National Keystone Infrastructure	✓	✓	✓	✓
Shallow bedrock	✓	✓	✓	✓
Incompatible land use	✓	✓	✓	✓
Upwind of residential area	✓	✓	✓	✓
Servitudes preventing establishment	✓	✓	✓	✓
Notes:		Geology is geo-technically unstable – Refer to attached 1. Conceptual Engineering Report (Appendix J) 2. Geo-technical Specialist Report (Appendix J)		Refer to Figure 6-2 showing the location of the site and water body. Undermining although reported was not confirmed on this site.

6.2.3 Site Screening

Upon completion of the fatal flaw assessment a screening assessment of each of the sites was undertaken. Site screening involved the compilation of a site screening rating matrix, a one-day site investigation, and a workshop between the environmental team and key Camden Power Station personnel to rate each of the potential sites. Economic, Environmental and Public Criteria were all taken into account. The site screening matrix is shown in Table 6-3

Economic Criteria

The economic criteria focussed on the establishment and operating cost associated with each specific site. This includes the distance to the site from the waste sources, the accessibility of the site, the ease of operations, the available footprint, the cost to establish the site, and security concerns.

According to the economic criteria Alternatives 1 is the most preferred. This result was expected as Alternative 1 is located very close to the existing ash disposal site, which will allow very easy integration with current operations.

It should be noted that a key finding from this analysis was that some of the alternatives have existing transmission power lines running through the sites.

A further important factor to consider is the difficulty of crossing the Richards Bay Coal Line, a requirement of both Site 2 and 3. This will substantially increase the cost of both these options.

Environmental Criteria

The environmental criteria that were identified as important ranking components include the distance to ground or surface water features, presence of wetlands, geological instability, terrestrial ecological sensitivity, soil depth and agricultural potential, and potential presence of features of cultural / historical sensitivity.

The scoring matrix indicated that Alternative 1 had the most preferred score; with all the elements of the matrix scoring well with the exception of the terrestrial ecology components.

Public Criteria

The public criteria that were considered during the site evaluation was the possible displacements of local habitants, the visibility of the site, the sensitivity of the access road and the distance to the nearest residential area.

According to the evaluation of the public criteria, Alternative 3 was the most suitable site, as this site will present the least visibility of the disposal facility from the main roads and settlements in the area. In addition the Camden village is closest to Alternative 1. In recent years this township has been vacated by residents to a large degree, but a few residents remain.

Overall Site Scoring

The combined scores indicate which of the two sites is the most suitable in terms of the DWAF Minimum Requirements approach (2nd Ed [1998] and draft 3rd Ed [2005])1. The combined site ranking is shown in Table 6-3.

The results of the analysis show that Alternative 1 is the most preferred site. However, the NEMA EIA Regulations require assessment of all feasible alternatives, and thus both Site 1 and 3 have been investigated further in this EIA.

Table 6-3: Sensitivity risk matrix for Alternative 1 and 3

Ranking Component		Alt 1	Alt 3
Economic	The distance of the site from the ash/effluent generation areas	3	1
	Access to the ash disposal site	3	1
	Size of available footprint	3	3
	Ease of operation	3	1
	Relocation of existing services to avoid facility	-1	-1
	Cost to establish infrastructure	1	1
	Land Owned Fully or Partially by Eskom	1	-1
	Security Concerns	1	0
Total Economic		14	7
Environmental	Surface Water and Wetland	3	3
	Groundwater	3	3
	Soils and Land Capability	3	1
	Terrestrial Ecology (Fauna and Flora)	1	1
	Archaeology, Cultural Historical, and Paleontological	3	3
Total Environmental		13	11
Public	The displacement of local inhabitants.	1	1
	Exposed sites with high visibility	-1	1
	Sensitivity of access road(s) passes	1	1
	The distance to the nearest residential area	-1	1
Total Public		0	4
	Overall Site Scoring	**27**	**22**

3	Very suitable
1	suitable
0	unknown
-1	unsuitable
-3	very unsuitable
-10	Fatal flaw

6.3 DESIGN ALTERNATIVES

It should be noted that ash disposal facilities are not a new solution for ash disposal and Eskom has developed this technology for a number of their power stations between 1960 and 1980 however, the requirements for lining of the ash disposal facilities is new. This lining requirement poses new challenges to the operating methods of ash disposal facilities. With the introduction of a liner system the management of compartments becomes critical, as it will not be practical to line the entire facility on initiation as the risk of liner damage will be high. The number and sequencing of compartments have a direct impact on the layout and number of decant penstocks. For each of the alternative sites the different construction and lining options were investigated.

6.4 THE NO-GO ALTERNATIVE

This alternative presents that, in the case that the project does not take place, the power station will have to stop operating all together, since Eskom does not intend disposing of the ash generated illegally.

7 PROJECT DESCRIPTION

The proposed Camden Power Station Ash Disposal Facility entails the construction of an additional Ash Disposal Facility (ADF) as well as the construction of the required supporting infrastructure. The proposed ADF will provide the required additional storage capacity for the disposal of ash until 2028 plus a 5 year contingency period, and therefore up to 2033. As was mentioned in Part 1-2 of this document, a number of criteria was identified to select the most suitable site for the proposed ADF. The selected alternative sites which meet all criteria would in turn also determine the location and extent of the required supporting infrastructure. A detailed description and comparative assessment of all identified feasible alternatives is provided in Part 10 of this Final EIR. The Conceptual Enginering Report (see Appendix J) provides detailed information regarding the technical aspects of the proposed project including the following:

- Site Selection and Options Analysis;
- Cost Estimate / Trade Off Study;
- Operation and Maintenance Plan;
- Conceptual Design;
- Basis of the Design; and
- Water Balance.

The Conceptual Engineering Report was also used to populate the Project Description in this document.

7.1 PROJECT COMPONENTS AND LAYOUT

It is envisaged that the proposed Camden Power Station Ash Disposal Facility Project will consist of the following components:

- A suitably designed and lined ash disposal facility (wet facility) able to accommodate the ~17 years' (operational period from 2017 to 2033) worth of ash still to be generated by Camden Power Station;
- Clean and dirty water separation and containment facilities, including:
  - Ash Water Return Dam (AWRD), Pumpstation and trenches / drains;
  - Clean water diversion channels;
  - Dirty water diversion channels;
  - Storm water diversion canals and discharge; and
  - Monitoring boreholes;

- Installation of additional pipelines for the transportation of ash slurry to the Ash Disposal Facility (containment dam) and the replacement of existing pipelines;
- Return water pipelines from the the new AWRD leading back to the existing AWRR at the power station;
- Extension of the existing access roads around the facility, fencing around the facility and access control;

A simplified site layout plan for both Alternative 1 and 3 showing all of these project elements is included below as Figure 7-1 and Figure 7-2 respectively.

It should be noted that entire waste stream can be accommodated within a single facility on Site 1 whereas the topography requires that two facilities be constructed on Site 3 to accommodate the same volume of waste. Site 3 is therefore labelled Site 3A and Site 3B on diagrams and in the textual discussions below. The reader must note that both Site 3A and Site 3B will need to be built if Site 3 is selected as the preferred alternative.

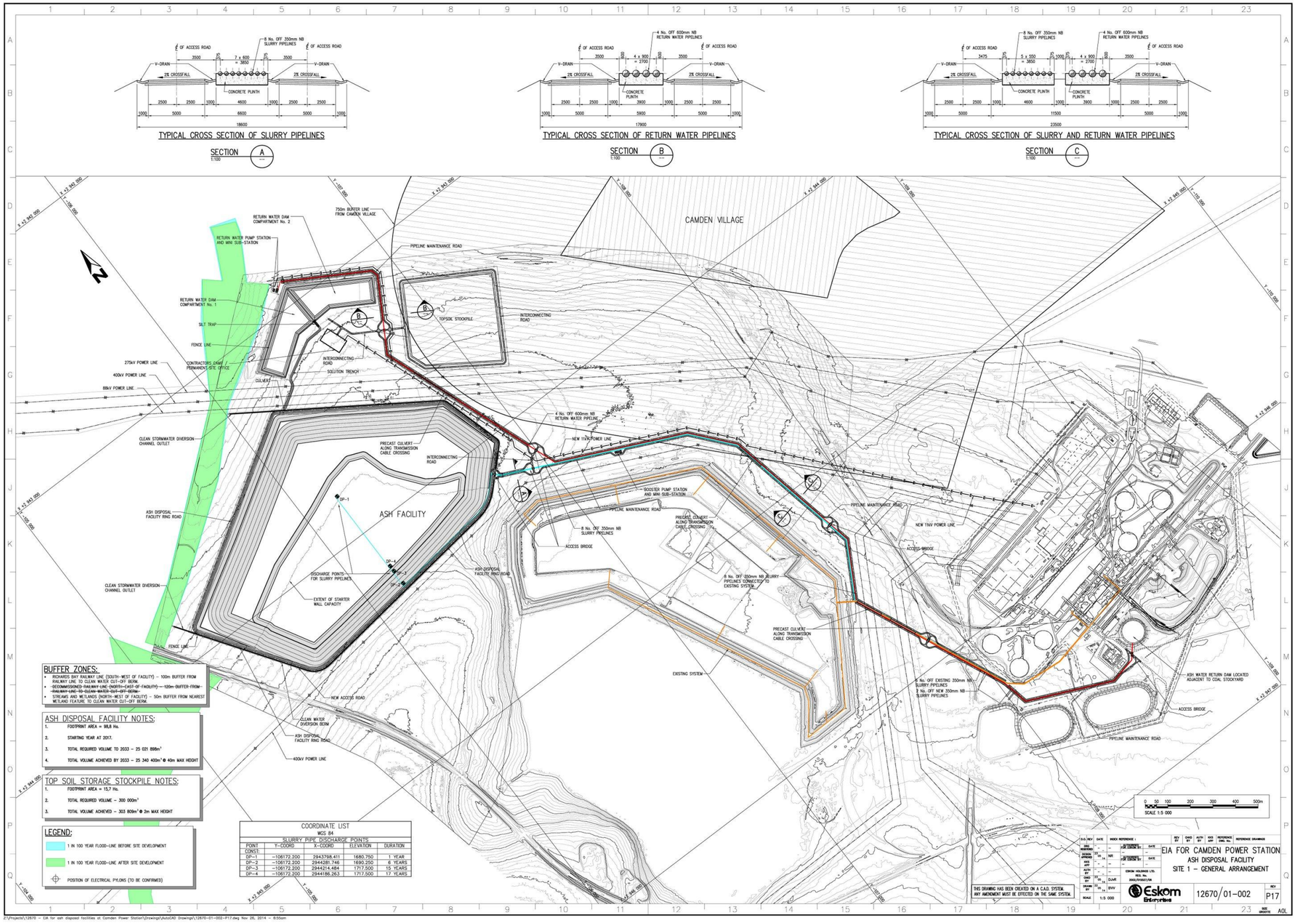

Figure 7-1: Camden Ash Disposal Facility Expansion Project Layout Map for Site 1

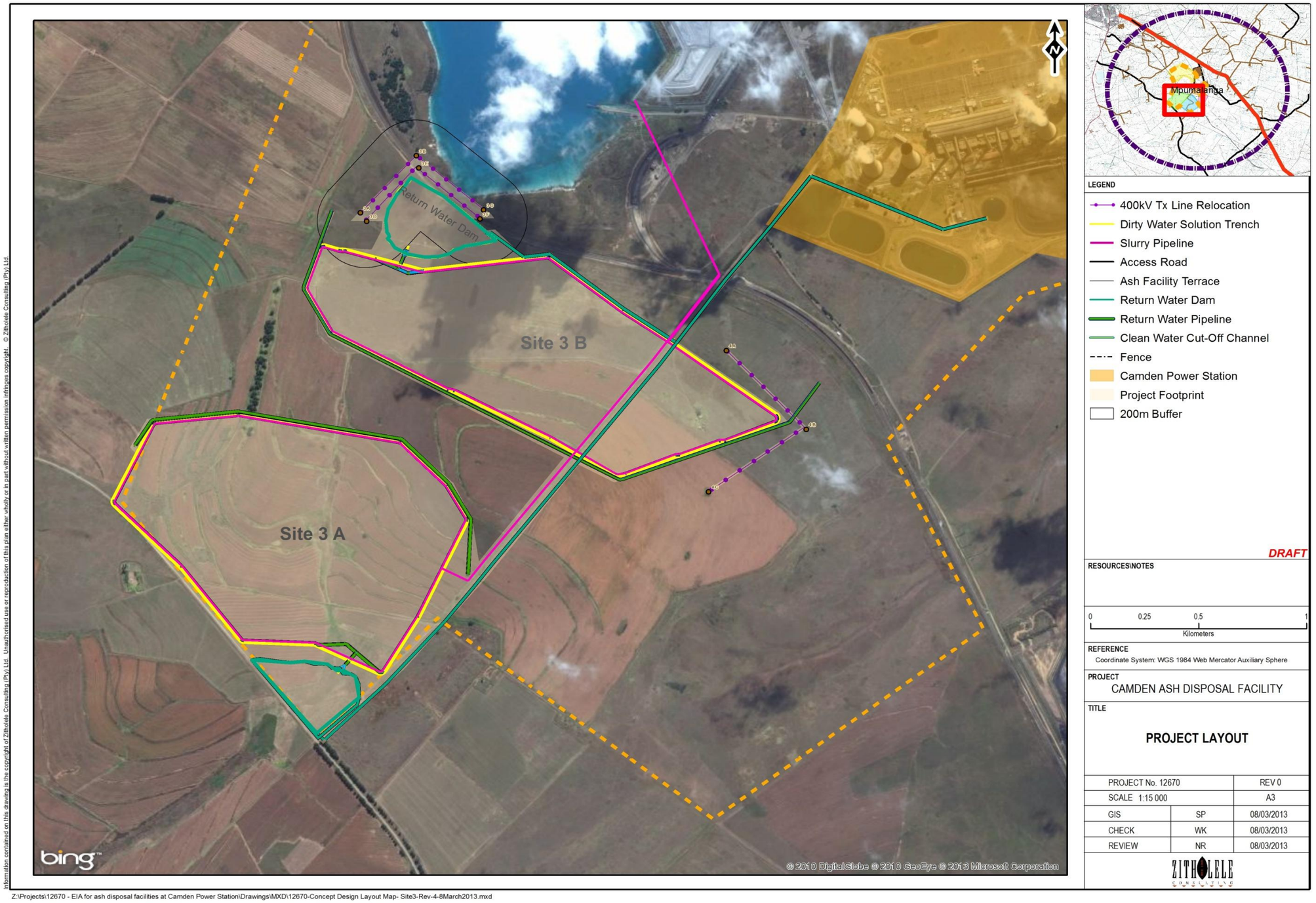

Figure 7-2: Camden Ash Disposal Facility Expansion Project Layout Map for Site 3

7.2 AFFECTED PROPERTIES AND LAND OWNERS

The properties and landowner details that will be affected at Site 1 and 3 are documented in Table 7-1. All properties that fall within the footprint of Site 1 and Site 3 as well as the corresponding land owners are shown in Figure 7-3.

Table 7-1: Properties and Land Owners Affected if Site 1 is developed for the Camden Ash Disposal Facility Expansion Project

Site	Farm Name	Portion No	Registered Land Owner
1	Uitkomst 292 IT	18	John James Lloyd
3A	Uitkomst 292 IT	10	Lodewyk Johannes De Jager
3A	Uitkomst 292 IT	2	Lood De Jager Trust
3B	Mooiplaats 290 IT	14	Willem Nicolaas Van der Wath

7.3 FOOTPRINT AND LIFESPAN OF THE FACILITY

The new ash disposal facility will need to cater for an estimated 25 million m^3 of ash up to 2033. Additional structures *inter alia* AWRD and channels, roads, construction camp, pipelines and fences will also increase the footprint of the project. A breakdown of the footprint of the project is shown in Table 7-2 and is represented graphically in Figure 7-1 and Figure 7-2 for each alternative respectively.

Table 7-2: Footprint (in hectares) of each site alternative for the Camden Ash Disposal Facility Expansion Project

Project Component	Site 1 (ha) With 750m buffer[6]	Site 3A +3B (ha)
Ash Disposal Facility	98,8 ha	323 ha
Ash Return Water Dam	9,7 ha	14,00 ha
Pipelines and pump station for slurry deposition	1,7 ha	2,76 ha
Pipelines for return water and pump station	1,9 ha	1,47 ha
Dirty water containment canals and trenches	3,1 ha	3,98 ha
Clean Stormwater Diversion Channel	0,9 ha	2,11 ha
Ash Disposal Facility Ring Road	2 ha	-
Pipeline Maintance Road	5,1 ha	-
Interconnecting Road	1,2 ha	
Areas between facilities and infrastructure	5,4 ha	34,00 ha
Total	**136,6 ha**	**396,01 ha**

Note: The overall reduction in the footprint with the redesigned Site 1 is ~20 ha or 10% of the total footprint. Although this footprint reduction is desirable the EAP has not reduced the significance of the impacts later in this report. It is the opinion of the EAP that the current impact assessment ratings would not be reduced sufficiently by this footprint reduction to affect the majority of the ratings. It is however pertinent to note that the redesign does not increase the impact footprint and does not result in increased impacts.

[6] Site 1 has been remodelled to include a 750m buffer zone between the village and the facility.

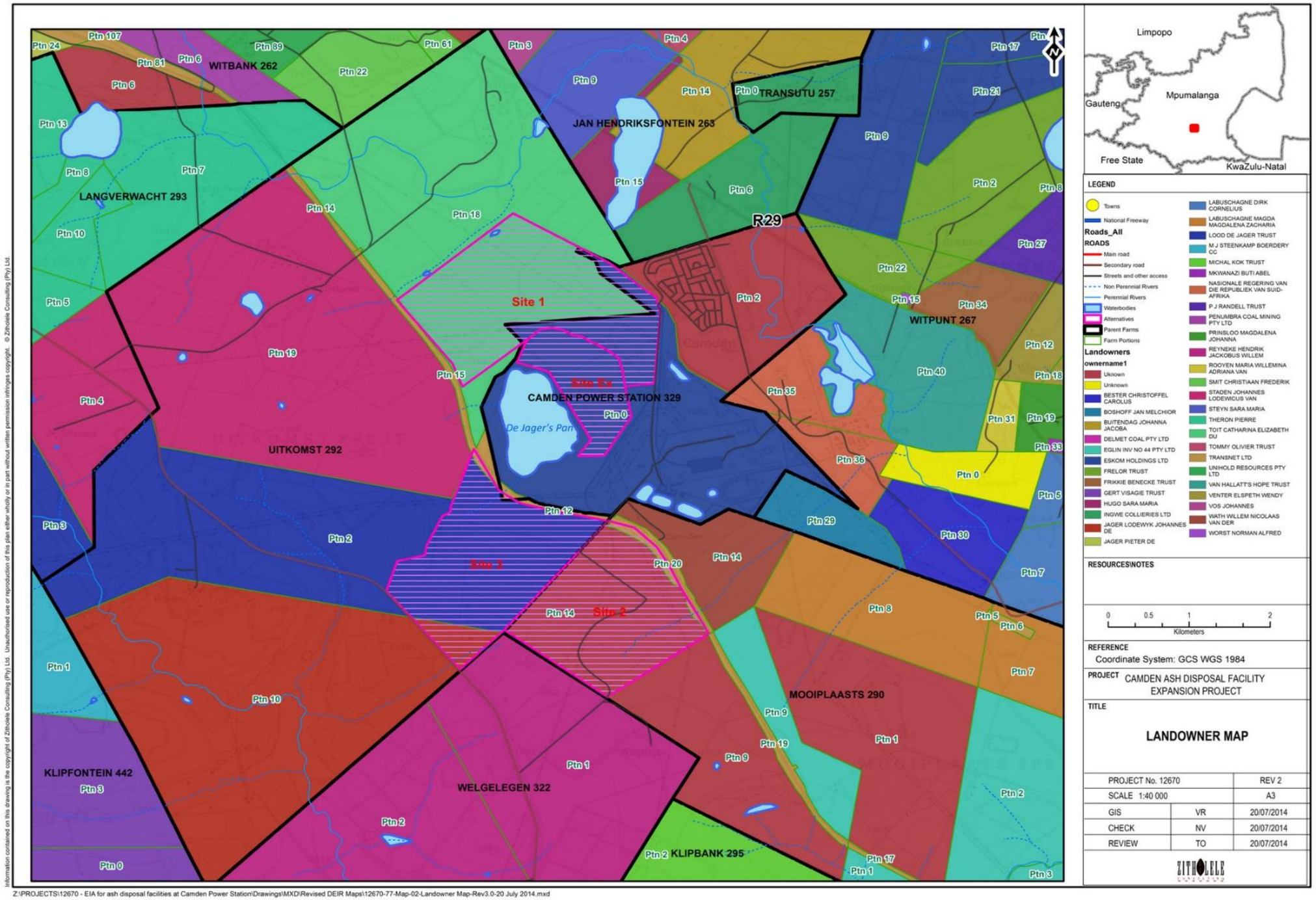

Figure 7-3: Land Owner Map

7.4 HEIGHT OF THE FACILITY

According to Eskom policy the height of a facility and the rate of rise are critical to ensure that an ash disposal facility is operated safely and efficiently. It is envisaged that the rate of rise will not exceed the current 3.5 m per annum. The new facility will be ~40 m high at its highest point once fully constructed. Figure 7-4 provides a photograph of the current disposal site from a high point in the terrain.

Figure 7-4: View of the sides of the existing ash disposal site

7.5 SOURCES OF WASTE

The following wastes (as depicted in Figure 7-6) are produced as part of the ash disposal processes at Camden Power Station:

- Fly ash and coarse ash, from the coal burning operations, which are disposed of at the ADF, through wet ashing processes; and
- Four streams of liquid effluent, being:
  - Cooling Water Blow-down;
  - Effluent from the demineralisation (Demin) Plant ;
  - Return water from the current ADF; and recently
  - Effluent from the Reverse Osmosis (RO) Plant.

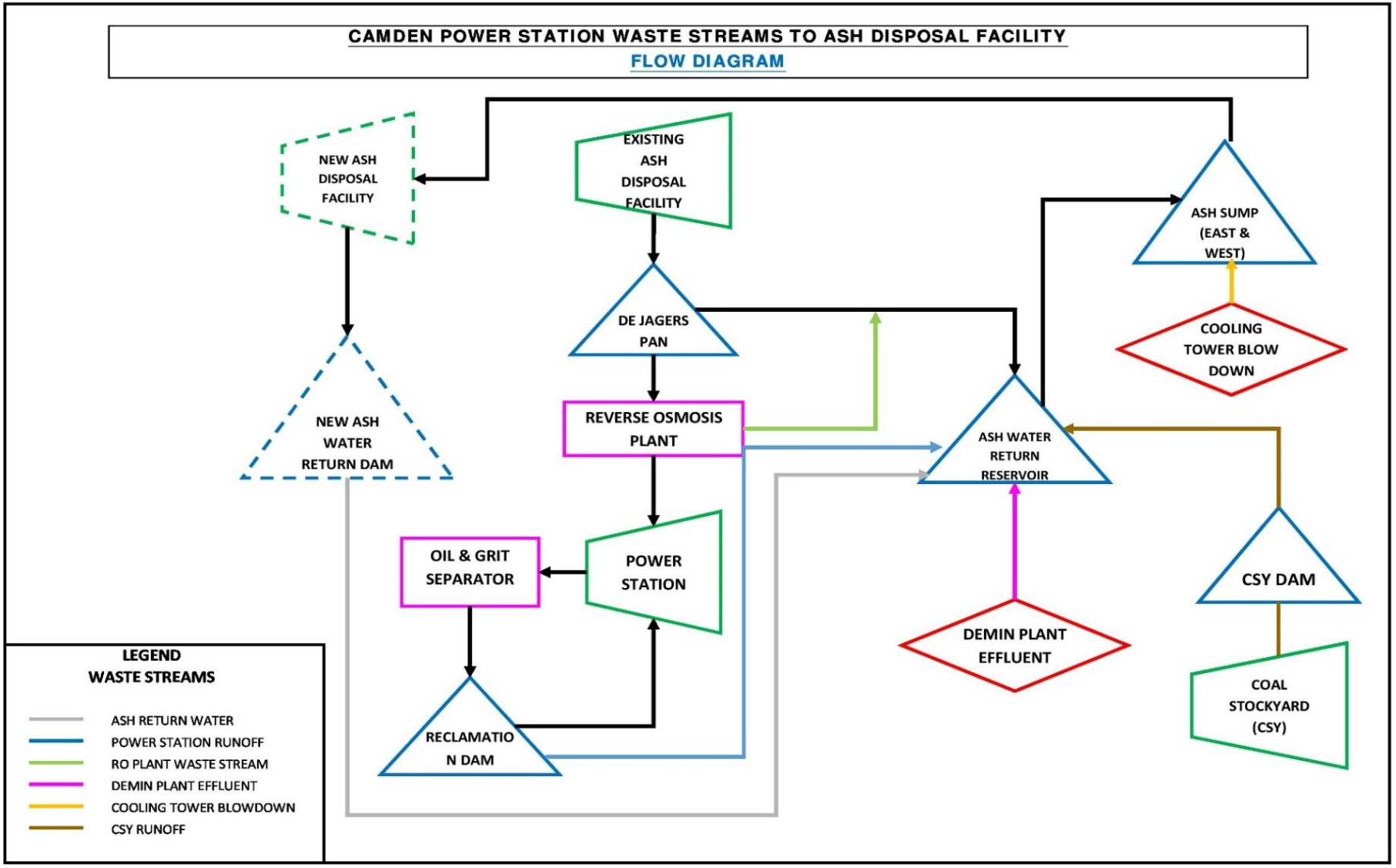

Figure 7-5: Schematic of waste streams at Camden Power Station. The Figure shows not only the current situation, but also the proposed scenario with the new ADF

Ash is generated at the Power Station, and is transported as wet slurry via pipelines to the ash disposal facility for disposal. The wet ash, in slurry form, is pumped to the ash disposal facility, where ash water is evaporated, stored or overflows via penstocks. The ash water that overflows drains to the De Jagers Pan. The de Jagers Pan also receives clean water from the catchment. The water from De Jagers Pan is transported to the Ash Water Return Reservoir (AWRR) on site. Refer to Figure 7-6.

Some of the ash water at De Jagers Pan is abstracted and treated at the RO plant, producing clean water and effluent waste stream (concentrated ash water). The clean water from the RO plant is taken to the power station where it is re-used in the cooling water processes. The effluent waste stream (concentrated ash water) from the RO plant is also pumped back to the station ash water high level reservoir (Ash Water Return Reservoir, AWRR) on site. This effluent waste stream and return water from De Jagers Pan is used for ash transportation from boilers and dust hoppers. The effluent from the RO plant therefore forms an integral part of the closed system of ash water used for transportation of ash slurry to the ash disposal facility.

It should be noted that the effluent is originally generated as ash return water from the ADF. Therefore, the effluent sent back to the ADF as an ash carrier medium originates from the same closed system as the ash return water coming off the ADF.

Figure 7-6: Transportation (red) and disposal (yellow) at current ash disposal facilities.

7.6 VOLUMES OF WASTE

7.6.1 Ash Volumes

The volumes of ash vary from month-to-month, however a detailed register of all the ash disposed at the existing facility is kept at the power station. The current site is authorised to receive a maximum of 3 421 000 m^3 of slurry a year. It is anticipated that the new site will have to take the same consistency and composition of ash for the remaining operating life of the Camden Power Station until 2023 plus a 10 year contingency period, and therefore up to 2033.

7.6.2 RO Plant Effluent Volumes

Once the treatment plant is operational at 85% recovery rate, it will produce ~500 m^3 of effluent per day. This volume of effluent waste stream is considered negligible at 5% of the total waste stream per annum to be disposed of on the proposed ash disposal facility, and will only constitute a total of 4.25% of the total waste stream over the 17 year life of the facility.

7.7 WASTE CHARACTERISATION

Waste classification was done through the NEM:WA Waste Classification and Management Regulations (GNR 634 – GNR 636, August 2013) and National Norms and Standards for Storage of Waste on Land (GNR 926, August 2003), as described in sections below. Refer to the Engineering Report (Appendix J) for the Waste Classification report and laboratory results.

7.7.1 National Norms and Standards for disposal of waste to landfill

The National Norms and Standards for the disposal of waste for landfill under Section 7(1)(c) of the NEM:WA (2008) was published in Government Notice No. R636 on 23 August 2013. The National Norms and Standards for Disposal of Waste to Landfill stipulates the requirements for disposal of waste to landfill, including:

- Landfill classification and containment barrier design;
- Waste acceptance criteria for disposal to landfill; and
- Waste disposal restrictions.

7.7.2 National Norms and Standards for the Assessment of Waste for Landfill Disposal

The National Norms and Standards for the Assessment of Waste for Landfill Disposal made under section 7(1)(c) of the NEM:WA (2008) was published in Government Notice No. R.635 on 23 August 2013. The National Norms and Standards for the Assessment of Waste for Landfill Disposal prescribes the manner in which waste must be assessed for the purposes of disposal to landfill with reference to Total Concentration analysis and Leachable Concentration analysis and allowable Total concentration in mg/kg (TC) threshold limits and Leach concentration in mg/ℓ (LC) threshold limits.

7.7.3 Waste Classification and Management Regulations

The Waste Classification and Management Regulations, published in Government Notice No. R.634 on 23 August 2014, in terms of the NEM:WA (2008), provides specifications relating the following:

- Provides for the classification and management of waste;
- Establishes a mechanism for the listing of waste management activities that do not require a waste management license;
- Prescribes the requirements for the disposal of waste to landfill; and
- Prescribes general duties of waste generators, transporters and managers.

7.7.4 Waste Classification of the proposed Ash Disposal Facility

The Waste Classification system used for the ash and ash disposal site leachate samples collected was provided for in Government Notice No. R.634, 635 and R.636 and focuses on the long term disposal of waste (longer than 90 days) on land or waste disposal facilities. The system is based on the Australian State of Victoria's waste classification system for disposal, which uses the Australian Standard Leaching Procedure (ASLP) to determine the leachable concentrations (LCs) of pollutants (DEA, 2011a).

Camden Power Station supplied representative samples of dry ash, two wet ash samples, namely a fine ash [dusting ash] and coarse ash [ashing ash], and ash disposal site leachate (toe seepage water). The samples were then sent to the SGS Laboratory in Randburg for various leach analyses, total concentration (TC) determination and quantitative x-ray diffraction (XRD) analysis to determine the mineralogy.

The SGS laboratory subjected the dry ash to a Minimum Requirements' Acid Rain Leach Procedure (ARLP). The ARLP leach procedure was used in the 1998 Minimum Requirements waste classification system where a waste is mono-disposed or stored or

where it is co-disposed with other inorganic waste types not containing any decomposable compounds.

The dry ash sample was also subjected to a total extraction procedure in order to determine the TCs of the various elements.

In addition, the dry ash sample was subjected to a XRD analysis to determine the mineralogy.

Following the new DEA assessment system for the mono storage and disposal of a waste, solids were firstly separated from the liquid fraction and the percentage solids determined. The solids fractions were then subjected to a deionised (DI) (South African Standard Leach Procedure) water leach test, whereafter the leach solution was analysed for various metals and other inorganic constituents. The water fractions of the two wet ash samples were also analysed for the various metals and inorganic constituents listed in the National Norms and Standards. The organic components listed in the National Norms and Standards were not analysed for, as it is highly unlikely that organics will occur in the wet ash at concentrations above the LCT0 and TCT0 values of the National Norms and Standards.

The two wet ash samples provided were termed dusting ash, that is the fine ash-water mixture used to develop the outer walls of the current ash disposal facility, and ashing ash, the coarse ash-water mixture. The coarse ash is deposited in the middle of the ash disposal facility. It is noted that the effluent from the RO plant is added to the ash water system.

A sample of leachate collected at the toe of the ash disposal facility (seepage water) was also analysed for various inorganic constituents.

Although a sample of effluent from the RO plant was requested for analyses at the time, the plant was not operative on the day that the ash samples were collected. Theoretical values for the various constituents of concern were provided by Eskom Camden Power Station and these values were used in the initial classification. However, for this updated classification, Mrs I. Hodgson of the Camden Power Station provided some analyses performed on the RO plant effluent on 20 February 2014 and also determined the conductivity of the effluent on 20 February 2014. The conductivity of the effluent was verbally reported as 3 309 µS/cm (330.9 mS/m). For the assessment of the effluent, the 70% water recovery rate results were used, which provides a more concentrated effluent, therefore the more conservative scenario was used for the assessment. In addition, the RO plant effluent was analysed in November of 2012 by Waterlab for a different waste assessment exercise and that analytical information has now also been used in this assessment.

For the assessment of the wet ash in terms of the DEA's National Norms and Standards the analytical results from the ARLP were ignored. Only the results obtained from the DI water leach and the TCs were used for the assessment of the wet ash.

Wet Ash

In order to assess the wet dusting ash (fine ash) and wet ashing ash (coarse ash) for disposal, the percentage contributions of the concentrations of the constituents in the liquid fractions (which also contains a percentage of RO plant effluent) and the leach concentrations were calculated based on the percentage liquids to solids. This method is in line with the Australian leach procedure methodology, which was adopted in the South African National Norms and Standards.

Based on the corrected concentrations, both the dusting and ashing ash are assessed as Type 3 wastes.

In addition, the concentrations of the listed constituents were also determined on the ash seepage water collected at the base of the existing ash disposal facility. Based on these concentrations, the ash is also assessed as a Type 3 waste. It is noted that the TDS of the seepage water (764 mg/ℓ) is significantly lower than the average TDS of the dusting and ashing ash water fractions (1 424 mg/ℓ). The ash has a significant adsorption capacity for certain salts, while significant amounts of calcium sulfate will also precipitate out in the ash body.

Type 3 wastes should be disposed of on waste disposal facilities with Class C landfill barrier systems.

RO Plant Effluent

Based on the theoretical and actual concentrations provided for the RO plant effluent, the effluent is classified as a Type 3 liquid waste. The effluent is classified as a Type 3 waste due to the concentrations of TDS, chloride, sulphate, fluoride, lead, boron, total chromium, chromium VI, molybdenum and selenium being above their respective LCT0 values.

7.7.5 Waste Classification Conclusions and Recommendations

In terms of the DEA's National Norms and Standards, the Camden ash was subjected to a TC extract and DI water leaches. Two samples were used in the assessment, namely dusting ash (fine ash) and ashing ash (course) ash. In addition, the water leaching from the base or toe of the existing ash disposal facility was also analysed and compared to the respective LCT values. The seepage water was therefore also classified in terms of the National Norms and Standards, as it is seen as the actual risk posed by the ash disposal facility to the receiving environment.

The DI water leach scenario is applicable in the case that ash is mono-disposed or stored in the environment at a permanent storage facility, i.e., the waste is stored for longer than 90 days. Based on the DI water leach results, and taking the concentrations of the water

fractions of the wet ash samples into account, both the dusting and ashing ash samples are classified as Type 3 wastes requiring disposal on a landfill with a Class C barrier system.

This barrier system is considered appropriate for the wet ash disposal facility provided the drainage layer on top of the barrier system contains drainage pipes of adequate size, spacing and strength to ensure atmospheric pressure within the drainage application for the service life of the ash disposal facility (DEA, 2013b). It should be noted that the National Norms and Standards require that the disposal of liquid waste must be phased out over a period of six years from the date that the National Norms and Standards were promulgated. If the authorities insist on this approach, it may have significant cost implications for the Camden Power Station, which was not designed as a dry ash power plant. Therefore it is recommended that agreement be reached with the authorities on the long term management scenario of the ash disposal facility prior to the barrier system being designed.

The RO plant effluent is also classified as a Type 3 waste. This effluent is added to the ash water circuit. A Class C landfill barrier is considered appropriate for the wet ash and RO plant effluent disposal facility. As with the wet ash only disposal scenario, it is a requirement that liquid waste should be disposed of in hazardous lagoon facilities, but provided that the drainage layer on top of the Class C barrier system contains drainage pipes of adequate size, spacing and strength to ensure atmospheric pressure within the drainage application for the service life of the ash disposal facility, the adding of the RO plant effluent into the ash water circuit scenario is considered appropriate.

It has been shown that ash has significant capacity to adsorb and precipitate salts, which is also the case at Camden. The TDS of the ashing water (average of the dusting and ashing ash water fraction values is 1 424 mg/ℓ) has a significantly higher TDS value than that of the seepage water reporting at the toe of the existing wet ash disposal facility (764 mg/ℓ). The adding of the RO plant effluent into the ash water circuit can therefore be regarded as treatment of the RO effluent and the ash carrier water itself.

It is important to note that the disposal of brines or wastes with a high salt content (TDS >5% [5grams per 100ml]) and a leachate concentration for TDS of more than 100 000mg/l needs to be phased out with eight (8) years from the date of promulgation of the National Norms and Standards (DEA, 2013b). However, the effluent from the RO plant at Camden has a TDS of only 2 150mg/l (0.215% [0.215 grams per 100 ml]), therefore it does not comply with the definition of a brine as given in the National Norms and Standards. Therefore the requirement of phasing out the disposal of the Camden RO plant effluent is not applicable as the TDS is lower than 5%. In addition, the RO plant effluent is added to the ash carrier water system and as a result a significant percentage of the salt is absorbed/precipitated in the ash body itself.

7.7.6 Barrier System Design

It should be noted that ash disposal facilities are not a new solution for ash management and Eskom has developed this technology for a number of their power stations between 1960 and 1980, however, the installation of a barrier system or "lining of the ash disposal facilities" is a new requirement (since 2008). This poses new challenges to the operating methods of ash disposal facilities. With the introduction of a barrier system the management of compartments becomes critical, as it will not be practical to install the barrier system for the entire facility on initiation as the risk of liner damage will be too high. The liner may be protected by placing of a layer of material on top of it or by constructing temporary roads on top of the liner. This will however be finalised during the detail design phase. This is discussed in more detail in Section 8.2.11 of this report, which details the installation of the barrier system.

In addition the design of the barrier system is determined by the classification of the waste, as discussed in summary in Section 7.7.4 above, and in more detail in the Waste Classification Report (attached as Appendix J).

The design specifications for the barrier system will also differ, depending on the classification

7.8 CLEAN AND DIRTY WATER SEPARATION AND CONTAINMENT INFRASTRUCTURE

7.8.1 Clean Water Separation Infrastructure

An upstream concrete lined channel shall be constructed to divert clean water around the proposed facility and discharge into the natural environment. The channel will be sized to accommodate the 1:100 year storm event. The sites have been positioned such that the "clean" area between the natural watershed and the proposed facility is as small as possible. The proposed sizes of the trapezoidal channel, with side slopes of 1.5:1 (h:v) and base width of 1 m, required for each alternative site are listed in Table 7-3. The location of the proposed clean water diversion channel is shown on Figure 7-1 and Figure 7-2 for each alternative sites, respectively. The channels will be concrete lined in order to facilitate cleaning. The slope of the channels for Sites 3A and B are marginally steeper than that of Site 1.

Table 7-3: Sizing of Clean Water Diversion Trench

Site No	"Clean" Area (ha)	Flow Rate (m^3/s)	Channel Length (m)	Slope (%)	Channel Height (mm)	Channel Top Width (mm)
1	15.8	2.4	450	0.78	500	2500
1	5.6	0.833	623	1.18	260	1800
1	6.0	0.9	295	0.78	300	1900
1	6.0	0.9	306	0.76	300	1900
1	23.4	3.5	590	2.00	480	2400

Site No	"Clean" Area (ha)	Flow Rate (m^3/s)	Channel Length (m)	Slope (%)	Channel Height (mm)	Channel Top Width (mm)
3A	13.1	10.1	1700	3.69	700	3100
3B	28.2	11.4	1800	4.71	700	3100
3B	27.5	10.4	1200	3.92	700	3100

7.8.2 Dirty Water Containment Infrastructure

Solution trench

Dirty water run-off generated off the side slopes of the ash disposal facility will drain into a suitably sized "solution trench" running around the facility. This trench will be designed to receive and convey run-off generated after a 100 year storm event. The solution trench will also receive discharge from the leachate collection system and this flow has also been included in the sizing of the infrastructure. Conceptual sizes of the trapezoidal channels, with side slopes of 3:2 (h:v) and base width of 1 m, required are listed for each alternative in Table 7-4. The location of the proposed dirty water trenches is shown in Drawing 12670-02-002-A-P11 included in Appendix C of the Conceptual Engineering Design Report (included as Appendix J of this FEIR).

Table 7-4: Sizing of Solution Trenches

Site No	Channel ID	Flow Rate (m^3/s)	Channel Length (m)	Channel Slope (%)	Channel Height (mm)	Channel Top Width (mm)
1	A	33	450	0.78	1800	6400
	B	33	590	2.00	1500	5500
	C	33	1 021	0.59	1900	6700
	D	33	623	1.18	1600	5800
	E	33	295	0.78	1800	6400
	F	33	306	0.76	1800	6400
	G	33	753	1.11	1600	5800
3A	A	6.3	1,700	5.51	500	2,500
	B	13.7	800	3.92	800	3,400
	C	5.9	580	4.83	500	2,500
	D	3.4	730	1.60	500	2,500
3B	A	7.5	1,300	3.80	600	2,800
	B	2.6	400	2.21	400	2,200
	C	6.6	700	2.94	600	2,800
	D	16.9	1,150	3.64	900	3,700
	E	22.9	570	4.26	1,000	4,000
	F	10.5	350	3.99	700	3,100

Ash Water Return Dam

Water draining from the deposited wet ash will be recycled via a system consisting of an Ash Water Return Dam (AWRD) and drains that collect the runoff from the ash disposal facility (containment dam) prior to pumping the water to the power station or via the RO plant for treatment or reuse.

For the foreseeable future water from the current AWRD will be sent to the RO Plant, where it will be treated, clean water will be sent to the power station for reuse; while effluent (concentrated ash return water) will be combined with the ash slurry for transportation of ash to the proposed ash disposal facility. As a barrier system will be installed at the new facility it is predicted that no water will be lost through seepage, but may be lost through evaporation, and as such a closed loop system is formed. The placement and size of the AWRD and associated infrastructure is shown in Figure 7-1 and Figure 7-2 for each alternative respectively, and detailed sizing is provided in Table 7-5.

All dirty water run-off generated within the footprint area of the waste disposal facility will be captured in the new AWRD. Although Government Notice 704 (GN704) stipulates that the AWRD shall be sized to accommodate the 50 year 24 hour storm event, this stipulation is based on the assumption that the AWRD is empty prior to such a storm event. However, this is rarely the case and a more realistic approach should be adopted. It is Best Practice to undertake continuous modelling (a daily time step model) of the system in order to ascertain a more realistic capacity of the dam. This method takes into account the operating philosophy of the facility as well as any abstractions from the dam including evaporation and was applied to Site 1 only (Preferred Alternative) (refer to Table 7-3: Sizing of Return Water Dam).

For the remaining sites (3A and 3B) the assumption was made that the New AWRD will be 25% full prior to the 1 in 50 year storm event. The proposed sizes of the AWRD for each of the proposed options for this method which complies with the requirements of GN704 is provided in Table 7-7. At a later stage detailed design engineering will be undertaken.

Table 7-5: Sizing of Return Water Dam

Site No	"Contaminated" Area (ha)	Crest Height (mamsl)	AWRD Size (m^3)
1	99.0	1669.00	300,000
3A	162.3	1 669,80	153, 400
3B	214.5	1 682,55	180, 600

Stormwater captured at the Ash Dam pool level will be conveyed to the new AWRD via penstocks. The penstocks and the discharge pipes will be designed such that the flow is attenuated at the pool level and drained over a 24 hour period (with two penstock inlets in operation) to the new AWRD.

A silt trap will be installed to remove silt from the decanted water before is enters the lined new AWRD. The amount of silt in the water will need to be determined and will provide input into the detailed sizing and cleaning frequency of the silt trap. Although the liner requirement for the New AWRD is the same standard as for the Ash Disposal Facility, leachate collection drains will not be provided for the AWRD. A well prepared and compacted base is essential for the liner. The new AWRD has two (2) equal compartments to facilitate maintenance.

7.8.3 Leachate Collection and Management

The leachate collection system will comprise of a toe drain as well as a main drain system. A leachate collection system will be designed such that a maximum leachate head of 300 mm will be maintained over the liner system. The leachate will be drained to the solution trench, discussed below, which ultimately discharges to the new AWRD. The solution trench and AWRD is shown in Figure 7-1 and Figure 7-2 for each alternative respectively.

The leachate collection system will be designed using a 160mm geopipe covered with 19mm stone wrapped with Grade A4 bidim. This will be located above the liner system. The permeability of the leachate collection system varies between 3m to 20m per year. Based on this, a conservative drainage rate of 5mm/h was assumed in order to determine the size of cuspated drain required for the leachate collection system. Conceptual flows draining to the new AWRD via the solution trenches indicated in the previous section (Section 7.8.2 of this report) is indicated in the Table 7-6 below.

Table 7-6: Leachate Flow Rates

Site No	Max Area for Leachate (ha)	Flow Rate (m^3/s)
1	99	1.4
3A	101	1.4
3B	92	1.3

7.8.4 Surface- and Groundwater monitoring

Existing surface- and groundwater monitoring

Camden Power Station undertakes routine water quality monitoring, which is currently outsourced to an independent cosultancy (GHT, 2014). The monitoring sites at Camden Power Station have been classified according to their location relative to the infrastructure and natural streams or drainage systems in the environment. All the activities at Camden Power Station drains along three small streams towards one major stream, the Witpint Spruit, east of the power station. The Witpunt Spruit drains into the Vaal River approximately 5 kilometres downstream from the power station. These three effected sub drainage and one major drainage systems or streams are described as follows:

- Sub Drainage System 1: Witpunt Spruit Northern Tributary
- Ash Dam Complex Eastern Drainage System

- Power Station Area North-western Drainage System
- SANDF Village Area South-eastern Drainage System
- Sub Drainage System 2: Witpunt Spruit Central Tributary
- Power Station Area North-eastern Drainage System
- Sub Drainage System 3: Witpunt Spruit Southern Tributary
- Power Station Area - Eastern Drainage System
- Coal Stock Yard Area – Southern and Eastern Drainage Systems
- Major Drainage System 1: Witpunt Spruit
- Witpunt Spruit East of Power Station
- Vaal River approximately 5 km downstream from Power Station

Nine different types of monitoring sites were identified. These different types of monitoring sites are:

- Groundwater sites (labelled B),
- River or natural stream sites (labelled R),
- Canal or trench sites (labelled C),
- Sewage effluent or discharge sites (labelled K),
- Pan or dam sites (labelled P),
- Seepage sites (labelled S),
- Sump sites (labelled T),
- Auger holes and Dugged trenches (labelled D) and
- Other sites (labelled Z).

Refer to Figure 7-8 for a map of the exisiting monitoring points for Surface Water and to Figure 7-9 for a map of the groundwater monitoring points.

Camden Power Station should continue to monitoring the existing sampling points to determine the direction of pollution plume and incorporate mitigation measures. New sampling positions should be identified, by a specialist, for the new facility. The new monitoring positions should take in consideration the specialist studies conducted during the the EIA process. These points need to be sited in such a way as to ensure that they are not damaged or destroyed during construction.

Camden Power Station should incorporated the new sampling points into the Camden Power Station water monitoring plan and ensure that these points are sampled prior to

construction to ensure a proper baseline is determined. The extended sampling network shall ensure proper monitoring of the plume at the new and existing facility and will provide valuable information for rehabilitation and mitigation.

Proposed surface- and groundwater monitoring

A system of groundwater monitoring points is proposed to be installed to cover the new facilities. The responsibility for the monitoring of the water quality will remain with the environmental section of the power station. The monitoring frequency is currently three monthly on the existing facility, but will be increased if a deterioration in the water quality (i.e. increase in pollution levels) is detected. The changes in the monitoring programme will also be informed by the station's Water Use Licence (WUL) requirements. The location of monitoring points covering the existing ash disposal facility are shown in Figure 7-7 and Figure 7-8

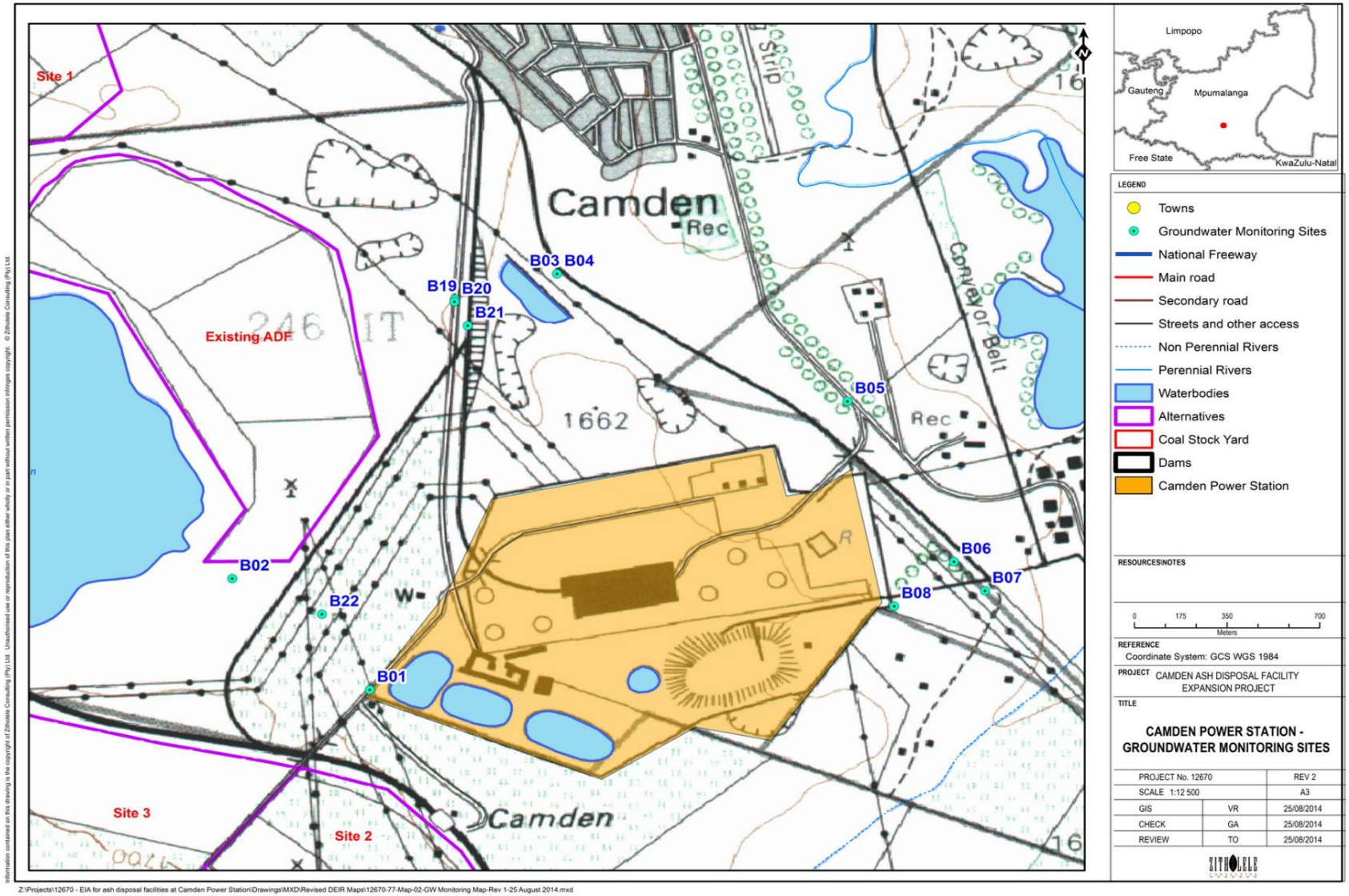

Figure 7-7: Existing Groundwater Monitoring Network

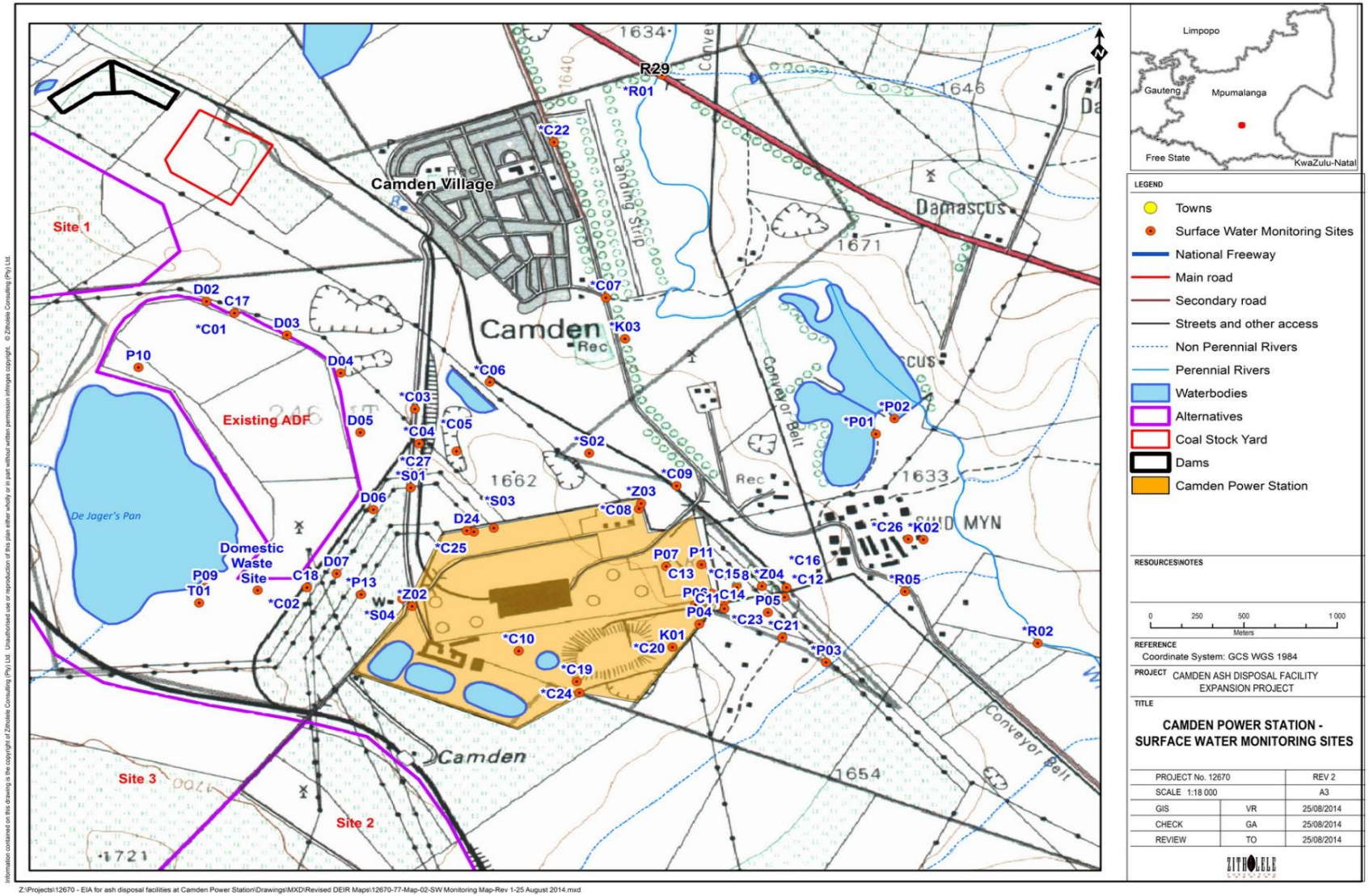

Figure 7-8: Existing Surface Water Monitoring Network

7.9 PIPELINES

7.9.1 Slurry pipelines

Currently six (6) 300NB slurry pipelines leave the existing ash sumps located on the power station terrace to the existing Ash Disposal Facility. The six (6) existing 300NB pipelines will be replaced with six (6) 350NB pipelines.Two (2) additional steel pipelines, 350mm in diameter, will be installed parallel to the six (6) replaced pipelines from the existing ash sumps to the take-off point to the new ADF, for redundancy. Slurry pipelines to the existing facility's discharge point will be discontinued once the facility has reached its capacity. The sections of the existing pipeline no longer required will be dismantled and the areas affected will be rehabilitated. The pipelines will be extended from the existing pipeline route to the new facility by the 350 mm diameter steel pipelines. Eight (8) pipelines are required in total, with six (6)-operational at any given time. The pipelines will convey a total combined flow of between 950 m^3/hr. All pipelines will be installed above surface and fixed to concrete plinths. A booster pump station, accommodating eight (8) pumps and having an estimated footprint area of 100 m^2, will be constructed immediately downstream of the take-off point.

The length of the new pipelines is approximately 3.0 km each. The two (2) new steel pipelines constructed parallel to the six (6) existing pipelines from the ash sumps to the take-off (T-off) point is approximately 1.5km in length each.

7.9.2 Return water pipelines

The existing ash return water pipeline from De Jagers Pan will need to remain in place after the existing facility has reached its design capacity. This will be required in order to manage stormwater that either runs off the contaminated terrain and side slopes of the existing facility or any stormwater that recharges through the facility before it is capped.

Four additional 600 mm diameter steel pipelines are proposed for the ash return water pipeline. The proposed pipelines will extend from the proposed AWRD back to the existing AWRD at the Camden Power Station across a distance of 4.8km. The aforementioned access roads will also serve as the access roads to the new ADF and to the new AWRD. The pipeline will be installed above surface and fixed to concrete plinths. A total combined flow of 2,100 m^3/hour will be conveyed by these pipelines to the Ash Water Return Dams located on the power station terrace. The pumps for these pipelines will be located within a new pump station located adjacent to the return water dam and will be able to accommodate seven (7) pumps, four (4) duty and three (3) standby. A mini electrical sub-station will also be accommodated adjacent to the pump station. Both the pump station and the mini sub-station will cover a footprint area of approximately 100 m^2. Each of the above set of pipelines will have five (5) metre wide access roads on either side for its entire length. This will facilitate maintenance of the pipelines.

The length of the return water pipelines for Site 1 will be 5,2 km by comparison to the 7,27 km of pipelines to be used for Site 3. The placement of these pipelines is shown on Figure 7-1.

7.10 ACCESS ROADS, FENCING, AND ACCESS CONTROL

The existing access roads will be extended to provide access to the proposed Ash Disposal Facility and associated infrastructure. The current access road is located on the eastern side of the existing Ash Disposal Facility and a road leads to the AWRD (to the west of it). The current gravel access road is in a fair condition and does not require any upgrade. It is proposed to link the new roads to the existing roads. To allow vehicle access a 5 m step-in is proposed on the Ash Disposal Facility. The proposed access road will consist of a gravel base with a stabilised wearing course.

In order to ensure safety and to prevent illegal dumping into the site, the site will be secured by means of a 1,8 m high diamond mesh fence along the entire perimeter. Access will be gained through an access control point monitored by a security guard. This person can also be the existing security guards on site. Access can also be managed through station access processes.

A new access road to the facility will be constructed for vehicle access. This new road will be taken from the existing site access road, and will circumvent the entire facility, located at the toe of the ash disposal facility. The road will have no servitude. The proposed access road will consist of a gravel base with a stabilised wearing course.

7.11 RELOCATION OF TRANSMISSION LINES AND OTHER INFRASTRUCTURE

The preferred site, Site 1, was revisited in order to determine services that may need to be relocated in order to accommodate the proposed Ash Disposal Facility. No pipelines were observed within the footprint of the preferred site alternative (i.e. Site 1) and the existing roads were restricted to informal tracks which will not need to be relocated. The construction of the Ash Disposal Facility at the preferred site alternative (i.e. Site 1) will not require the relocation of any electrical transmission lines. Pipelines, roads and channels will pass underneath existing transmission lines. Preliminary cross sections of the proposed infrastructure which will pass underneath existing transmission lines also indicating clearances, are included as Appendix C of the Conceptual Engineering Drawings (refer to Appendix J of this FEIR).

7.12 CONTRACTORS CAMP

A contractor's camp of 50m x 50m (2500 m^2) will be established. The contractor's camp will be for:

- The location of the contractors site office and first aid station (containers, park-homes or similar type structure that can be removed will be used);
- Parking of vehicles (including heavy vehicles for construction purposes);
- Storage of equipment and construction materials;
- Safe storage of dangerous goods (including hydrocarbons and chemicals that may be required during construction, that will be stored in properly designed, ventilated, secured, and bunded storage facilities). The volume of dangerous goods that is stored at the contractors camp should not be below the thresholds stipulated in the listed activities contained in Government Notice No. R544, R.545 and R.546.;
- Storage of potable water (a jojo tank or similar type temporary structure of about ~2000 litres will be installed for the duration of the construction phase); and
- Temporary ablution facilities will be established that consist of portable toilets or a conservancy tank will be used.

This contractors camp will be used for the life of the facility and only decommissioned and rehabilitated once the entire ash disposal facility is finally rehabilitated or as may be deemed not necessary.

7.13 REHABILITATION OF THE ASH DISPOSAL FACILITY

The permit / license for the existing ash dam require rehabilitation of the facility through capping with soil material in order to cover the waste, and successful re-vegetation of rehabilitated areas of the site. This process has to date been very successful as illustrated in Figure 7-9 below, and the current practice will be continued regardless of which site is selected for development. The rehabilitation of the Ash Disposal Facility will entail the following overarching steps:

- gradual stripping and stockpiling of topsoil;
- gradual shaping of side slopes and top of the facility;
- gradual spreading of topsoil to cover shaped the facility side slopes and top surface;
- planting of grass for erosion control on prepared slopes;
- establishment of veld grass on the prepared areas;
- establishment of indigenous trees and shrubs; and
- monitoring of rehabilitated areas to ensure continued stability and eventual self sustainability and implementing corrective measures (where required).

The methods for rehabilitation of the facility are addressed in more detail in the Conceptual Engineering Report, and operationalized through the draft EMP and the draft Operations Manual for the Camden Ash Facility Expansion project.

Figure 7-9: Rehabilitation on the existing ash disposal site in the foreground

On rehabilitation of the slopes, runoff is still captured in the WRRD. The water will be analysed for acceptability to discharge standards. If compliant, this water will be discharged to the environment. If not compliant, it will be returned to the AWRD

8 DESCRIPTION OF DEVELOPMENT ACTIVITIES

The construction, operation and closure activities of this project are discussed below according to the following phases: Pre-construction; Construction and Remediation; Operation and Consecutive Rehabilitation; Decommissioning and Closure of the Facility.

8.1 THE PRE-CONSTRUCTION PHASE

8.1.1 Land Purchases and Negotiation

Eskom is the land owner of a number of properties that fall within the development footprint. The land owner for each of the properties that fall within the development footprint as well as adjacent properties are shown in Figure 7-3. Once the EA has been obtained, Eskom's negotiators will commence with detailed negotiations to purchase the land earmarked for the development.

8.1.2 Appointment of Construction Contractor

If required, after all land has been acquired and all the internal tendering processes have been satisfied, Eskom will appoint the construction contractor.

8.1.3 Construction Schedule

The construction schedule will be determined prior to construction in consultation with the appointed construction contractor. The current timeframe for construction is estimated to be 12 – 24 months. It is envisaged that the proposed ash disposal facility must be ready to receive ash from the power station by the middle of the year 2017.

8.1.4 Extension of surface water / groundwater and biomonitoring network / points

Monitoring will be commenced ahead of construction at all monitoring points as will be agreed by the station and the DWS, if necessary. The existing and recommended monitoring points are shown in Figure 7-7 and Figure 7-8. The proposed location of monitoring points are shown in Figure 8-1.

Figure 8-1: Proposed location of biomonitoring points

8.2 THE CONSTRUCTION AND REMEDIATION PHASE

8.2.1 Obtaining the Environmental Authorisation

Obtaining the integrated EA & WML and WUL will signal readiness of the commencement of the project construction phase. If a positive EA and water licence is obtained, the construction of the ash disposal facility will be undertaken over a period of 12 - 24 months. The activities undertaken during the construction phase are discussed below.

8.2.2 Installation of fences and access control

The construction area will be secured with a surrounding fence installed at the outset of construction phase.

8.2.3 Site preparation and clearance for contractor's camp

An identified area will be cleared for the siting of a contractor's camp. The recommended positions of these potential contractors camps are show on Figure 7-1 (Site 1) and Figure 7-2 (Site 3) for each alternative respectively. The location has been selected because of its ease of access, central proximity, and currently disturbed status. Preparation of this area will include vegetation clearing, compaction, installation of bunded areas for hydrocarbon storage, establishment of temporary offices / storage facilities (such as containers or park homes), chemical toilets (portable / conservancy tanks), potable water storage, and fences and access control. The volume of dangerous goods that is stored at the contractors camp should be within the limits stipulated in the listed activities contained in Government Notice No. R544, R.545 and R.546.This area will be rehabilitated as per the EMPr requirements post construction.

The location of the facility is shown in Figure 7-1 and Figure 7-2 for the respective site.

8.2.4 Erection of camp sites for the contractors' workforce

Contractors will not house their workforce on site.

8.2.5 Vegetation clearing to facilitate access and construction activities

Vegetation must be cleared to facilitate access, construction and safe operation. Vegetation will eventually be removed over the entire footprint of the proposed new disposal facility (including roads and canals), at the contractors camp, at all the tower and plinth positions for all pipelines, and at the proposed AWRD that will be constructed for the new ash disposal facility. Where protected indigenous vegetation needs to be removed it must be replanted so as to minimise impacts to the environment. Search and rescue activities may be required for any protected species if found on site during clearing. Where protected species are

identified a permit will be obtained for their relocation prior to any vegetation clearing activities commencing.

8.2.6 Establishing of access roads

Once the contractor is established on site the access roads to the construction site will be established. Each road alignment will first be walked to ensure that site sensitivities are accounted for and avoided / planned for wherever encountered. Each road will then be cleared of vegetation, graded, and where necessary a nominal wearing course of gravel may be imported and/or the road may be compacted for added stability. This will be determined during the detailed engineering phase of the project. All materials used in the development of access roads will be inert and non-carbonaceous material. The road will be developed taking into account proper storm water management measures, including upslope cut-off drains, and / or mitre drains where required**.** The proposed access roads will be constructed outside an urban area, but will exceed a width of 5 meters. This activity will therefore trigger a listed activity in Government Notice No. R.544.

8.2.7 Site services

Apart from the access roads, no other services are envisaged for the proposed development. Portable chemical toilets will be used during the construction phase, and a reserve water tank of approximately 2500 litres will supply potable water requirements at the construction camp as required.

8.2.8 Pipeline construction

Slurry pipeline

The slurry pipelines to the new facility will be constructed in advance, to ensure that it is online and ready for operation once the existing facility reaches capacity. The construction activities for the pipelines will consist of the following: route walk down, identification of plinth positions, soil nominations at plinth positions, excavation for foundations, reinforcing and concreting of foundations (installation of concrete plinths), assembling and installation of pipelines on plinths, connection to pumping source, and inspection of the pipelines prior to commissioning.

It should be noted that the new pipelines for this facility will be taken off the existing pipelines, which will be retained until neither pipeline is required any longer (at this stage it is estimated that this will occur at the end of the life of this new ash disposal facility).

Return water pipeline

The new return water pipelines will need to be installed from the new AWRD back to the power station. The construction activities for the pipeline will include a route walk down,

detailed geotechnical along route alignment, restricted excavations for the pipe pedestals, temporary stockpiling of soils, placement of a nominal gravel bedding inside of the trench, testing of the pipeline for leaks, replacement and profiling of stockpiled soils, and seeding and re-vegetation.

The existing return water pipelines will be retained as they are essential to the management of water levels in the De Jagers pan, which has been used as the return water dam for the existing ash disposal facility. This infrastructure is independent from this proposed Camden Power Station Ash Disposal Facility Project, and is therefore not addressed in this study.

8.2.9 Installation of clean and dirty water separation and containment infrastructure

Please refer to Figure 7-2 see the location of the infrastructure discussed below. Detailed information can also be obtained in Appendix J.

Clean Water Separation Channel

The detailed construction of the clean water channel will be undertaken during the detailed design phase of the project, and will be informed by the geotechnical conditions along the channel alignment. For the purpose of this assessment it has been assumed that construction will include the following activities:

- The channel position will be surveyed and pegged;
- Walk down of the proposed alignment to identify site specific sensitivities and concerns;
- Geotechnical study will be undertaken along the route to determine founding conditions;
- Vegetation will be cleared;
- The channel will be excavated;
- Where necessary material will be imported and/or the area compacted to improve stability;
- The concrete lining will be installed;
- The area will be profiled to tie into the adjacent terrain, ensuring that suitable measures are taken to avoid damming up of water on surface, and erosion at discharge points.

Dirty Water Solution Trench

The solution trench will be constructed in the same manner as described above for the clean water separation channel, with the exception that the solution trench will not discharge to the environment. The dirty water contained in the solution trench will be discharged to the AWRD, from where it will be taken to the power station for re-use.

Ash Water Return Dam

The AWRD will be constructed using conventional construction equipment "plant" and methods. The sequence of construction will likely be as follows: the area earmarked for development will be surveyed and pegged; a detailed geotechnical study will then be undertaken; vegetation clearing will take place followed by topsoil stripping and stockpiling; the dam area will then be excavated and profiled as required; inert material will then be used to construct the dam wall (where insufficient material occurs on site the material required will be imported); once the dam wall and profile has been created the barrier system (including leak detection system) will be installed; the AWRD pipelines will be installed to the facility; and the final profiles will then be established and the remaining area of the dam will be re-vegetated.

Leachate Collection and Management

The leachate collection system will comprise of a toe drain as well as a main drain system. A leachate collection system will be designed such that a maximum leachate head of 300 mm will be maintained over the liner system. The leachate will be drained to the solution trench, discussed below, which ultimately discharges to the New AWRD. The leachate collection system will be designed using a 160mm geopipe covered with 19mm stone wrapped with Grade A4 bidim. This will be located above the liner system. The permeability, as discussed in a previous section, varies between 3 to 20 m per year. Based on this, a conservative drainage rate of 5mm/h was assumed in order to determine spacing of the geopipe for the leachate collection system.

Surface and Groundwater Monitoring Points

During the pre-construction and construction phase on-going monitoring and reporting will be undertaken at designated monitoring points.

8.2.10 Liner Design

Refer to Figure 8-2 for the proposed design of the Class C barrier system. On the 16th of October 2014, the conceptual engineering report was presented to the DWS Engineering Division. The recommendations made by Mr Kelvin Legge have been incorporated into the liner design, and Figure 8-2 now reflects his comments.

In the proposed liner design, an HDPE sheet is used for the geomembrane. The thickness of the HDPE sheet is indicated in the figure. River sand is proposed to be used for the cushion layer. Grade A4 bidim is proposed for the geotextile layer.

The liner system also calls for a 300mm clay layer. Testing will be conducted on the ADF footprint on Site 1 to determine the permeability of the compacted *in situ* soils. DWS have indicated that if the permeability is less than 10^{-5}cm per second then the *in situ* soils may be

used instead of the clay layer, however the 1.5mm thick HDPE liner must be increased to 2mm thick. Importation of clay is possible however, may not be economically viable.

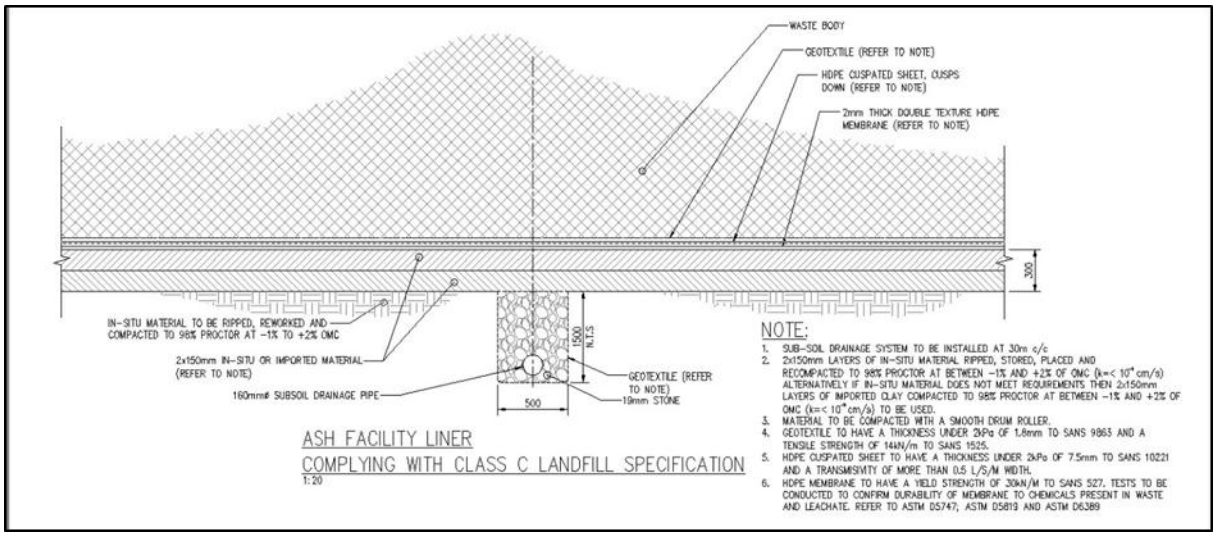

Figure 8-2: Proposed Liner Design

8.2.11 Barrier System Installation

The total footprint area of the New ADF on Site 1 is approximately 99 ha. The construction of the liner will be phased to a certain extent taking into account the rate of growth of the footprint area of the New ADF. The footprint area required for the first year of ash disposal will be approximately 54.2 ha, which is more than half of the total footprint area. This is indicated by the red contours in the Figure 8-5. The entire site must be lined before the fifth year of ash disposal commences. The New ADF will reach a level of 1 688 m AMSL and a total height of 16.25 m above the toe of the starter wall in the beginning of the fifth year of ash disposal.

Site 1: Liner installation details

Figure 8-3: Lining requirements for the first five (5) years of ash disposal

8.2.12 Construction of the starter wall

The starter wall for the New ADF must be constructed to a height where the average annual rate of rise is less than 3.5m per year. A graph showing the rate of rise versus the year for Site 1 is presented in Figure 8-6. The Rate of Rise will increase in 2029 from 2.2 m/year to 3.2 m/year, but then due to the unit decommissioning period over the last 3 years, the Rate of Rise will actually decrease. It was calculated that the annual rate of rise will decrease to below 3.5 m per year after 1 year and 11 months. The required height of the starter wall is 11.25 m. The starter wall has a top width of 5m, 1 in 3 side slopes and will have a volume of approximately 364 000 m^3.

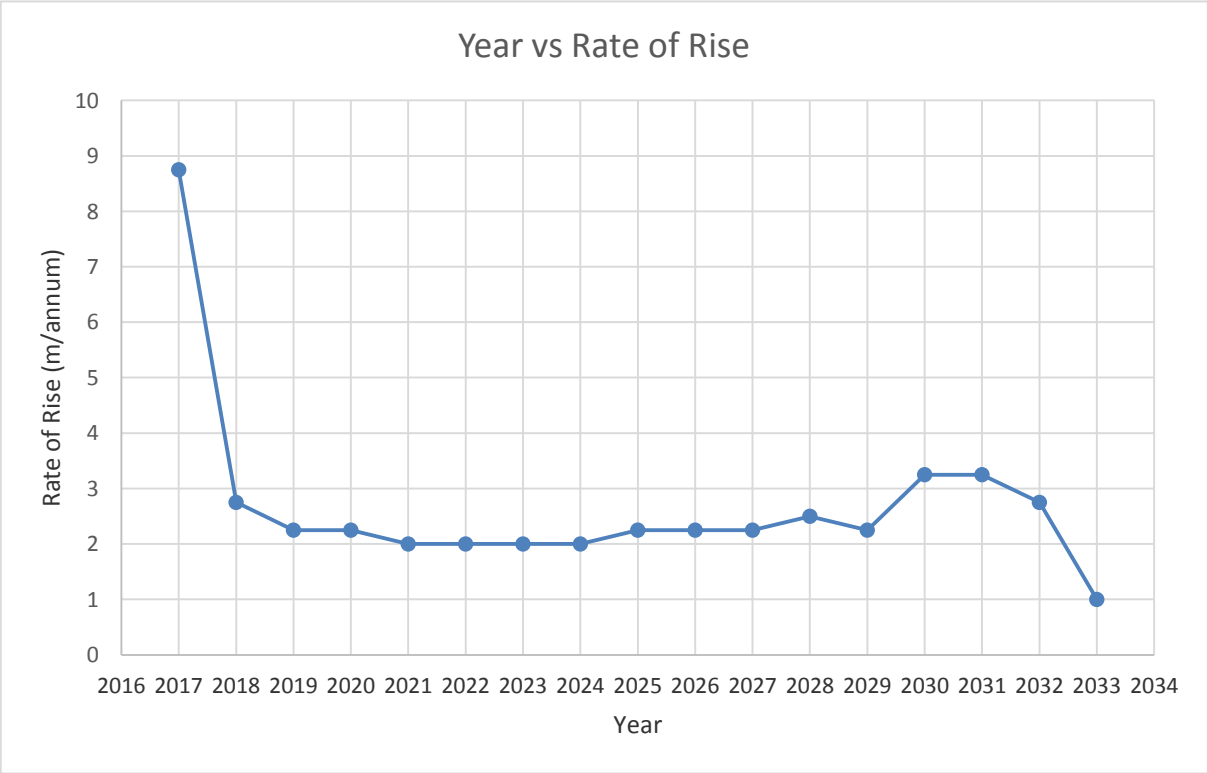

Figure 8-4: Site 1 Years versus Rate of Rise

8.2.13 Rehabilitation of construction activities

Rehabilitation of disturbed areas

Once construction is completed, **rehabilitation** of affected areas will be undertaken to obtain the following objectives:

- A sustainable topographic profile, tied into the adjacent vegetation in such a manner that erosion is controlled;
- A sustainable vegetation layer, free of alien invasive species; and
- A litter free environment where all construction waste has been suitably removed to a licensed facility.

The ECO / WMCO appointed to monitor the construction phase will delineate all areas requiring rehabilitation activities and will be responsible for signing off that these areas have been suitably rehabilitated as per the methods identified in the EMPr and the Method Statement from the Contractor. The following areas have been identified at this juncture as areas that will require rehabilitation post construction:

- Any access roads not remaining for the operational phase maintenance and servicing of infrastructure; and
- The decommissioned slurry pipeline and adjacent servitude.

The methods for rehabilitation will be confirmed on site, based on the extent and type of impact, and will be in compliance with the approved EMP for the project. It is envisaged that rehabilitation activities will include at a minimum:

- Profiling of the terrain to ensure that it is free draining, and ties into the existing terrain without causing erosion;
- Soil amelioration and improvement will be undertaken to promote establishment of a sustainable vegetation layer;
- Seeding of the area will be undertaken with an appropriate seedmix to ensure that a sustainable vegetation cover is established;
- Water from the area, usually in the first two years, during dry spells to ensure vegetation cover is properly established is common; and
- Alien invasive control is practiced to ensure that the area is maintained in a weed free condition.

<u>Signing off by affected Landowners upon completion of the construction and rehabilitation</u>

Once rehabilitation activities have been completed the area will be audited by the ECO / WMCO and a close out audit produced. The audit report will be submitted to the DEA and the affected landowners (if other than Eskom) for review and approval.

Once the construction is finished, the rehabilitated development footprint will be signed off as complete, and will be handed over to Eskom for Operation.

8.3 THE OPERATIONAL PHASE

The operations of the project facilities and all of its components are described in Section 7 of the Conceptual Engineering Report (Refer to Appendix B). This Operations and Rehabilitation Plan should be included in the station's Environmental Management Systems (EMS) since Camden has ISO 14001 EMS certification. A summary description is given below.

8.3.1 Taking over the facility from the Contractor

Eskom will take ownership of the ash disposal facility from the Contractor (if separate from Eskom) upon completion of construction phase as described in the preceding section (Section 8-2).

8.3.2 Access roads, fences, and access control

Access roads and fences retained for the operational phase will be inspected regularly. Roads must be maintained according to the original design and construction specification. This includes cross slopes, road bed and wearing surface material, layer thickness and compaction of the layers. Periodic maintenance will be undertaken (as required) and will include: grading and profiling; importation of additional wearing course where required; debriding of storm water infrastructure such as cut-off / mitre drains; vegetation clearing (including firebreaks) and alien invasive control, repairing of fences; and litter collection and clean up.

8.3.3 Site services

Apart from the contractors camp, access roads and fences, no other services are envisaged for the new development.

8.3.4 Pipelines

Slurry pipelines

Regular inspections of the pipelines will be undertaken to ensure the integrity of the pipelines is retained and identify any leaks / damage that may have occurred. In addition to the general maintenance described for the access roads and fences above, maintenance on the pipeline will likely include the periodic flushing of the pipeline, replacement of pipe segments, and cleaning of spills / leaks that occur.

Depending on the size of the spill / leak that may occur, this will immediately be contained and then cleaned up manually by hand and shovel or a TLB (or similar type tracked equipment). The collected spill material will be loaded on to a suitably designed vehicle and disposed of at the waste disposal facility.

Return water pipeline

General maintenance of the pipeline servitude (such as vegetation clearing, alien invasive control, and repairs to fencing etc) will therefore also include maintenance of the flow meters to be placed at the pumping and discharge points of the pipeline, and monthly balancing of the flow meter results to ensure that the pipeline is not leaking. Maintenance inspections will also include observations to determine if surface evidence such as undue greening of the veld can be observed.

In the event that any pipeline leaks occur, pumping through this pipeline will be ceased, the position of the leak will be established, appropriate measures to repair the damage to the pipeline will be undertaken, and the excavated soils will be returned. The area will again be profiled and re-vegetated. Monitoring of the area will continue as before.498

8.3.5 Clean and dirty water separation and containment infrastructure

Clean Water Separation Channel

The clean water separation channel will be inspected for integrity prior to the rainy season each year, and fortnightly during the rainy season and after severe storms. Maintenance of the clean water separation channel will include removal of debris of the channel (cleaning of litter and vegetation that may have become overgrown), repairing of the channel as may be required, correction of any erosion identified, and control of alien invasive species.

Dirty Water Solution Trench

A regular monthly inspection of the solution trench shall be carried out to determine whether the trench has become choked by sediment or vegetation, or has been seriously eroded. Any damage shall be repaired as soon as possible. Grass and weeds growing through the concrete joints of the concrete lining shall be removed as soon as possible. Any trench crossings shall not encroach into the trench where the flow can be obstructed. Any seepage of water through the soil into the trench shall be noted, recording both the approximate flow rate and the location and repaired. The Ash Plant Manager must be notified of any such events. Any increase in the wetted area and/or flow from the toe of the ash dam is to be treated as an early indication that the filter drains are malfunctioning.

Return Water Dam

The most typical failure of AWRD's include seepage / pipelines; overtopping and erosion; and structural failures. These can all be managed or avoided entirely through a regular inspection and maintenance programme. This will form the basis of on-going operations and management of the AWRD.

Leachate Collection and Management

Once installed the leachate collection system will be between the waste body and the liner. Maintenance of the solution trench will be critical to ensure on-going operation of the leachate system occurs unhindered.

Surface and Groundwater Monitoring Points

During the construction phase on-going monitoring and reporting will be undertaken at designated monitoring points.

8.3.6 Barrier System Maintenance

Once installed the barrier system will be inspected monthly in advance of deposition of waste. Any damage to the barrier system will be repaired immediately and prior to any waste being placed on the area. Once the area has been covered with waste it is expected that the integrity of the barrier system is intact, and will operate for the life of the facility.

8.3.7 Ash disposal

The ash slurry will be pumped from the power station to a central distribution point situated at a high point on the southern perimeter of the ash disposal facility (as shown in Figure 7-1 and Figure 7-2). From the distribution point the fly ash and the coarse ash are channelled through various open trenches and allowed to gravitate into the appropriate paddocks.

As indicated the initial deposition needs to be contained using a starter earth wall for each compartment. This initial deposition area is thus very small and grows as the compartment basin fills. Due to the small area the rate of rise is initially high. The ash does not have enough time to consolidate and gain sufficient strength to support itself. Therefore a starter wall is built to a height where the rate of rise is 3,0 m / year.

A transition from open end deposition to a spiggotting or daywall method is required once the starter wall height is reached. This is required for two reasons:

- Firstly the ash cannot be gravitated to the upper compartment from the level of the distribution box; and
- Secondly, at this point the ash may be used to build walls in an upstream direction.

Spiggotting in a cycle around the entire perimeter of each compartment allows the walls to be built in a stable way and enables proper pool and freeboard control.

Spiggotting allows for the slurry to be deposited in thin layers, which are then allowed to dry out and consolidate. A specified cycle time is allowed between the layers which is dependent on the geometry of the deposit and consolidation parameters. The deposit thus

gains sufficient strength and rises continuously. An increase of 2,0 m in height over a year period was accepted for this study.

8.3.8 Dewatering of the ash slurry

Water on top of the ash dam will be decanted from the pool using penstocks. Up to two temporary penstock inlets per compartment in the initial phases will be required. A permanent penstock, central to each compartment will then be installed and operated for the life of the facility.

In developing this operational methodology various operational aspects were assumed which help reduce risks associated with the operation of the ash disposal facility and reduce potential environmental impacts. These include, inter alia:

- The pool will be operated at a minimum level; i.e. water will not be stored on the ash disposal facility (containment dam except during major storm events, in which case the water will be decanted as quickly as the penstock will safely allow. If water is stored on the facility the facility dam will need to be licensed as a water dam with the dam safety office according to regulation 1560 of the National Water Act (1998).
- More than one compartment allows flexibility in terms of deposition if a compartment requires maintenance.

A penstock consists of a vertical decant tower and an inclined horizontal conduit. The penstock's function is to remove the free water from the top surface of the ash disposal facility, thereby recovering the water for re-use in the next cycle of ashing. The penstock has been designed to decant all the water from the ashing operations and is also capable of removing the storm water from a 1 in 50 year 24 hour storm in 96 hours (3389 m^3 /s) off the facility with one penstock functioning, or 48 hours with two penstocks functioning.

Penstocks are a very important part of an ash disposal facility but are notoriously unreliable. For this reason most slimes dams have two penstocks. Should a penstock fail and need replacement, ashing could continue without disruption using the other penstock. There are currently two penstocks on either side of the dividing wall of the existing Ash Disposal Facility. Theoretical calculations show that the concrete penstock rings can safely carry the forces resulting from an ash height of 24m. The rings will experience crushing failure from 35m of ash onwards.

In order to reduce the risk of cavity formation in the future, it is important to double wrap the vertical sections of the penstock decant tower with a U24 geotextile once the rings have been placed.

8.4 REHABILITATION AND DECOMMISSIONING PHASE

8.4.1 Consecutive rehabilitation of Ash Disposal Facility

Rehabilitation of the ash disposal facility will commence during the operational phase and continue consecutively with operation, ensuring that that the footprint for rehabilitation post operation is reduced. The methods for rehabilitation will be confirmed on site, and will be in compliance with the approved EMPr for the project. This rehabilitation will be included into the station's Environmental Management Systems (EMS), as Camden has ISO 14001 EMS certification. It is envisaged that rehabilitation activities will include at a minimum:

- Profiling of the terrain to ensure that it is free draining, and ties into the existing terrain without causing erosion;
- Soil amelioration and improvement prior to placement will be undertaken to promote establishment of a sustainable vegetation layer;
- The improved soil will be placed as a 300 mm thick layer over the ash body;
- Seeding of the area will be undertaken with an appropriate seed mix to ensure that a sustainable vegetation cover is established;
- Watering of the vegetated area, usually in the first two years, during dry spells to ensure vegetation cover is properly established is common; and
- Alien invasive control is practiced to ensure that the area is maintained in a weed free condition.

8.4.2 Rehabilitation of disturbed areas

Areas earmarked for rehabilitation

Once the ash disposal facility has reached capacity it will be finally rehabilitated as per the procedure documented above. It is envisaged that some of the associated infrastructure will then no longer be required, and will need to be decommissioned / dismantled and the area disturbed will need to be rehabilitated. It is envisaged that the following infrastructure will require decommissioning / dismantling and rehabilitation at closure of the facility:

- The contractors camp / hard park / lay down areas;
- Any access roads not remaining for long term maintenance of the facility;
- The return water pipeline surface area and servitude; and
- The slurry pipeline and servitude.

The decommissioning will be done in line with relevant legislation at the time of decommissioning of the said infrastructure. Present legislation would require that an EIA be undertaken for the decommissioning of the aforementioned infrastructure.

Rehabilitation of disturbed areas

The following is assumed regarding the decommissioning and rehabilitation of infrastructure:

- The physical removal of the infrastructure would entail the reversal of the construction process;
- A rehabilitation programme would need to be agreed upon with the landowners (if applicable) before being implemented; and
- Materials generated by the decommissioning process will be disposed of according to the Waste Hierarchy i.e. wherever feasible materials will be reused, then recycled and lastly disposed of. Materials will be disposed of in a suitable manner, in a suitably licensed facility.

The primary objectives of the rehabilitation process will be to obtain the following objectives:

- A sustainable topographic profile, tied into the adjacent vegetation in such a manner that erosion is controlled;
- A sustainable vegetation layer, free of alien invasive species;
- Where feasible / possible pre-construction land use will be re-established; and
- A litter free environment where all construction waste has been suitably removed to a licensed facility.

The methods for rehabilitation will be confirmed on site, based on the extent and type of impact, and will be in compliance with the approved EMPr for the project. It is envisaged that rehabilitation activities will include at a minimum:

- Profiling of the terrain to ensure that it is free draining, and ties into the existing terrain without causing erosion;
- Soil amelioration and improvement will be undertaken to promote establishment of a sustainable vegetation layer;
- Seeding of the area will be undertaken with an appropriate seedmix to ensure that a sustainable vegetation cover is established;
- Water of the area, usually in the first two years, during dry spells to ensure vegetation cover is properly established is common; and

- Alien invasive control is practiced to ensure that the area is maintained in a weed free condition.

The following steps shall be taken in preparation for the re-vegetation of the Ash Disposal Facility at the end of the Operational Phase:

- The slopes of the ADF shall not exceed 1:10;
- Spread topsoil evenly to a minimum thickness of 300 mm over the total graded area;
- Work the topsoil in to a minimum depth of 300 mm ensuring a smooth final surface without any slacks and hollows where ponding can take place;
- Application of the fertilizers shall be carried out not more than 1 week prior to planting. The mixing of inorganic fertilizers and seed shall not be acceptable. Fertilizers evenly at the following rates:
  - 250 kg/ha 4:3:4 (30) + Zn
  - 300 kg/ha Superphosphate (10,5% P)
- For slopes in excess of 1:10 (10 %), the edge of side slope steps to be graded to create an even slope with a rough surface. Ash clods shall not exceed 350 mm in diameter;
- For erosion control purposes slopes exceeding 5 metres in length shall be stabilized by planting 450 mm wide sod strips. The strips shall be spaced 5 m apart measuring from the toe of the slope in each case. Sods shall be secured in place using pegs or any other approved method;
- Topsoil shall be spread evenly to a minimum thickness of 300 mm over the total graded area;
- Rough veld grass stalks shall be spread over topsoil to a depth of 40-60 mm;
- The slope shall be evenly smoothed ensuring that all signs of terracing are removed and that the ash, topsoil and veld grass are thoroughly mixed. Ash clods exceeding 100 mm in diameter may protrude through the topsoil layer.

<u>Planting Procedure</u>

Trees shall not be planted on slopes in excess of 1:3. The trees shall be planted in groups of 3-5 plants ensuring a minimum coverage 50 plants/ha. Certain trees are sensitive to the direction of a slope and the planting plan shall take this into account. The following tree species may be used:

- Acacia karroo (Sweet Thorn) – Plant on east and west slopes;
- Diospyros (Blue Bush) – Plant on north lycoides slope;

- Rhus pyroides (Common Wild Currant) – Plant on any slope;
- Ziziphus (Buffalo Thorn) – Plant on north mucronata slope; and
- Rhus lancea (Karree) – Plant on east and west slopes

Scarifying

The total area to be seeded or planted shall be scarified to a minimum depth of 20 mm. Scarification shall be done horizontally across slopes. Seeding shall take place directly following scarifying. In the event of the scarified surface becoming smooth again before seeding, the Contractor shall re-scarify to ensure a suitable seed bed.

Seeding

Seeding shall take place as early as possible during the growing season. The Contractor is expected to programme accordingly. The seed mixture to be used shall be made up as follows unless agreed differently with the Project Manager:

Table 8-1: Seed mixture to be used

Grass species	kg/ha
Chloris gayana	2
Eragrostis tef	3
Eragrostis curvula	3
Aragrostis chloromelas	1
Aragrostis lehmanniana	1
Enneapogon cenchroides	2
Aragrostis echonochloidea	1
Themeda triandra	1
Digitaria eriantha	2
Cynodon dactylon	2
Hypperrhenia hirta	1
Panicum maximum	1

Where specific grass seed cannot be obtained by the Contractor, it may be replaced with another species in consultation and agreement with the Project Manager / ECO. The change will be of the same monetary and environmental value.

No seeded sections shall be handed over by Contractor prior to a successful germination rate of at least 70% (measured as 70% of the total area and/or 70% of any particular seeded area of at least 2 500 m^2) can be proven by the Contractor. In addition, there shall be no

bare patches in excess of 500 mm in diameter or half a meter squared in area. Germination shall be regarded as successful when the grass sward is 5 mm above ground level and identifiable as of the types sown.

Care after planting

The Contractor shall protect newly seeded/planted areas against undue traffic and/or other disturbances throughout the contract and maintenance periods.

Maintenance

The Contractor shall adequately maintain construction areas for a period of 6 months. Maintenance shall include:

- Continuous repair of damage caused by erosion or any other cause. Erosion gullies exceeding 100 mm in width may be repaired by placing Cynodon spp sods or clumps in the gullies that have begun to form so as to effectively stop them from developing.
- Maintenance of acceptable grass cover with reseeding/sodding as necessary.
- The Contractor shall be required to apply a top dressing of 150 kg/ha ammonium sulphate to seeded areas 4 to 6 weeks after germination under favourable growing conditions. (If in doubt the Contractor should discuss this aspect with the Project Manager).

Signing off of all rehabilitated areas upon completion

Once rehabilitation activities have been completed the area will be audited by an independent competent person (i.e. ECO) and a close out audit produced. This will be submitted to the DEA and the affected landowners for review and approval. Once approval has been obtained the decommissioning will be signed off as complete.

9 DESCRIPTION OF RECEIVING ENVIRONMENT

9.1 CLIMATE

The project area falls within the highveld climate classification of Viterito (1987), and can thus expect warm, wet summers, and mild, dry winters, with equivalent evaporation depths exceeding precipitation. Regular dust storms can also be expected during periods of prolonged dry weather. Average annual rainfall for the highveld decreases from 900 mm in the east to 650 mm in the west, with approximately 85% falling between October and April. In the vicinity of Camden Power Stations the estimated rainfall from showers and thunderstorms is about 726 mm/year and the evaporation 1400 mm/year, based on available records for Nooitgedacht – Agriculture College (442811) a South African Weather Bureau meteorological station about 17 km to the northwest of the area (See Figure 9-1 below). The water balance in the area plays a major role in the possible impacts on especially surface water but also groundwater. It is evident that the evaporation exceeds the precipitation by a large margin. The area thus has a water deficit and a negative water balance in general.

Average daily maximum temperatures vary from 25ºC in January to 16ºC in June, but in extreme cases these may rise to 34 and 23ºC, respectively. In comparison, average daily minima of 13 and 0ºC can be expected, with temperatures falling to 5 and –10ºC, respectively, on unusually cold days (See Figure 9-2 below).

For the entire study area there is a daily swing between berg and in-shore air movement. The main direction of air movement is from the south-west alternating with winds from the north-east. The south-westerly winds are often associated with cold fronts that are preceded by warm fronts. The hot air ahead of cold fronts is often the cause of veld fires in winter when the veld is dry.

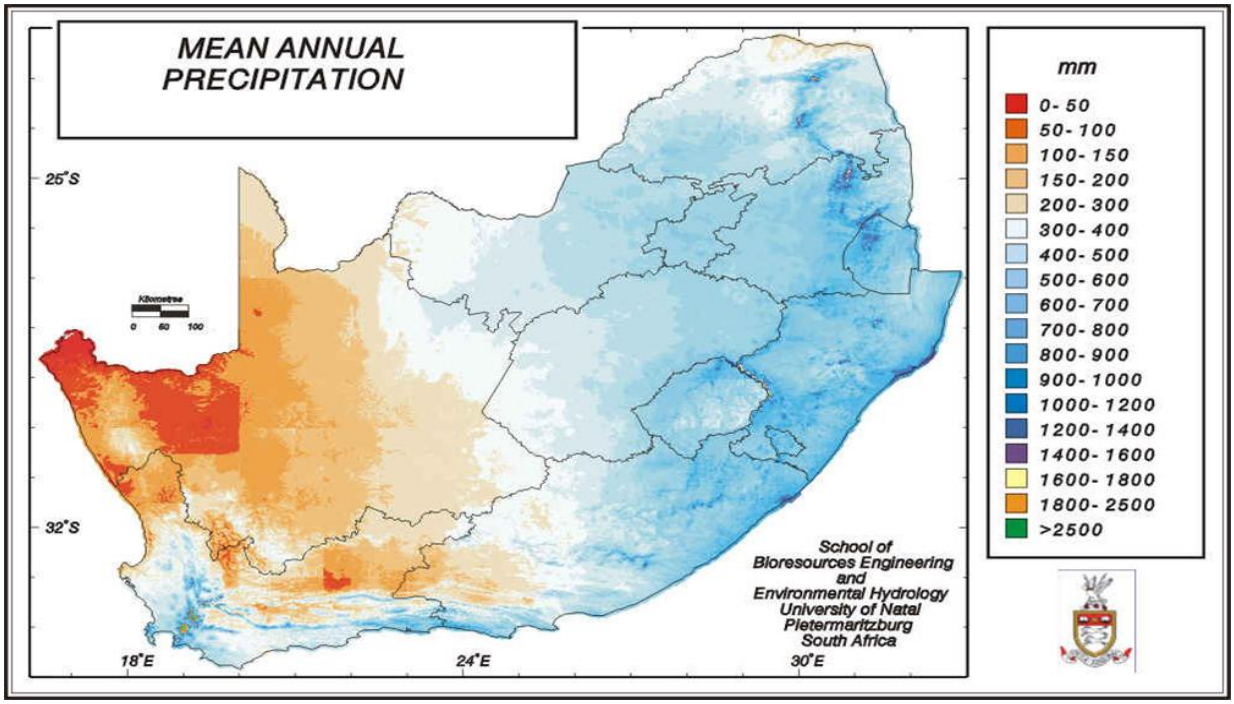

Figure 9-1: Mean annual Precipitation of Ermelo District

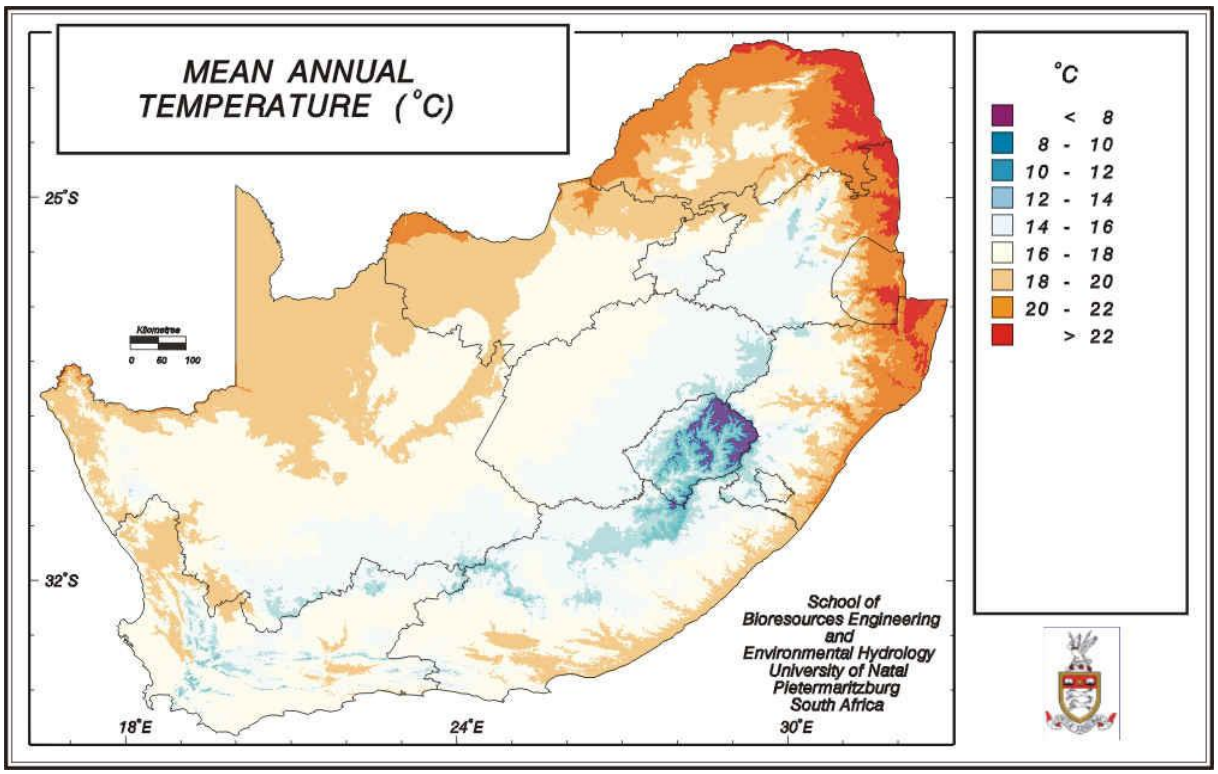

Figure 9-2: Mean annual Temperature of Ermelo District

9.2 GEOLOGY

9.2.1 Methodology and Data Sources

The geological analysis was undertaken through desktop evaluation using a Geographic Information System (GIS) and relevant data sources (April 2009). The geological data was taken from the Environmental Potential Atlas Data from the Department of Environmental Affairs (DEA).

9.2.2 Regional Description

The site falls within the Carboniferous to early Jurassic aged Karoo Basin, a geological feature that covers much of South Africa. Sediments in this part of Mpumalunga Province fall within the Permo-Triassic aged Northern facies of the Ecca Series, forming part of the Karoo sequence (Truswell, 1977). Sediments of the Vryheid formation comprise the local geology. The sediments of the Vryheid Formation were deposited in a fluvio-deltaic environment where swamps and marshes existed, in which peat accumulated. Shales, mudstones, siltstones and sandstones constitute the bulk of the formation, with interlayering of these sediments throughout. The coal seams have relatively high dirt content. Coal measures currently mined in the area form part of the Highveld Coal Field.

Late Triassic to Middle Jurassic aged Dolerite sills and feeder dykes are common in the Karoo Basin, which intruded the Vryheid Formation. Numerous minor faults, many of which are water bearing, interrupt the coal seams. Small fracture zones, which frequently are associated with the upper and lower contacts of sills, also are commonly water bearing, and occur throughout the power station area. Previous investigations identified the presence of a near surface, slightly weathered to fresh dolerite sill. The extent of the sill is, however, unknown.

The type and distribution of site soils appears to be, in part, controlled by parent rock material. Soils overlying doleritic material are typically highly plastic and dark brown to black in colour, while those on Karoo sediments are typically lighter in colour and moderate to highly reactive in character. Shrinkage cracks can, however be expected to develop in site soils irrespective of parent material during periods of prolonged dry weather.

9.2.3 Study area Description

The two candidate sites identified all fall within the sediments of the Vryheid Formation consisting of grit, sandstone, shale and coal seams. Large sacrificial deposits of ferricrete are visible on the ground with outcrops visible on the north eastern side of site alternative 3.

9.3 TOPOGRAPHY

9.3.1 Data Collection

The topography data was obtained from the Surveyor General's 1:50 000 toposheet data for the region. Contours were combined from the topographical mapsheets to form a combined contours layer. Using the GIS the contour information was used to develop a digital elevation model of the region as shown in Figure 9-3 below.

9.3.2 Regional Description

The study area ranges from 1 620 Metres Above Mean Sea Level (mamsl) to 1 760 mamsl. The highest parts of the study area are northern west of the site and the lowest parts are in the south eastern portions of the study area, south of the Vaal River. The topogrpahy is undulating with shallow incised valleys where the main watercourses flow. Several pans are found throughout the area, especially on the sandstone geology. Figure 9-3 provides an illustration of the topography of the sites.

9.3.3 Study area Description

The study area drains towards the southeast where the water is intercepted by the Vaal River. The topography at Alternative 1 is relatively flat and rolling, gently sloping to existing site in the south. Alternatives 2 and 3 are located south of the De Jagers Pan, which is a natural pan/depression in the landscape. Both Alternatives 2 and 3 drain northwards to the depression as they are located on relatively steep slopes.

9.3.4 Sensitivities

Sensitivities associated with the topography are mainly in the form of ridges, which do not occur on any of the alternatives. Other associated impacts include the visibility and drainage of the sites, which will be assessed in more detail in the following sections.

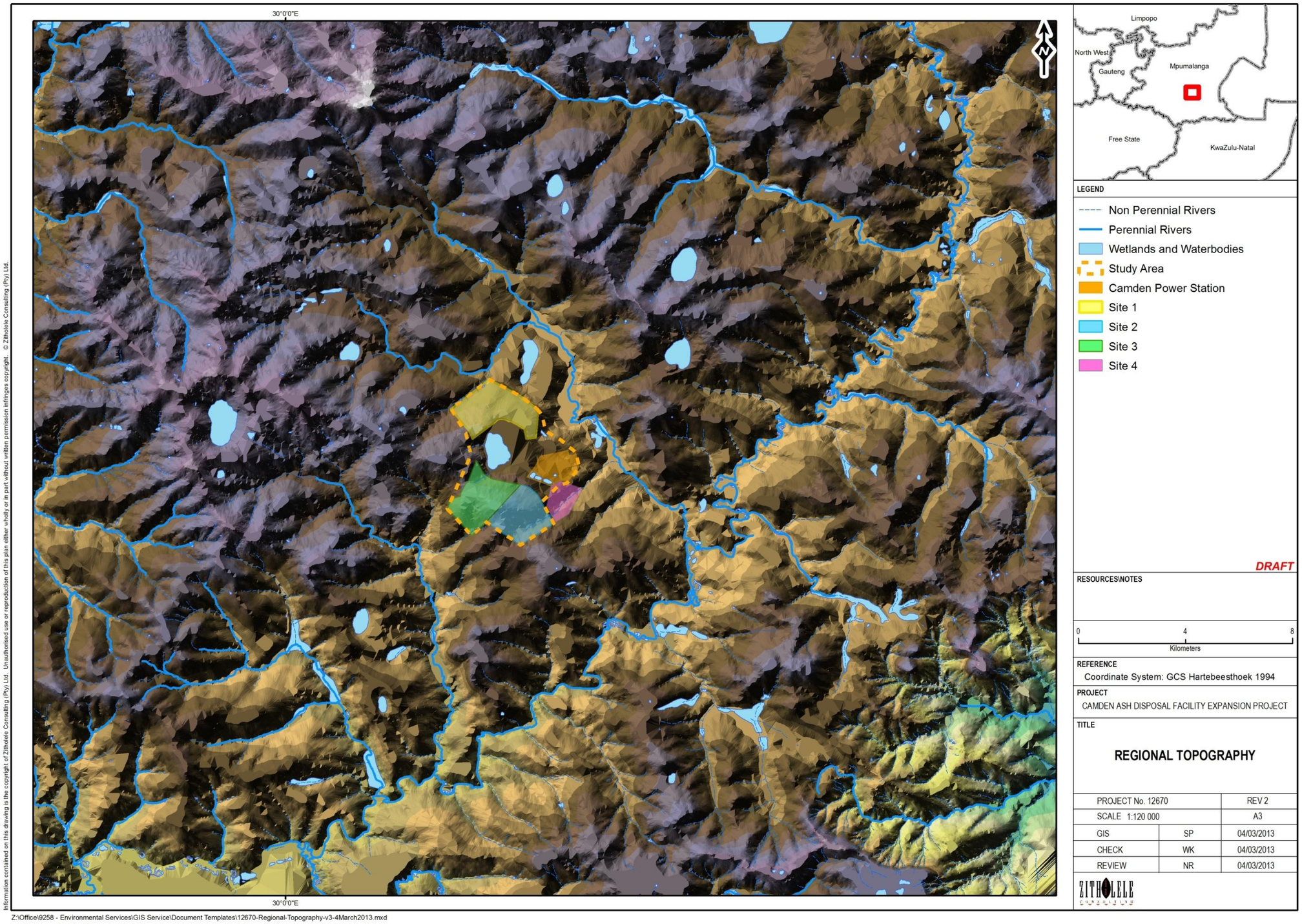

Figure 9-3: Regional topography

9.4 SOILS

9.4.1 Data Collection

A number of site visits was conducted from October 2011 – February 2012. Soils were augered at 150m intervals over the proposed alternative sites using a 150 mm bucket auger, up to refusal or 1.2 m. Soils were identified according to Soil Classification; a taxonomic system for South Africa (Memoirs on the Natural Resources of South Africa, no. 15, 1991). The following soil characteristics were documented:

- Soil horizons;
- Soil colour;
- Soil depth;
- Soil texture (Field determination);
- Wetness;
- Occurrence of concretions or rocks; and
- Underlying material (if possible).

9.4.2 Regional Description

From the available literature as well as the observations during the site investigation, it is apparent that all three sites are underlain by siltstone, mudstone and sandstone that belong to the Vryheid Formation of the Ecca Group, Karoo Supergroup.

Generally these geological structures will decompose in-situ, forming residual soils that may be silty and clayey, with the possibility of expansive soil being present. These soils are often blanketed by a considerable thickness of transported soils of colluvial origin that consist of silty and clayey fine sands.

9.4.3 Study area Description

During the site visit large quantities of soil forms were identified. The soil forms were grouped into management units and are described in detail in the sections below and Figure 9-5 illustrates the location of the soil types. The management units are broken up into:

- Agricultural Soils;
- Shallow Soils;
- Transitional and Poor Transitional Soils; and
- Disturbed Soils / Hard Rock.

9.4.4 Shallow (Rocky) Soils

The rocky soils are generally shallow and overlie an impeding layer such as hard rock or weathering saprolite. These soils are not suitable for cultivation and in most cases are only usable as light grazing. The main soil form found in rocky soils was the Mispah and Dresden soil forms as described below.

Mispah soil form

The Mispah soil form is characterised by an Orthic A – horizon overlying hard rock. Mispah soil is horizontally orientated, hard, fractured sediments which do not have distinct vertical channels containing soil material. There is usually a red or yellow-brown apedal horizon with very low organic matter content. Please refer to Figure 9-4 for an illustration of a typical Mispah soil form.

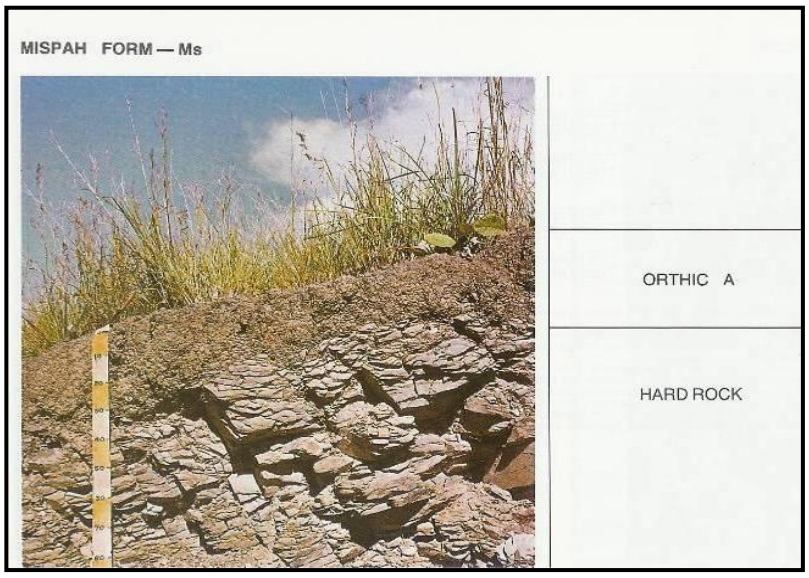

Figure 9-4: Mispah soil form (Soil Classification, 1991).

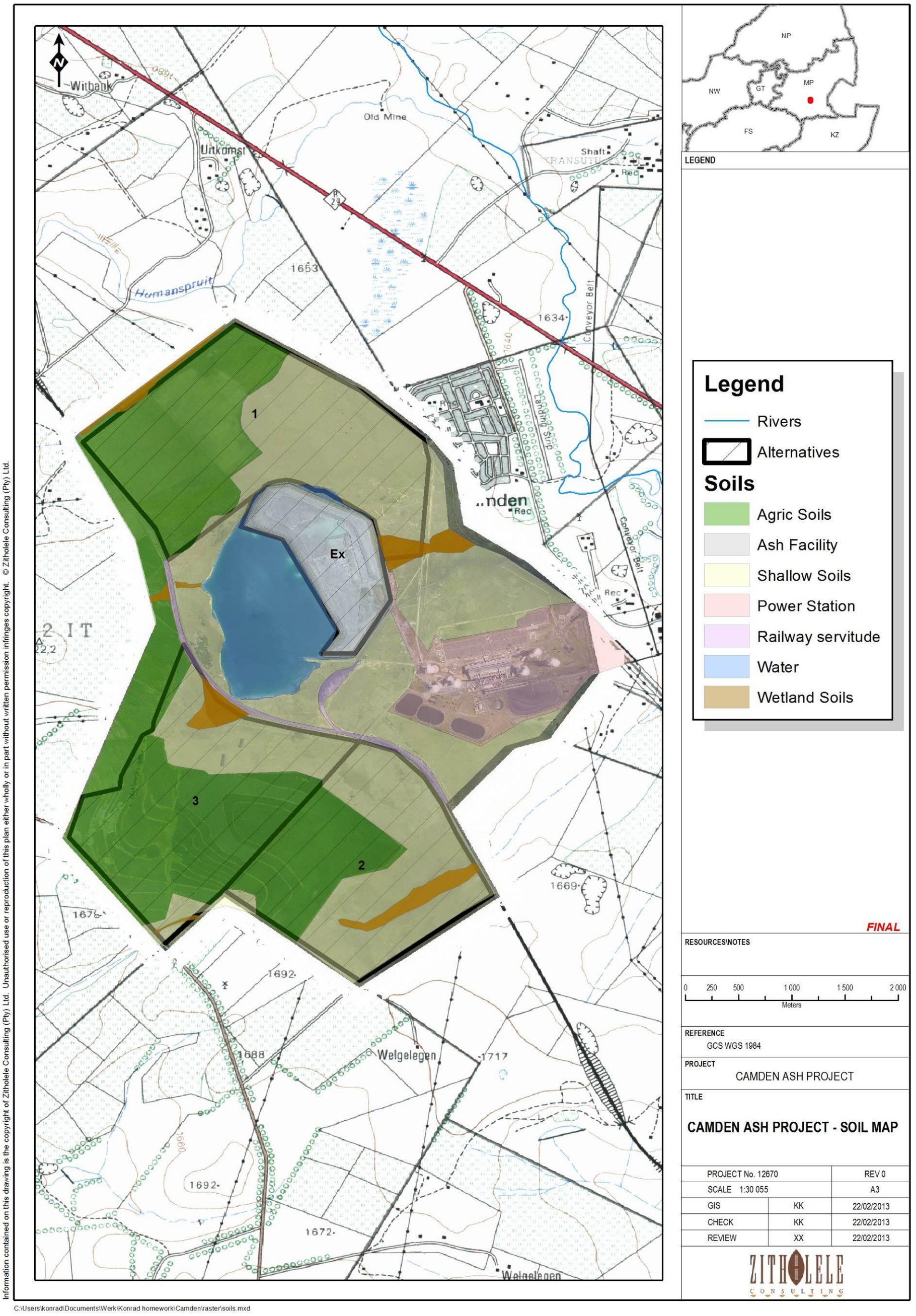

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Figure 9-5: Soil Type Map

Dresden Soil Form

The Dresden soil form is typified by an Orthic A-horizon over a Hard Plinthic B-horizon. The Hard Plinthic B-horizon develops when a Soft Plinthic horizon is subjected to a prolonged dry period and the accumulated Fe and Mn colloidal matter hardens, almost irreversibly. This B-horizon has similar characteristics to hard rock and has a very low agricultural potential, refer to Figure 9-6 for an illustration.

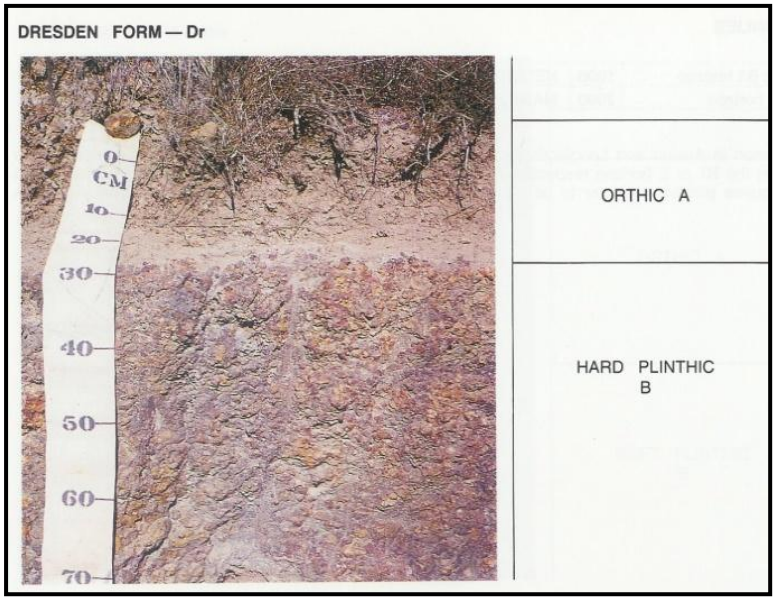

Figure 9-6: Dresden Soil Form (Soil Classification, 1991)

9.4.5 Agricultural Soils

The agricultural soils found on site support an industry of commercial maize/legume production. These soils include Hutton, Clovelly and Avalon. These soils have deep yellow-brown B-horizons with minimal structure. These soils drain well and provide excellent to moderate cultivation opportunities. Each of the soils are described in more detail below.

Clovelly Soil Form

Clovelly soils can be identified as an apedal “yellow” B-horizon as indicated in Figure 9-7. These soils along with Hutton soils are the main agricultural soil found within South Africa, due to the deep, well-drained nature of these soils. The soils are found on the valley slopes of the site.

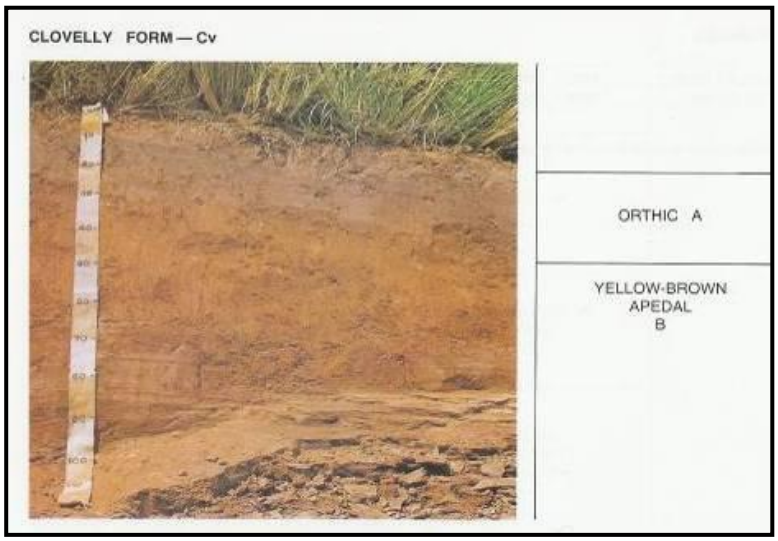

Figure 9-7: Clovelly soil form (Soil Classification, 1991)

Avalon Soil Form

The Avalon soil form is characterised by the occurrence of a yellow-brown apedal B-horizon over a soft plinthic B – horizon (See Figure 9-8). The yellow-brown apedal horizon is the same as described for the Clovelly soil form and the plinthic horizon has the following characteristics:

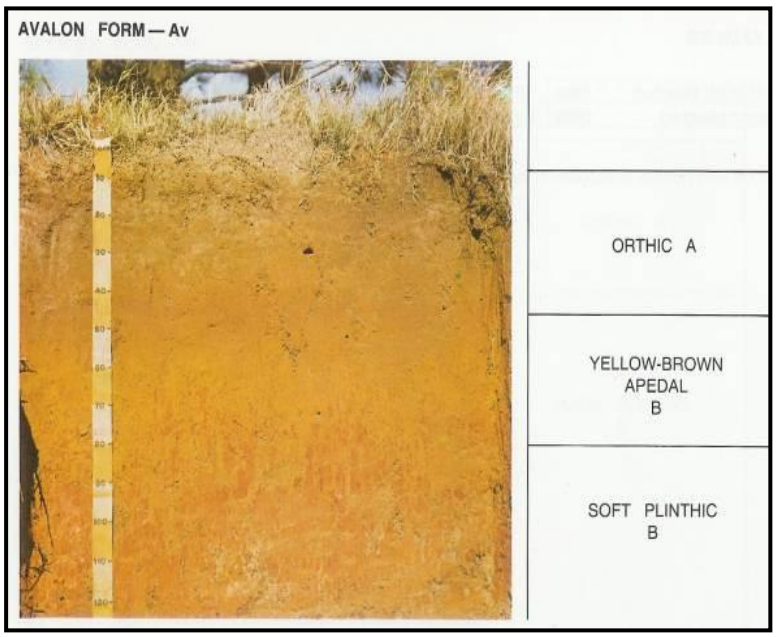

Figure 9-8: Avalon Soil Form (Soil Classification, 1991)

- Has undergone localised accumulation of iron and manganese oxides under conditions of a fluctuating water table with clear red-brown, yellow-brown or black strains in more than 10% of the horizon;
- Has grey colours of gleying in or directly underneath the horizon; and
- Does not qualify as a diagnostic soft carbonate horizon.

These soils are found between lower down the slopes than the Clovelly soils and indicate the start of the soils with clay accumulation.

Hutton Soil Form

Hutton's are identified on the basis of the presence of an apedal (structureless) "red" B-horizon as indicated in Figure 9-9. These soils are the main agricultural soil found in South Africa, due to the deep, well-drained nature of these soils.

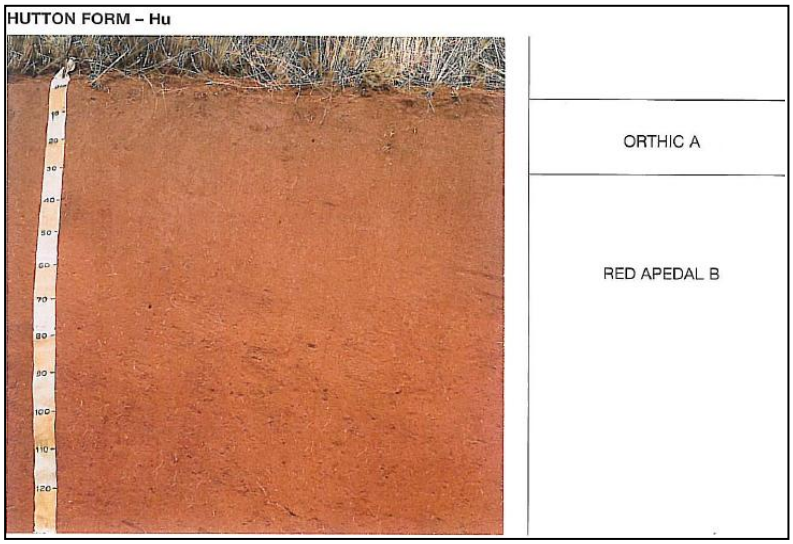

Figure 9-9: Hutton Soil Form (Soil Classification, 1991)

9.4.6 Transitional Soils

The transitional soil management unit comprises the soils found between clay soils and the agricultural soils. These soils often have signs of clay accumulation or water movement in the lower horizons. These soils are usually indicative of seasonal or temporary wetland conditions. The main soil forms found in transitional soils were Wasbank, Longlands and Westleigh, each form is described below.

Longlands Soil Form

The Longlands soil forms are all typified by an eluvial (E) horizon over a soft plinthic horizon (as described above). The E-horizon is a horizon that has been washed clean by excessive water movement through the horizon and the plinthic horizon as undergone local accumulation of colloidal matter (refer photo below). Please refer to Figure 9-10 and Figure 9-11 for an illustration of this soil form.

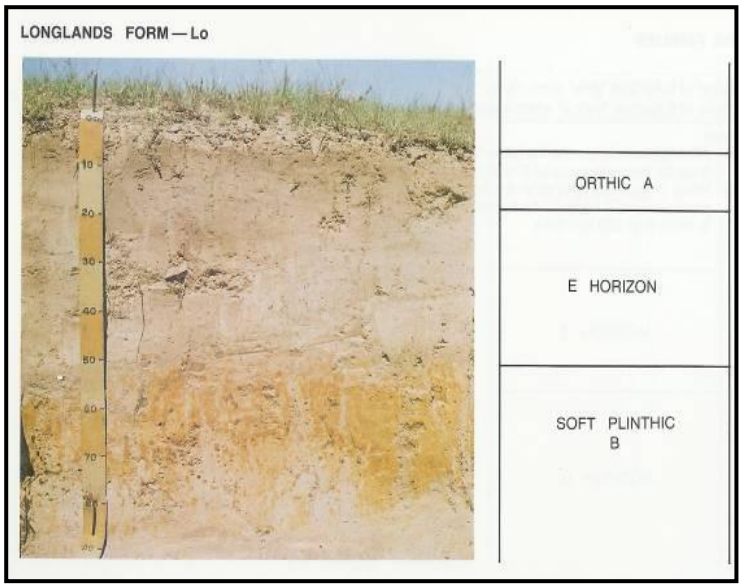

Figure 9-10: Longlands Soil Form (Soil Classification, 1991)

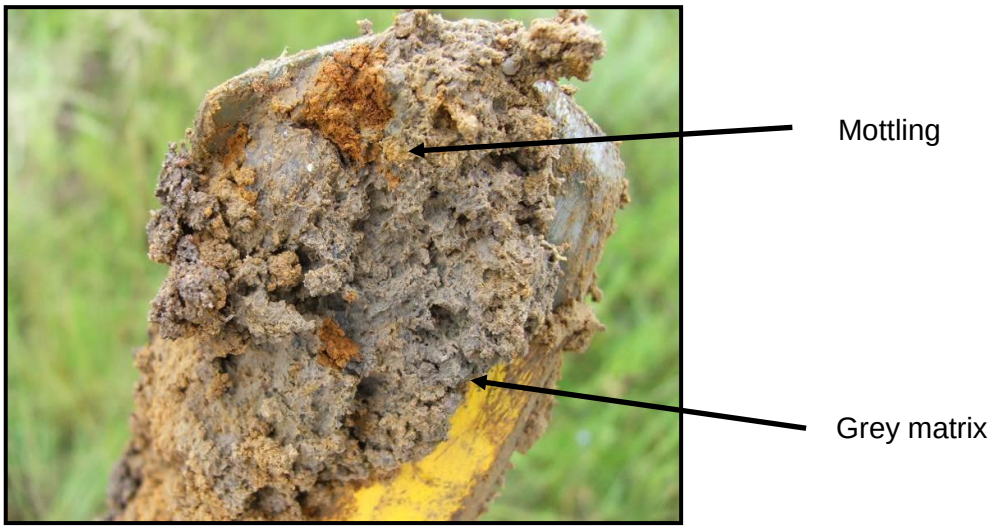

Figure 9-11: Soft plinthic B-horizon

Wasbank Soil Form

The Wasbank soil form is found in close proximity to the Longlands soil form and is typified by an Orthic A-horizon over an E-horizon (as described above) over a Hard Plinthic B-horizon. The Hard Plinthic B-horizon develops when a Soft Plinthic horizon is subjected to a prolonged dry period and the accumulated colloidal matter hardens, almost irreversibly. The Wasbank soil form is illustrated in Figure 9-12.

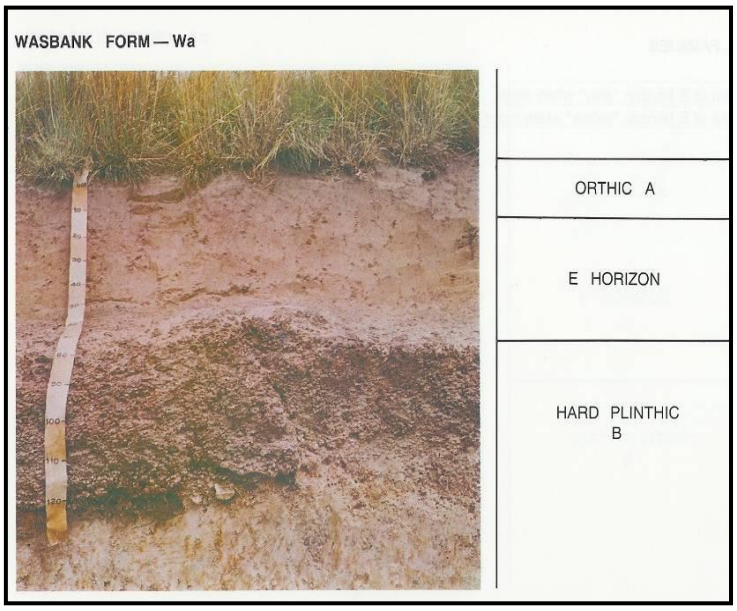

Figure 9-12: Wasbank Soil Form (Soil Classification, 1991)

Westleigh Soil Forms

Westleigh soils are characterised by an orthic A-horizon over a soft plinthic B-horizon and is found in areas between good agricultural soils and clay soils and the movement of water determines the characteristics of the soil. Refer to Figure 9-13 for an illustration.

Figure 9-13: Westleigh Soil Form (Soil Classification 1991)

9.4.7 Clay Soils

The clay soil management unit is found in areas where clays have accumulated to such an extent that the majority of the soil matrix is made up of clay particles. These soils are usually indicative of seasonal or permanent wetland conditions. The main soil forms found in clay soils were Katspruit and Willowbrook, each form is described below. These soils are saturated with water and must be noted to be unstable for construction and are sensitive. Although clay is required as part of the liner of the proposed ash facility, building on top of

clay is generally not recommended as the material can shift, crack and is generally regarded as unstable. Improvements to ground conditions would be required.

Katspruit Soil Form

The Katspruit soil form is most commonly found in areas of semi-permanent wetness. The soil is made up of an Orthic A-horizon over a diagnostic G-horizon and is indicated in Figure 9-14. The G-horizon has several unique diagnostic criteria as a horizon, namely:

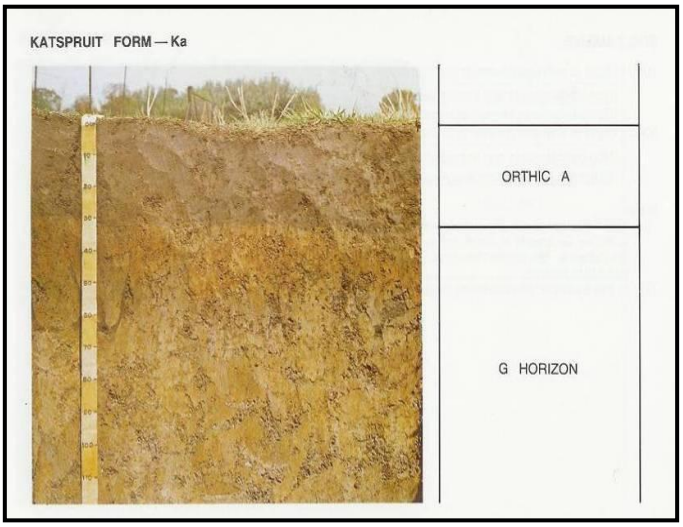

Figure 9-14: Katspruit Soil form (Soil Classification, 1991)

- It is saturated with water for long periods unless drained;
- Is dominated by grey, low chroma matrix colours, often with blue or green tints, with or without mottling;
- Has not undergone marked removal of colloid matter, usually accumulation of colloid matter has taken place in the horizon;
- Has a consistency at least one grade firmer than that of the overlying horizon;
- Lacks saprolitic character; and
- Lacks plinthic character.

Willowbrook Soil Form

Willowbrook soils are characterised by Melanic A-horizon over a G-horizon. The G-horizon is invariably firm or very firm and its characteristics are described above. Refer to Figure 9-15 for an illustration. The Melanic horizon has several unique diagnostic criteria as a horizon, namely:

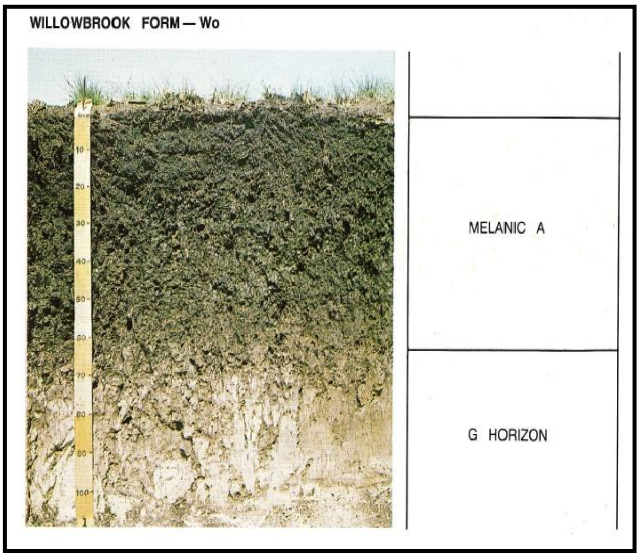

Figure 9-15: Willowbrook Soil Form (Soil Classification 1991)

- Has dark colours in the dry state.
- Lack slickensides that are diagnostic of vertic horizons.
- Has less organic carbon than required for diagnostic organic O horizon.

- Has structure that is strong enough so that the major part of the horizon is not both massive and hard or very hard when dry.

9.4.8 Disturbed Soils

The disturbed soil management unit is found in areas where human disturbance has influenced the soil that developed on site. This is the case at dumping sites, roadsides, beneath buildings and mined areas. Refer to Figure 9-16 for an illustration.

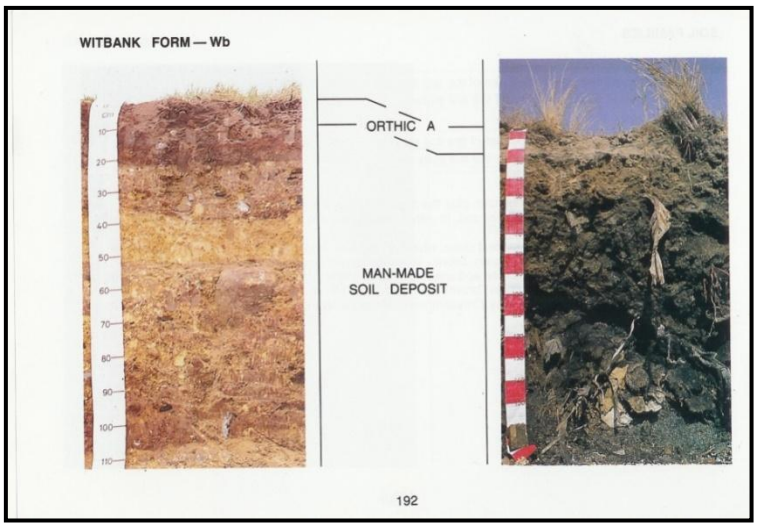

Figure 9-16: Witbank Soil Form (Soil Classification, 1991)

9.5 AGRICULTURAL POTENTIAL (LAND CAPABILITY)

9.5.1 Data Collection

A literature review was conducted in order to obtain relevant information concerning the area, including information from the Environmental Potential Atlas (ENPAT), Weather Bureau and Department of Agriculture. Results from the soil study were taken into account when determining the agricultural potential also known as the land capability of the site. The land capability assessment methodology as outlined by the National Department of Agriculture was used to assess the soil's capability to support agriculture on site. (Refer to Table 9-1 and Figure 9-17 below)

9.5.2 Regional Description

The regional land capability is mostly Class II or IV soils with few limitations. This is evident in the large number of cultivated lands found in the region. In the areas where the soil is too shallow or too wet to cultivate, livestock are grazed.

9.5.3 Study area Description

According to the land capability methodology, the potential for a soil to be utilised for agriculture is based on a wide number of factors. These are listed in Table 9-1 below along with a short description of each factor.

Table 9-1: Agricultural Potential criteria

Criteria	Description
Rock Complex	If a soil type has prevalent rocks in the upper sections of the soil it is a limiting factor to the soil's agricultural potential
Flooding Risk	The risk of flooding is determined by the closeness of the soil to water sources.
Erosion Risk	The erosion risk of a soil is determined by combining the wind and water erosion potentials.
Slope	The slope of the site could potentially limit the agricultural use thereof.
Texture	The texture of the soil can limits its use by being too sandy or too clayey.
Depth	The effective depth of a soil is critical for the rooting zone for agricultural crops.
Drainage	The capability of a soil to drain water is important as most grain crops do not tolerate submergence in water.
Mechanical Limitations	Mechanical limitations are any factors that could prevent the soil from being tilled or ploughed.
pH	The pH of the soil is important when considering soil nutrients and hence fertility.
Soil Capability	This section highlights the soil type's capability to sustain agriculture.
Climate Class	The climate class highlights the prevalent climatic conditions that could influence the agricultural use of a site.
Land Capability / Agricultural Potential	The land capability or agricultural potential rating for a site combines the soil capability and the climate class to arrive at the sites potential to support agriculture.

The soils identified in Section 9.4 above were classified according to the methodology proposed by the Agricultural Research Council – Institute for Soil, Climate and Water (2002). The criteria mentioned above were evaluated in the Table 9-2 below. The site is made up of several land capability classes, namely Class II, III, IV, V, VI and VII. The Class II - III soils are suitable for cultivation and can be used for a range of agricultural applications in the case of Class II. Class IV – V soils have features that reduce their potential for agricultural use, this can be flood hazards, erosion risk, texture or drainage. The Class VI and VII soils have continuing limitations that cannot be corrected; in this case rock complexes, flood hazard, stoniness, and a shallow rooting zone constitute these limitations. Table 9-2 illustrates the various land capability units within the study area.

Table 9-2: Land Capability of the soils within the study area

Soil	Good Agricultural	Agricultural	Transitional	Poor Transitional	Shallow Soil	Disturbed / Hard Rock
% on Site	8	28	12	40	11	1
Rock Complex	None	None	None	None	Yes	None
Flooding Risk	No	Moderate	Moderate	Moderate	No	Very Limiting
Erosion Risk	Low	Moderate	High	High	High	Very Low
Slope %	3.9	3.7	3.7	3.7	4.0	0.5
Texture	Loam	Loam	Loam	Clay/Clayey Loam	Sandy Loam	Rock/Sandy
Effective Depth	> 100 cm	> 60 cm	> 60 cm	< 60 cm	< 60 cm	< 10 cm
Drainage	Good	Imperfect	Imperfect	Poor	Poorly drained	Poorly drained
Mech Limitations	None	None	None	None	Rocks	Rocks
pH	> 5.5	> 5.5	> 5.5	> 5.5	> 5.5	> 5.5
Soil Capability	Class II	Class III	Class IV	Class V	Class VI	Class VIII
Climate Class	Mild	Mild	Mild	Mild	Mild	Mild
Land Capability	Class II – Arable Land	Class III – Moderately Arable Land	Class IV – Poor Arable Land	Class V – Good Grazing Land	Class VI – Moderately Grazing Land	Class VII – Wildlife

No limitation	Low	Moderate	High	Very Limiting

For an illustration of the land capability please refer to Figure 9-17.

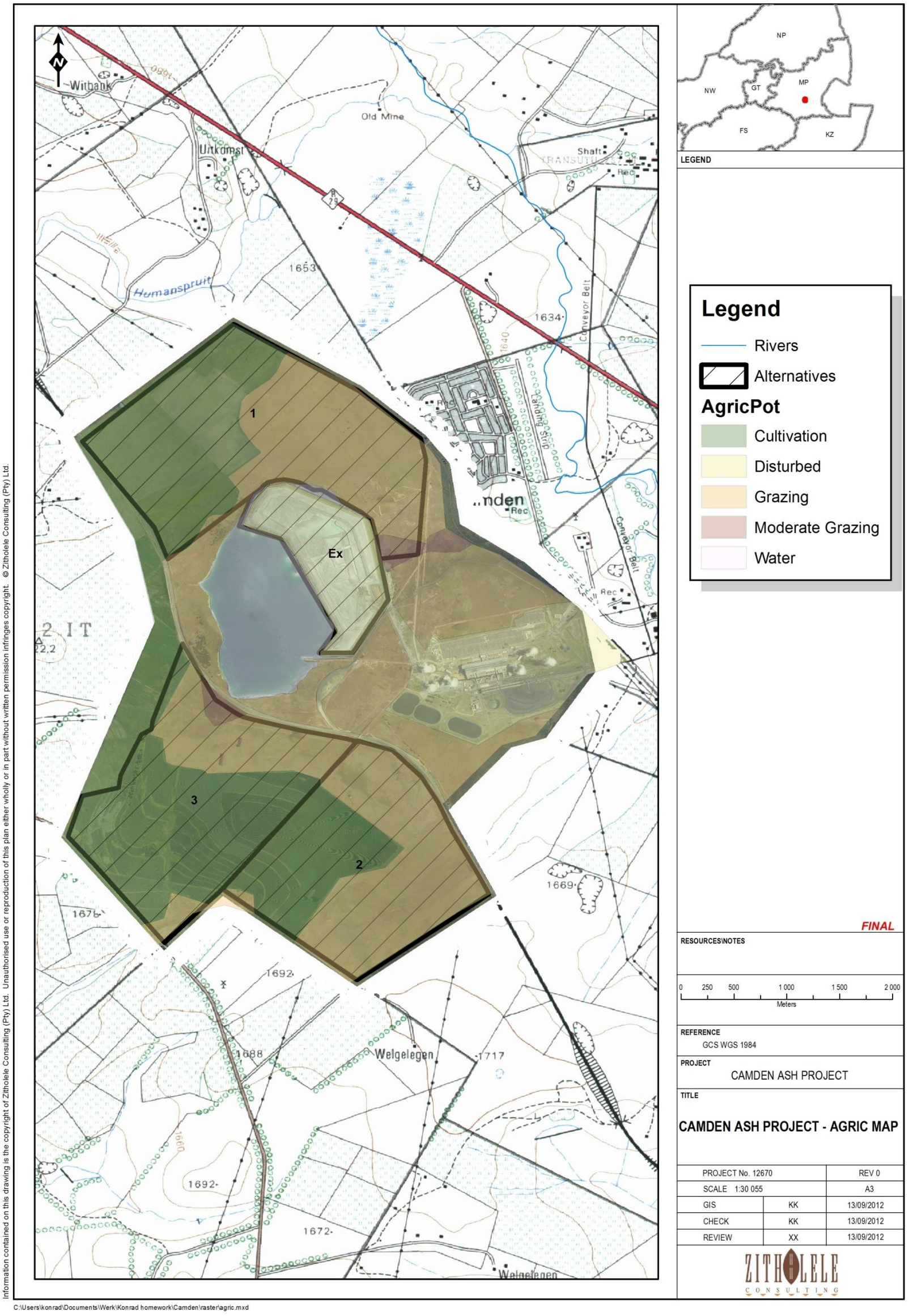

Figure 9-17: Agricultural Potential

9.6 SURFACE WATER

9.6.1 Data Collection

The surface water data was obtained from the Department of Water Affairs National database of Freshwater Ecosystem Priority Areas (FEPAs) for river ecosystems and wetlands. The data used included catchments, wetlands, water bodies, river alignments and ecological status of these sources.

9.6.2 Regional Description

The main drainage features of the area are the Witpuntspruit which drains south-eastwards to the Vaal River, which is located some 6 km downstream of Camden Power Station. Several unnamed tributaries are also found in the area. In addition to the streams, several wetlands and pans can also be found in the region as illustrated in Figure 9-18 below. The streams and their associated pans and wetlands support a number of faunal and floral species uniquely adapted to these aquatic ecosystems, and therefore all surface water bodies are earmarked as sensitive features and should be avoided as far as possible.

9.6.3 Study area Description

From Figure 9-18 below, it is evident that there are water bodies or streams in close proximity to the study area. The De Jagers Pan is a natural depression/pan that is located adjacent to the existing ash disposal site. This pan is used as a return water dam as part of the approved water management system for the current station operations. In addition to the pan there are small non-perennial drainage lines on all three alternative sites. In order to identify the exact location and status of these features a wetland and riparian delineation study was undertaken as described in Section 9.6.4 below.

9.6.4 Sensitivities

All the surface water features are seen as sensitive and should be avoided by the ash disposal site. A detailed delineation study was undertaken to determine the extent of the surface water features. The results of the delineation are shown in Figure 9-18. A summary of the wetland and surface water delineation study is provided below, and more detailed description is included in the attached Biophysical Specialist Study (refer to Appendix I).

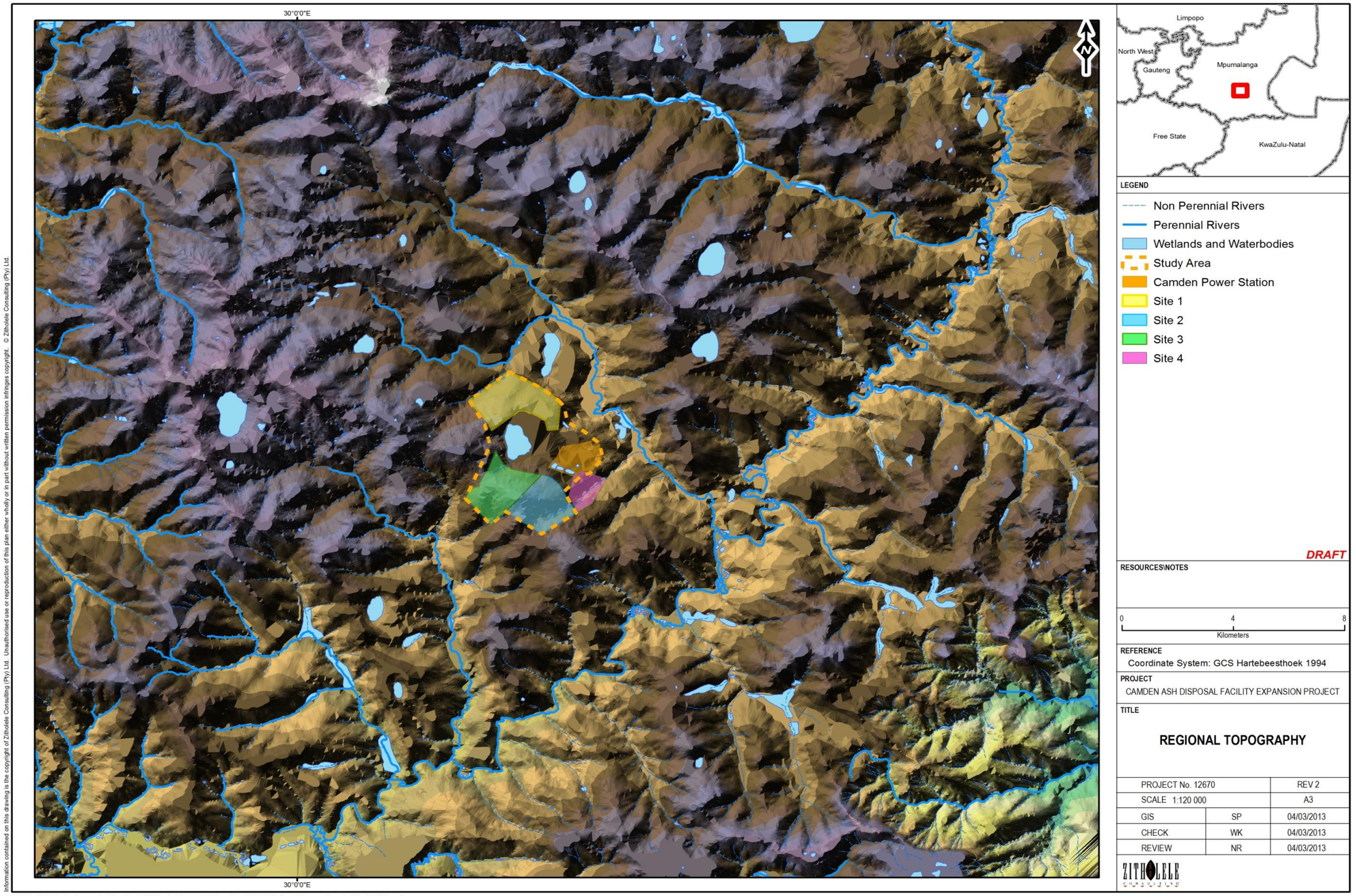

Figure 9-18: Wetland and surface water

9.7 AQUATIC ECOSYSTEMS

9.7.1 Data Collection

The description of the aquatic ecosystem associated with the proposed development area was informed by the initial Aquatic Study conducted in 2012 (refer to Appendix H1) as well a revised study that was carried out in 2014 (refer to Appendix H2). The initial Aquatic Study was conducted in the wet season (January) and considered five biomonitoring and two toxicological sites. The Humanspruit (which is located north of preferred Site 1) showed elevated salt levels as well as low pH values. The Electrical Conductivity (EC) measured 74.7 mS/m and 100.7 mS/m, while the pH values measured were 5.55 and 6.30 respectively. These findings were consistent with measurements taken in the field during the August 2014 site visit. Sampling of the biota in 2012 indicated that the Humanspruit is seriously impaired, with only four aquatic macroinvertebrate taxa identified and no fish being captured during the study. In a survey conducted in March 2014 (Clean Stream Biological Services, 2014), similarly poor water quality was observed in the Witpuntspruit with two sites recording pH values below the South African Water Quality Guidelines (DWAF, 1996 – Vol. 7). The pH values measured were 4.92 and 6.56, respectively. In addition, a further three on-site toxicological sites were sampled, both of which showed no acute toxicity. A combined total of 24 aquatic macroinvertebrate taxa were sampled, with six having a moderate requirement for unmodified water quality.

Riparian Zones vs. Wetlands

Wetlands

The riparian zone and wetlands were delineated according to the Department of Water and Sanitation (DWS, previously known as the Department of Water Affairs and Forestry - DWAF) guideline, 2003: A practical guideline procedure for the identification and delineation of wetlands and riparian zones. According to the DWS guidelines *a wetland* is defined by the National Water Act, 1998 (36 of 1998) as:

"land which is transitional between terrestrial and aquatic systems where the water table is usually at or near surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

In addition the guidelines indicate that wetlands must have one or more of the following attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and

- A high water table that results in saturation at or near surface, leading to anaerobic conditions developing in the top 50 centimetres of the soil.

During the site investigation the following indicators of potential wetlands were identified:

- Terrain unit indicator;
- Soil form indicator;
- Soil wetness indicator; and
- Vegetation indicator.

Riparian Areas

According to the DWS guidelines *a riparian area* is defined by the National Water Act as:

"Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas"

The difference between Riparian Areas and Wetlands

According to the DWS guidelines the difference between a wetland and a riparian area is:

"Many riparian areas display wetland indicators and should be classified as wetlands. However, other riparian areas are not saturated long enough or often enough to develop wetland characteristics, but also perform a number of important functions, which need to be safeguarded… Riparian areas commonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments."

Delineation

The site was investigated for the occurrence / presence of wetlands and riparian areas, using the methodology described above and described in more detail in the DWS guidelines.

Terrain Unit Indicator

The topography of the site is described in Section 9.3 of this report and is also shown in Figure 9-3. According to the DWS guidelines the valley bottom is the terrain unit where wetlands are most likely to occur, but the occurrence of wetlands is not excluded from any of the other terrain units.

The bulk of the area drains towards De Jager's Pan, which represents the valley bottom, and this is the area in which most wetlands are expected.

Soil Form Indicator

Of the soils identified the clay and transitional soils could potentially be wetland soils as they have clay accumulation. The clay soils are mostly typical of the permanent and seasonal wetland zone while the transitional soils can be found in temporary wetland zones.

Soil Wetness Indicator

The soils on site were subjected to a soil wetness assessment. If soils showed signs of wetness within 50 cm of the soil surface, it was classified as a hydromorphic soil and divided into the following zones:

Temporary Zone

- Minimal grey matrix (<10%);
- Few high chroma mottles; and
- Short periods of saturation.

Seasonal Zone

- Grey matrix (>10%);
- Many low chroma mottles present; and
- Significant periods of wetness (>3 months / annum).

Permanent Zone

- Prominent grey matrix;
- Few to no high chroma mottles;
- Wetness all year round; and
- Sulphuric odour.

Vegetation Indicator

The vegetation units on site are described in Section 9.8.2 below and illustrated in Figure 9-21. The vegetation found in the moist grassland vegetation unit has species present to indicate the presence of wetlands

9.7.2 Delineated Wetlands and Buffer Zones

As mentioned previously wetland types are differentiated based on their Hydro-Geomorphic (HGM) characteristics i.e. on the position of the wetland in the landscape, as well as the way in which water moves into, through and out of the wetland systems. Four wetland types were identified within the Study Area (Figure 9-19);

- Channelled valley bottom ('VBA');
- Unchannelled valley bottom ('VBB');
- Pan ('De Jager's Pan'); and
- Hillslope seep (west of De Jager's Pan).

Heavily-modified wetland conditions exist to the east of the existing ash dump, which is located along the eastern edge of De Jager's Pan ('modified wetland').

According to the methodology that was followed for delineation of wetlands by DWS, there are wetlands present on site. It should however be noted that several of the so-called wetlands could also be classified as riparian zones as they follow the drainage path of the perennial and non-perennial streams on each of the alternative sites. All the areas identified above perform critical ecosystem functions and also provide habitat for sensitive species. It was suggested by the specialist that a 50 m and 100 m buffer be placed from the edge of the temporary zone in order to sufficiently protect the wetlands and riparian zones. Figure 9-19 below illustrates the various wetland and riparian zones as well as the buffers placed along the edge of the temporary zone.

Channelled Valley Bottom (VBA)

A channelled valley bottom wetland is located approximately 100 m northwest of the boundary of the proposed ash facility and return water dam. Hydrophilic vegetation observed in this wetland included Imperata cylindrica grass and Juncus sp., with the exotic species Verbena sp. also recorded. At the time of survey (during the dry season), flow was limited and open water was restricted to areas where water had pooled. This channelled valley bottom system flows into the nearby Humanspruit.

Unchannelled Valley Bottom (VBB)

An unchannelled valley bottom wetland is located approximately 600 metres northeast of the proposed return water dam (Figure 9). Imperata grass is abundant in this area, and dead flower heads of a diversity of sedges (Cyperus sp., Pycreus sp., inter alia) were observed during the dry season survey. The wetland soils augured here showed wetness signatures indicating permanent, seasonal and temporary wetland zones; however these zones could not be clearly established as vegetation types could not be easily identified at the time of survey.

The southern extent of the wetland boundary is defined by the edges of cultivated fields. The wetland is intercepted by the main R29 road at its north-eastern extent, which has impounded it. The area that previously formed part of this wetland to the north of the intersecting R29 has now been disturbed by cultivation.

De Jager's Pan

A heavily-modified pan exists in the shape of the former De Jager's Pan, which has been utilised as a return water dam for the existing ash facility and has been integrated into the dirty water management circuit of the power plant for over 40 years. This area was not surveyed during the field visit.

Hillslope Seep

Inflow to De Jager's Pan comes from hillslope seep areas to the west of the pan. This area was not surveyed during the field visit; the boundary shown on Figure 9-19 was derived from recent aerial imagery and delineated from desktop only.

Modified wetland

Heavily-modified wetland conditions exist to the east of the existing ash dump. Originally, this system was likely a hillslope seep without channelled outflow and fed by seepage from De Jager's Pan. The system is now almost completely modified by the presence of the existing ash dump facility, and site roads that intersect the former wetland area at a number of junctures, channelling surface run-off through culverts. At the time of survey, the area was completely burnt and could not be accurately delineated in the field, however patches of *Imperata* grass are prevalent throughout, and Phragmites was evident adjacent to the channelled outflow from this area. Delineation of this system presented in this report is consequently derived from aerial imagery.

Wetland Functioning

The nature of the functions that the wetlands perform and the services they provide were assessed using the Wet Ecoservices tool. Each wetland was assessed separately. The assessment considers each HGM unit in the context of unit type and the land-use setting in which it occurs (i.e. Camden Power Station and ancillary infrastructure, agricultural cultivation) as these factors determine the potential functions provided by the wetlands and the opportunities available to perform certain functions and services.

VBA – Channelled valley bottom wetland

The findings of the assessment of VBA (channelled valley bottom wetland) adjacent to the infrastructure of preferred Site 1 (Figure 9-19) indicate that it principally controls exacerbation of erosion that could potentially arise as a result of tilled agricultural fields in its

catchment (Figure 9-20), and increased levels of surface water runoff. Phosphate trapping and stream flow regulation are regulated in tandem with erosion control. The wetland has a more limited role in flood attenuation and maintenance of biodiversity, as a function of its size and apparently limited biological diversity.

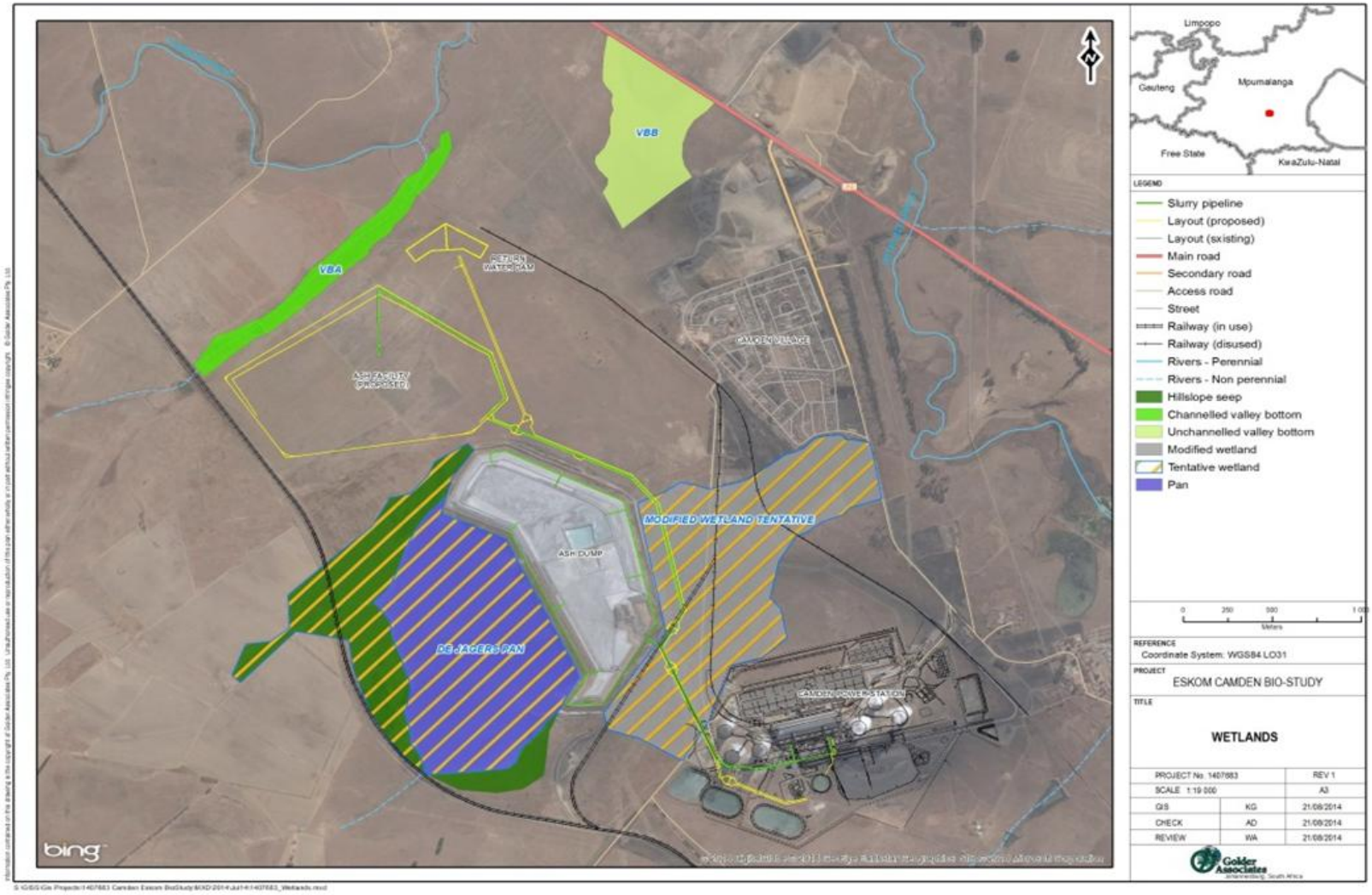

Figure 9-19: Wetlands and Riparian Zones including buffer

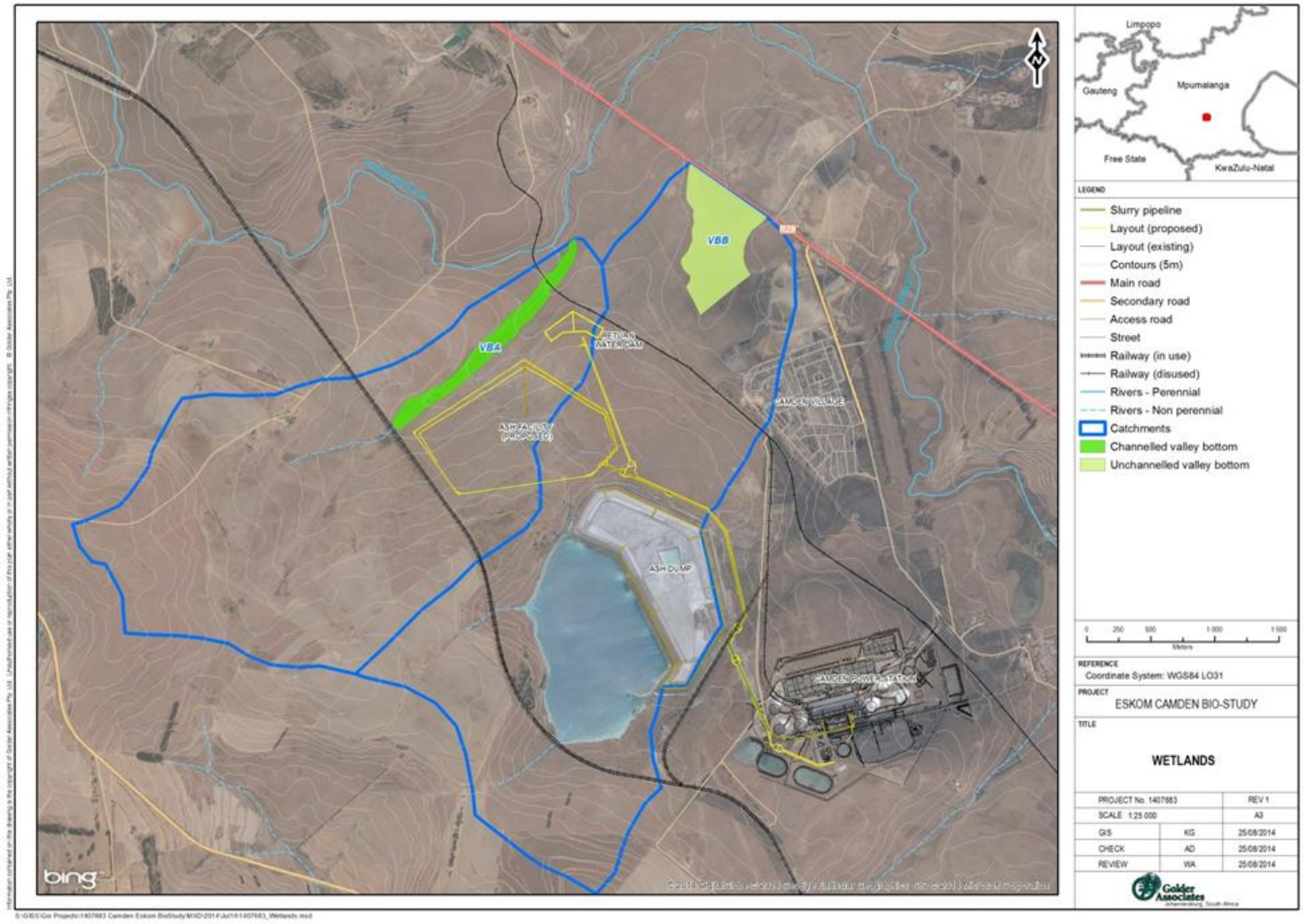

Figure 9-20: Location of infrastructure in Preferred Site 1 – the Study Area for wetland and aquatic assessment

9.8 TERRESTRIAL ECOLOGY

9.8.1 Data Collection

A literature review of the faunal and floral species that could occur in the area was conducted. C-Plan data provided from the Mpumalanga provincial department was used to conduct a desktop study of the area. This data consists of terrestrial components; ratings provide an indication as to the importance of the area with respect to biodiversity.

The study involved extensive fieldwork, a literature review and a desktop study utilizing GIS. Site investigations were conducted from October 2011 to March 2012, from spring to summer. The area within the servitude was sampled using transects placed at 100 m intervals. At random points along these transect an area of 20 m x 20 m was surveyed. All species within the 20 m x 20 m quadrant were identified, photographed and their occurrence noted. Sensitive features such as ridges or wetlands were sampled by walking randomly through the area concerned and identifying all species within the area.

The floral data below is taken from The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford (2006)). Also, while on site, the following field guides were used:

- Guide to Grasses of Southern Africa (Van Oudtshoorn,F, (1999));
- Field Guide to Trees of Southern Africa (Van Wyk, B and Van Wyk,P (1997));
- Field Guide to the Wild Flowers of the Highveld (Van Wyk,B and Malan,S, (1998));
- Problem Plants of South Africa (Bromilow,C, (2001)); and
- Medicinal Plants of South Africa (Van Wyk,B.E, Van Oudtshoorn,B and Gericke,N, (2002))

Species lists were obtained from the SIBIS (*South African National Biodiversity Institute - Accessed through the SIBIS portal, sibis.sanbi.org, 2012-01-25)*. In addition the following faunal guides were used on site and while compiling this report:

- Die Natuurlewe van Suider-Afrika, ‘n veldgids tot diere en plante van die streek (Carruthers,V, (1997));
- Birds of Southern Africa (Sinclair,I (1994));
- Smithers’ Mammals of Southern Africa, a field guide (Ed. Peter Apps, (2000));
- Sasol Owls and Owling in Southern Africa (Tarboton, W and Erasmus, R (1998));
- Bats of Southern Africa (Taylor, P.J, (2000)).

9.8.2 Vegetation

Regional Description

The area under investigation is located within the Grassland Biomes. Each biome comprises several bioregions which in turn has various vegetation types within the bioregion. The Grassland Biome is represented by Mesic Highveld Grassland and Inland Azonal Vegetation bioregions as described below. These descriptions are adapted from Mucina and Rutherford, 2006.

Mesic Highveld Grassland

Mesic Highveld Grassland is found mainly in the eastern, high rainfall regions of the Highveld, extending all the way to the northern escarpment. These are considered to be "sour" grasslands and are dominated by primarily andropogonoid grasses. The different grassland types are distinguished on the basis of geology, elevation, topography and rainfall. Shrublands are found on outcrops of rock within the bioregion, where the surface topography creates habitat in which woody vegetation is favoured above grasses.

Inland Azonal Vegetation

The Azonal Vegetation bioregion is characterised by those vegetation units that is associated with inland water features such as riparian and wetland vegetation. Along the proposed route only one vegetation type was identified, namely Eastern Temperate Freshwater Wetlands.

Study area Description

The vegetation types identified on site are indicated in Figure 9-21 below and described in detail below.

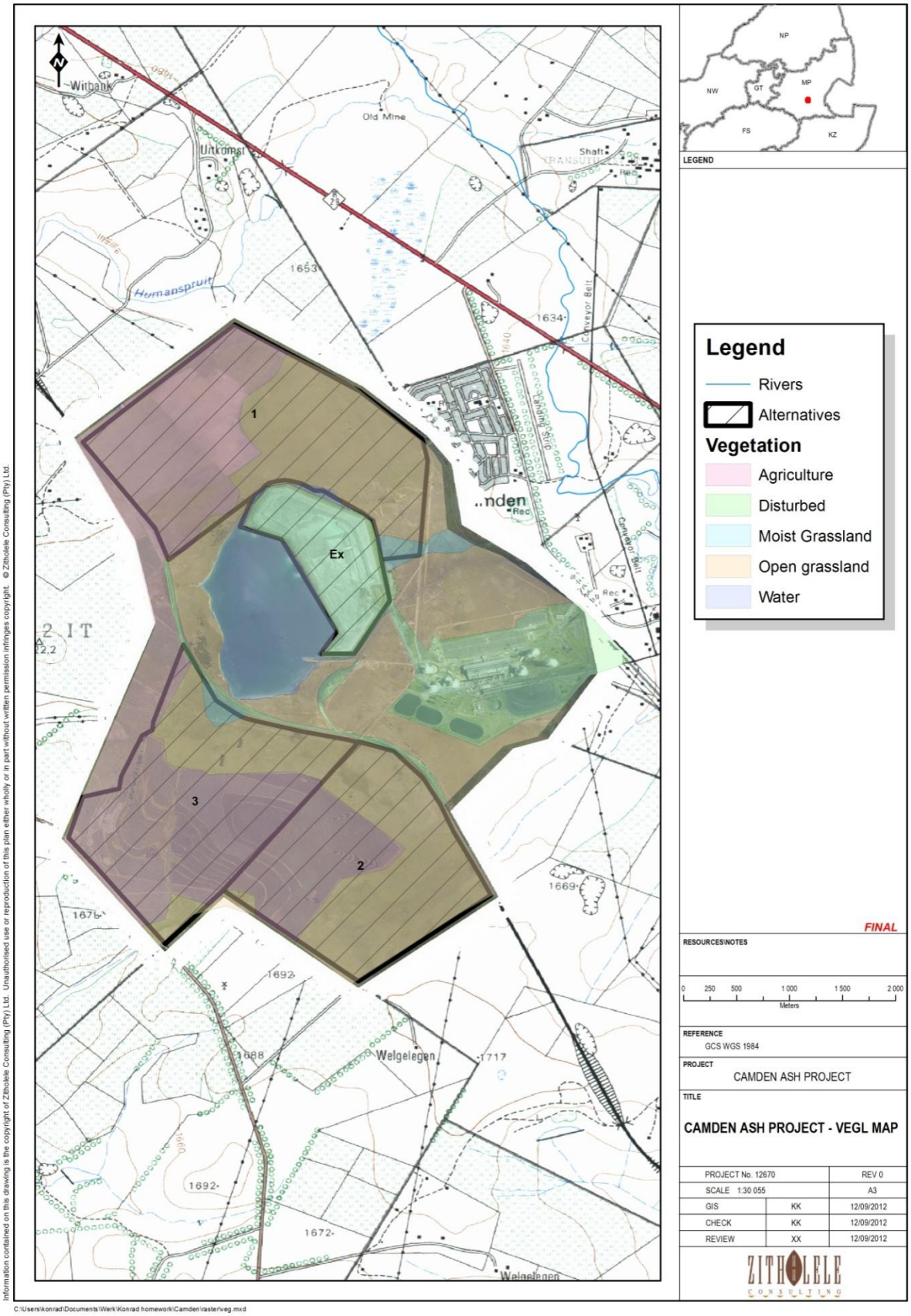

Figure 9-21: Vegetation map of the study area

Eastern Temperate Freshwater Wetlands

This vegetation unit is found throughout the Northern Cape, Eastern Cape, Free State, North-West, Gauteng, Mpumalanga and KwaZulu-Natal Provinces as well as in the neighbouring Lesotho and Swaziland. It is based around water bodies with stagnant water (lakes, pans, periodically flooded vleis, and edges of calmly flowing rivers) and embedded within the Grassland Biome. These water bodies support zoned systems of aquatic and hygrophillous vegetation of temporary flooded grasslands and ephemeral herblands.

Due to the recent efforts of organisations such as Ramsar, this vegetation unit is now 4.6 % conserved and rated as least threatened. The following alien species are encountered in this type of wetland: *Bidens bidentata, Cirsium vulgare, Conyza bonariensis, Oenothera rosea, Physalis viscosa, Plantago lanceolata, Rumex crispus, Sesbania punicea, Schkuhria pinnata, Stenotaphrum secundatum* (native on South African coast, alien on Highveld*), Trifolium pratense, Verbena bonariensis, V. brasiliensis, and Xanthium strumarium*.

In terms of the vegetation on site, there are 3 distinct areas within the study area that fall into this vegetation unit. The first is De Jager's Pan (shown in Figure 9-22), the large pan in the centre of the site. This pan is classified as a wetland and wetlands are of a more permanent nature and occur in low-lying areas such as tributaries of streams and rivers. Here hydrophytes are found. Typical plants are the Orange River Lily (*Crinum bulbispermum*), bulrush (*Typha capensis*) and reeds (*Phragmites australis*), sedges of the *Cyperus, Fuirena and Scirpus* genera also occur. Due to the use of the pan as a dirty water return dam for the power station over the 40 odd years of operation, the vegetation around the pan has been disturbed as the water quality was reduced.

Figure 9-22: De Jager's Pan with the existing ash facility in the foreground

The other two areas (shown in Figure 9-23) are the inflow into the pan from the south and the man-made outflow to the north-northeast of the pan and existing ash disposal site. These areas around drainage lines/seepage areas were also added to this unit because of the similar vegetation that occur in these areas. The seepage area is seasonally wet and is found to the south of the site, where the bowl-shaped topography drains to a central point that enters under the Richard Bay railway line and drains into the pan. These areas are usually covered by hygrophytes such as sedges and reeds. The dominant sedge in the study area is *Juncus rigidus*. Sometimes bulrush (*Typha capensis*) and reeds (*Phragmites australis*) also occurs. The photos below show these areas.

Figure 9-23: Moist Grassland found at the bottom of the southern slopes prior to joining De Jager's Pan

The third and last area (shown in Figure 9-24) is found to the north and north-east of the existing ash facility. This facility has built-in drainage channels around the facility to channel storm water from the site into De Jager's Pan. High water levels in De Jager's Pan have resulted in these channels being filled with water on a semi-permanent basis as shown in the photo below. Furthermore there are several places where this water has seeped from the site to the east down the slope. These areas are mostly covered by sedges and reeds as described above

Figure 9-24 Drainage around the existing ash facility

Eastern Highveld Grassland

The Eastern Highveld Grassland occurs in the Mpumalanga and the Gauteng provinces on the plains between Belfast in the east and the eastern side of Johannesburg in the west extending southwards to Bethal, Ermelo and west of Piet Retief. The landscape is made up of slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya, etc*.) with small scattered rocky outcrops with wiry, sour grasses and some woody species (*Arcacia caffra, Celtis Africana, Diospyros luciodes subspecies lycioides, Parinari capensis, Protea caffra, P. Welwitschii and Rhus magalismontanum*).

This vegetation unit is considered endangered with a conservation target of 24%. Only a very small fraction is conserved in statutory reserves (Nooitgedacht dam and Jericho dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Approximately 44% is transformed primarily by cultivation, plantations, mines, urbanisation and by the building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed areas.

In terms of the grassland found on site there are several areas used for grazing where the grassland is in a decent condition, however some signs of overgrazing as well as invasion by alien *Acacia mearnsii* and *Eucalyptus spp* are evident. Large sections of the grassland have been converted to agriculture in the southern and eastern parts of the study area, while the development of the power station and its supporting infrastructures has also impacted on a large section of the grassland. Below are photographs of this vegetation unit found in the study area.(Figure 9-25)

Figure 9-25: Eastern Highveld Grassland found to the north (left) and south (right) of Camden Power Station

Disturbance

A major factor found all over the study area is the disturbance of the natural vegetation. Large tracks of land have been changed by cultivation (maize and legumes), mining (coal and borrow pits), industry (power station) and urbanisation (Camden village). Figure 9-26 below provides examples of the source of disturbance across the study area.

Figure 9-26: Disturbances to natural vegetation found along the route

Red data Flora Species

No red data species were found. However species of importance noted on site include the *Boophone disticha.*

9.8.3 Terrestrial Animal Species

Invertebrates

A total of 568 arthropods are recorded for the study area. The large number is mainly due to the wide range of habitat available and the large area covered by the various alternatives.

Reptilia

A total of 3 reptilian species were recorded for the study site.

Amphibia

One amphibian was recorded as occurring within the study area - *Rana angolense*. These species are not restricted in terms of habitat or distribution and none of the species recorded are classified as Red Data species.

Avifauna

A specialist avifauna assessment was undertaken; a summary description of the avifauna which occurs in the study area is given in Section 9.9. For a detailed description of the Avifauna please refer to Appendix G.

Mammalia

Mammal species diversity was low across the bulk of the study area, as very little natural habitat remains. Most of the mammals occur in small pockets of remaining natural vegetation, with a total of 6 species being recorded. Of these only the Aardvark is listed as vulnerable.

9.9 AVIFAUNA

9.9.1 Data Collection

Data collection for the Avifaunal specialist study occurred as a two part study. First the specialist did a desktop study whereby he studied and referred to a series of recognised literature that is considered to be well representative of the study area and Mpumalanga Provinces as a whole. The literature used includes the following:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) was obtained from the Animal Demography Unit website (http://sabap2.adu.org.za,), for the Quarter-Degree Grid Cell (QDGC) where the proposed development is located (2630CA).
- The conservation status of all species considered likely to occur in the area was determined as per the most recent iteration of the southern African Red Data list for birds (Barnes 2000), and the most recent and comprehensive summary of southern African bird biology (Hockey et al. 2005). QDGCs are grid cells that cover 15 minutes of latitude by 15 minutes of longitude (15. × 15.), which correspond to the area shown on a 1:50 000 map.
- Additional bird distribution data and a classification of the vegetation types in the QDGCs were obtained from Southern African Bird Atlas Project 1 (SABAP1) (Harrison et al. 1997).
- The Mpumalanga Biobase Report (Emery et al. 2002) was consulted to establish which bird habitats are regarded as conservation priorities in the province.
- Data from the Co-ordinated Avifaunal Road count project (CAR) for the Mpumalanga precincts were obtained (Young, Harrison, Navarro, Anderson and Colahan, 2003). This data was of particular importance in order to establish what densities of large terrestrial birds could be expected to occur in the study area, and especially what the habitat preferences of those species are.
- Interviews were conducted with Ms Ursula Franke, Senior Field Officer: Highveld Crane Conservation Project of the Endangered Wildlife Trust, with regard to the occurrence of cranes and other Red Data species in the Ermelo district.

The second part of the study consisted of a field study. The specialist went out into the field during January 2012. During the field study the birds were counted at all three alternative

sites by driving slowly along a pre-determined transect and stopping regularly to scan the surroundings for birds. The number of birds and habitat type for all species seen or heard were recorded. The diversity and abundance of avifauna per habitat type (grassland vs. agriculture) were compared for all three sites combined in order to establish which habitat type supported the greatest variety and abundance of avifauna. The quantity of each habitat type was then measured for each alternative, and the site that contained the lowest quantity of sensitive habitat was deemed to be the preferred alternative for the proposed development.

9.9.2 Regional Description

It is generally accepted that vegetation structure, rather than the actual plant species, influences bird species distribution and abundance (in Harrison *et al.* 1997). Therefore, the vegetation description below does not focus on lists of plant species, but rather on factors which are relevant to bird distribution.

The proposed alignments fall within the grassland biome. The dominant plants in the grassland biome are grass species, with geophytes and herbs also well represented. Grasslands are maintained mainly by a combination of the following factors: relatively high summer rainfall; frequent fires; frost and grazing. These factors preclude the growth of trees and shrubs. This biome has been largely transformed in South Africa through various land uses such as afforestation, and in Mpumalanga and Gauteng, by crop cultivation and mining. **Sweet grassland** is generally found in the lower rainfall areas - vegetation is taller and sparser, and nutrients are retained in the leaves during winter. **Sour grassland** generally occurs in the higher rainfall areas on leached soils. Many grassland bird species show a preference for sour grassland over sweet or mixed grassland. **Mixed grassland** is a combination or a transition between the two grassland types above.

In the study area itself, short, dense sour grassland is most prevalent, with the dominant grassland type in the study area being Eastern Highveld Grassland (Mucina & Rutherford 2006)

9.9.3 Study area Description

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the broad vegetation type above, it is as important to examine the micro habitats available to birds. These are generally evident at a much smaller spatial scale than the vegetation types, and are determined by a host of factors, such as vegetation type, topography, land use and manmade infrastructure. The land use in the study area is a variety of mixed farming practices. Grazing is developed in parallel with crop farming.

The most important bird micro-habitats other than natural grassland that were identified during the field visit are the following (see Figure 9-27 and Figure 9-28 below for a photographic record of recorded habitat):

Figure 9-27: Cultivated field and Grassland

Figure 9-28: Existing Ash Water Return dam (De Jagers) and ash disposal facility

- Dry land cultivation: The habitat in the study area has been transformed through dryland cultivation, mostly maize but also other crops. The region has summer rainfall and therefore intensive crop farming is practiced on a wide scale.
- Wetlands and dams: None of the three site alternatives for the proposed ash disposal facility contains any significant wetlands or dams. This habitat is however present in the study area in the form of the existing ash dam (known as De Jagers Pan). This dam is characterised by relatively steep edges with little exposed shallow shoreline. In places, the edges are fringed by bulrush (*Typha capensis*) and reeds (*Phragmites australis*). The following bird species represented in Table 9-3 are all potential bird species that could be found at the existing ash disposal facility, and proposed facility based on the type of vegetation found around it and the structure of the water edge.

Table 9-3: Potential Waterbird species at the existing and proposed new ash dam

Colloquial Name	***Scientific name***
African Darter	*Anhinga rufa*
African Purple Swamphen	*Porphyrio madagascariensis*
African Rail	*Rallus caerulescens*
African Sacred Ibis	*Threskiornis aethiopicus*
African Spoonbill	*Platalea alba*
Cape Shoveler	*Anas smithii*
Cattle Egret	*Bubulcus ibis*
Common Moorhen	*Gallinula chloropus*
Egyptian Goose	*Alopochen aegyptiaca*
Grey Heron	*Ardea cinerea*
Hamerkop	*Scopus umbretta*
Little Egret	*Egretta garzetta*
Little Grebe	*Tachybaptus ruficollis*
Malachite Kingfisher	*Alcedo cristata*
Pied Kingfisher	*Ceryle rudis*
Purple Heron	*Ardea purpurea*
Red-billed Teal	*Anas erythrorhyncha*
Red-knobbed Coot	*Fulica cristata*
Reed Cormorant	*Phalacrocorax africanus*
Southern Pochard	*Netta erythrophthalma*
Spur-winged Goose	*Plectropterus gambensis*
Three-banded Plover	*Charadrius tricollaris*
Whiskered Tern	*Chlidonias hybrida*
White-breasted Cormorant	*Phalacrocorax lucidus*

It is however important to note that none of the priority avifauna species listed in the Mpumalanga Biobase Report (Emery *et al*. 2002) was recorded by the on-site surveys, but their occurrence cannot be ruled out.

9.10 VISUAL STUDY

The proposed alternatives are all found in a mostly rural landscape that has been infiltrated by mining and industrial development around the power station. The bulk of the study area is utilised for agriculture and coal mining with a varying topography.

9.10.1 Methodology

The methodology adopted for the visual assessment includes the following tasks:

- Examine the baseline information (contours, building dimensions, vegetation, inter alia);
- Determine the area from which the proposed power line may be visible (viewshed);
- Identify the locations from which views of the proposed development may be visible (observation sites), which include buildings and roads;

- Analyse the observation sites to determine the potential level of visual impact that may result from the proposed development; and
- Identify measures available to mitigate the potential impacts.

Each component of the assessment process is explained in detail in the following sections of the Report.

9.10.2 The Viewshed

The viewshed represents the area from which the proposed development would potentially be visible. The extent of the viewshed is influenced primarily by the combination of topography and vegetation, which determine the extent to which the development area would be visible from surrounding areas. The viewshed was determined by Zitholele through the following steps and presumptions:

- The likely viewshed was determined by desktop study (ArcGIS) using contour plans (20 m interval); and
- An offset of 2 m (maximum) for the observer and an offset of 45 m (maximum) for the proposed ash facility were utilized during the spatial analysis.

9.10.3 Visibility Assessment

Site visibility is an assessment of the extent to which the proposed development will potentially be visible from surrounding areas. It takes account of the context of the view, the relative number of viewers, duration of view and view distance.

The underlying rationale for this assessment is that if the proposed facility is not visible from surrounding areas then the development will not produce a visual impact. On the other hand if one or more parts of the facility are highly visible to a large number of people in surrounding areas then the potential visual impact is likely to be high.

Based on a combination of all these factors an overall rating of visibility was applied to each observation point. For the purpose of this report, categories of visibility have been defined as high (H), moderate (M) or low (L).

Assessment Criteria

For the purpose of this report, the quantitative criteria listed in Table 9-4have been determined and used in the Visibility Assessment. The criteria are defined in more detail in the sub-section following.

Table 9-4: Visual Impact Assessment Criteria

CRITERIA	DEFINITIONS

CRITERIA	DEFINITIONS
Category of Viewer	
Static	Farms, homesteads or industries
Dynamic	Travelling along road
View Elevation	
Above	Higher elevation then proposed power lines.
Level	Level view with power lines
Below	Lower elevation then power lines viewed
View Distance	
Long	> 5 km
Medium	1 – 5 km
Short	200 m – 1 000 m
Very Short	< 200 m
Period of View	
Long Term	> 120 minutes
Medium Time	1 – 120 minutes
Short Term	< 1 minute

Category Viewer

The visibility of the proposed development will vary between static and dynamic view types. In the case of static views, such as views from a farmhouse or homestead, the visual relationship between the proposed facility and the landscape will not change. The cone of vision is relatively wide and the viewer tends to scan back and forth across the landscape.

In contrast views from a moving vehicle are dynamic as the visual relationship between the proposed facility is constantly changing as well as the visual relationship between the proposed development and the landscape in which they it is seen. The view cone for motorists, particularly drivers, is generally narrower than for static views.

View Elevation

The elevation of the viewer relative to the object observed significantly influences the visibility of the object by changing the background and therefore the visual contrast. In situations where the viewer is at a higher elevation than the building/structure it will be seen against a background of landscape. The level of visual contrast between the proposed facility and the background will determine the level of visibility. A white/bright coloured structure seen against a background of dark/pale coloured tree-covered slopes will be highly visible compared to a background of light coloured slopes covered by yellow/brown dry vegetation.

In situations where the viewer is located at a lower elevation than the proposed facility it will mostly be viewed against the sky. The degree of visual contrast between white coloured structures will depend on the colour of the sky. Dark grey clouds will create a significantly greater level of contrast than for a background of white clouds. Figure 9-29 below illustrates this effect, where the view from above is far less visible.

Figure 9-29: Difference in view from below (left) and above (right)

View Distance

The influence of distance on visibility results from two factors:

- With increasing distance the proportion of the view cone occupied by a visible structure will decline; and
- Atmospheric effects due to dust and moisture in the air reduce the visual contrast between the structure and the background against which they are viewed.

Period of View

The visibility of structures will increase with the period over which they are seen. The longer the period of view the higher the level of visibility. However, it is presumed that over an extended period the level of visibility declines as people become accustomed to the new element in the landscape.

Long term views of the proposed facility will generally be associated with farm houses, informal settlements and a couple of towns located within the viewshed. Short term and moderate term views will generally relate to commuters moving through the viewshed mostly by vehicle.

Site Visibility

The procedure followed by Zitholele to assess Site Visibility involved:

- Generate a viewshed analysis of the area utilizing ArcGIS 10.
- Determine the various categories of observation points (e.g. Static, Dynamic)

10 COMPARATIVE ASSESSMENT OF ALTERNATIVES

A detailed comparative assessment was undertaken of the feasible alternatives (Site 1 and Site 3), as well as the "No-Go" alternative. The assessment was undertaken for all four phases of the development (Construction – Post Closure). The assessment was conducted taking cognisance of the Impact Assessment Methodology outlined in Section 11.1, and considered:

- Direction of the Impact (Positive / Negative Impact);
- Magnitude / Significance of the Impact;
- Duration / Temporal Scale of the Impact;
- Spatial Scale of the Impact; and
- Probability of occurrence of the impact.

The project impacts were identified and assessed, with and without mitigation measures; and where relevant, cumulative impacts (total project impact + initial baseline impacts to the environment) we also assessed. The residual cumulative impact post mitigation measures were also rated. The detailed comparative assessment is attached in Appendix Q. A summary of the comparative assessment results is presented in Table 10-1 to Table 10-4. A discussion of the results is presented in this chapter below.

10.1 CONSTRUCTION PHASE

The following key findings from the assessment are pertinent to the construction phase:

General:

- The potential impact risk to the environment from the construction of the proposed Camden Ash Disposal Expansion Facility is relatively low (refer to columns titled Project Impact);
- The most significant impact risk to the environment from the project, during the construction phase, will be to the Topography, Surface Water and Wetlands Resources, and existing infrastructure. This can be explained as follows:
  - **Topography:** permanent alternation of surface water drainage patterns;
  - **Surface Water and Wetlands:** increased suspended solids and sedimentation of surface water resources from construction activities, decreased recharge of surface water resources from alterations of topography, and installation of a barrier system to prevent water from leaving the contaminated area of the development site; and
  - **Existing infrastructure:** no powerlines will have to be relocated;

Table 10-1: Summary Results: Comparative Assessment – Construction Phase

		ALTERNATIVE:																			
		Site 1							Site 3A + 3B								"No-Go"						
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** - Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** - Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Unmitigated	**Status Quo** - Baseline Impact	**Cumulative Impact**	**Residual Impact**
CODE:																						
	CONSTRUCTION PHASE																					
G-1	Geology	Negative	Probable	1	1	3.7	3.7	3.7	Negative	Probable	1.1	1.1	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				VLOW	VLOW	HIGH	HIGH	HIGH			LOW	LOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
T-1	Topography	Negative	Definite	3.3	2.7	3.7	3.7	3.7	Negative	Definite	3.7	3.7	3.7	4	4			0	0	3.7	3.7	3.7
				HIGH	MOD	HIGH	HIGH	HIGH			HIGH	HIGH	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
SLC-1	Soil and Land Capability	Negative	Probable	1.2	0.7	3	3.7	3.3	Negative	Probable	1.3	0.8	3	3.7	3.7			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	HIGH			LOW	VLOW	MOD	HIGH	HIGH			NO	NO	MOD	MOD	MOD
SWW-1	Surface Water and Wetlands	Negative	Probable	2.1	0.9	3.7	3.7	3	Negative	Probable	2.7	1.5	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				MOD	VLOW	HIGH	HIGH	MOD			MOD	LOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
GW-1	Groundwater	Negative	Probable	0.8	0.5	3	3	3	Negative	Probable	0.8	0.5	3	3	3			0	0	3	3	3
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
TE-1	Terrestrial Ecology	Negative	Definite	1	0.7	3	3	2.7	Negative	Definite	1.1	0.8	3	3.3	3			0	0	3	3	3
				VLOW	VLOW	MOD	MOD	MOD			LOW	VLOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
AF-1	Avifauna	Negative	Definite	2.4	2.4	3	3	2.7	Negative	Definite	2.1	2.1	3	3	3			0	0	3	3	3
				MOD	MOD	MOD	MOD	MOD			MOD	MOD	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
AQ-1	Air Quality	Negative	Possible	1.3	0.6	3.3	3.3	3.3	Negative	Possible	1.1	0.5	3.3	3.3	3.3			0	0	3.3	3.3	3.3
				LOW	VLOW	HIGH	HIGH	HIGH			LOW	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
N-1	Noise	Negative	Probable	0.8	0.3	2.7	3	2.7	Negative	Probable	0.5	0.3	2.7	2.7	2.7			0	0	2.7	2.7	2.7
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
SOC-1	Social Environment	Positive	Probable	0.5	0.5	2.7	2.7	3	Positive	Probable	0.4	0.4	2.7	3	3	Negative	Definite	4.7	0	2.7	4.7	4.7
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			VHIGH	NO	MOD	VHIGH	VHIGH
EC-1	Economic	Positive	Possible	1	1.3	2.7	3	3	Positive	Possible	0.8	1	2.7	2.1	2.1	Negative	Definite	4.7	0	2.7	4.7	4.7
				VLOW	LOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			VHIGH	NO	MOD	VHIGH	VHIGH
INF-1	Infrastructure and Traffic	Negative	Probable	4	1	2.7	4.3	1.9	Negative	Probable	4	1	2.7	4.3	1.9			0	0	2.7	2.7	2.7
				HIGH	VLOW	MOD	VHIGH	LOW			HIGH	VLOW	MOD	VHIGH	LOW			NO	NO	MOD	MOD	MOD
V-1	Visual	Negative	Probable	1.2	1	3.7	3.7	3.7	Negative	Probable	1.2	1	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				LOW	VLOW	HIGH	HIGH	HIGH			LOW	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
ArCH-1	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0	0	0	0	0	No Impact	Definite	0	0	0	0	0			0	0	0	0	0
				NO	NO	NO	NO	NO			NO	NO	NO	NO	NO			NO	NO	NO	NO	NO

- All of the aforementioned project impacts can be mitigated to within acceptable levels, and close to baseline conditions;
- With mitigation measures none of the individual construction related impact risks will extend beyond the *local extent*;
- The summary tables indicate that the only positive residual impacts from the construction phase will be to the social and economic environment. With mitigation measures these positive impacts could be a **Moderate Positive Impact** that acts in the long-term;
- The baseline environment is already highly impacted by industrial (Camden Power Station and associated activities), mining (opencast and underground mining), and wide spread agricultural (cultivated lands) activities. The geology, topography, surface water, groundwater, terrestrial and visual environments are most affected; and
- None of the alternatives considered appear to run the risk of impacting the Archaeological, Paleontological and Cultural Heritage environment.

Site 1 Alternative:

- The impact risk for Site 1 is less than the impact risk of Site 3 (refer to columns titled project impact);
- All of Site 1's impact risks (refer to column titled Project Impact – Mitigated), with the exception of geology, can be reduced through mitigation measures that are relatively inexpensive and easy to implement with proper prior planning;
- The existing impacts to surface water resources (primarily the De Jager's Pan) can be reduced through mitigation measures (such as an RO plant);
- Site 1 is located ~750m from the Camden Village, a sensitive receptor in the area. The distance of ~750m is based on a screening assessment assuming a worst case scenario (irrespective of wind direction and speed). The village should be adequately protected if dust mitigation measures are successful, however monitoring should be undertaken to ensure that any impacts are within acceptable air quality standard limits; and
- The only residual impacts that are HIGH after the construction phase is complete are the Geological, Topographic, soil capability, surface water and Visual impacts (refer to column titled Residual Impact). This is as a result of the already highly impacted receiving environment. The project will not increase the significance of these existing impacts, but mitigation measures cannot reduce these impacts either.

Site 3 Alternative:

- All impacts with the exception of geology, topography and soil / land capability impacts, can be reduced through mitigation measures (refer to column titled Project Impact – Mitigated) that are relatively inexpensive and easy to implement with proper prior planning;

- The topography on Site 3 is such that two sites will be required to accommodate the total waste stream (refer to Section 6). Both site components (Site 3A and site 3B) combined are in excess of 19,7 % larger than Site 1, increasing the impact footprint;
- Site 3 is substantially larger than Site 1 (refer to Section 6) and will affect much larger areas of economically productive cultivated lands, splitting these into smaller uneconomic farming units. Mitigation measures will not reduce the residual significance of this impact;
- Site 3 will be more costly to construct because of the larger area requiring lining, the longer distances for pipelines, the more complicated and expensive crossing of the Richards Bay Coal Line;
- Site 3A and Site 3B are located on either side of a watershed, thus resulting in a dispersive effect for ground and surface water pollution, as opposed to Site 1 which is smaller and flows only in one direction;
- This site is more remote and thus is less visible, and affects less of the local population (only remote workers and landowner dwellings). The site is not far enough removed from Camden Village or Ermelo that the impact risk to air quality can be reduced; and
- The site is located on the opposite side of the Richards Bay Coal Line which will need to be crossed by all supporting services (i.e. roads, return water pipelines, and slurry pipelines). This is considered a very high risk to the project constructions and operations activities.

<u>No-Go Alternative</u>

- None of the construction related impacts described for Site 1 or Site 3 will be experienced if the Camden Ash Disposal Facility Expansion project is not implemented.
- If the Camden Ash Expansion Project is not constructed then none of the positive social and economic impacts from the project will be realised;
- Furthermore, without the expanded ash facilities the Camden Power Station will need to be shut down, removing 1 510 MW of power from the national grid (3,4 % of Eskom's installed generation capacity) which will cause nationwide blackouts. The impact risk to the receiving environment is thus:
  - Significance / Magnitude: VERY HIGH;
  - Spatial Scale of Impact: NATIONAL;
  - Duration: LONG TERM;
  - Probability of Impact: GOING TO HAPPEN; and
- The secondary impacts to the economy are just as far reaching, and will also be of a VERY HIGH nationwide, long term impact, that is certain to occur.

10.2 OPERATIONAL PHASE

The following key findings from the assessment are pertinent to the Operational Phase:

General:

- The potential impact risk to the environment from the operation of the proposed Camden Ash Disposal Expansion Facility is also relatively low;
- The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project, during the operational phase, will be to the Soil and Land Capability, and groundwater environment Although the soil and land capability will already be impacted by the Construction activities, it will be further impacted on during the operational phase as follows:
  - **Soil and Land Capability:** leachate may form below the facility and will pollute soil resources;
  - **Air Quality:** particulates may be mobilised, especially during high windfall events, that may impact on the surrounding study area; and
  - **Groundwater:** leachate draining from the facility could percolate through soil and into groundwater resources.
- All of the aforementioned impacts can be mitigated to within acceptable levels;
- With mitigation measures the operational phase related impact risks do not extend beyond the *local extent*; and
- Similar to the construction phase the positive impacts that will occur will be to the social and economic environment. With mitigation measures these impacts can be elevated to a **Moderate Positive Impact** that acts in the Long-Term.

Site1 Alternative:

- The comparative assessment indicates that Site 1 has a lower risk to the environment than Site 3.
- Site 3 Alternative:
- Site 3 having higher environmental risks will also be more costly to operate as it will consist of two sites, which sum into a larger footprint.

No-Go Alternative

- If the Camden Ash Expansion Project is not constructed it will reduce the operational life of the power station by 17 years. The employment opportunities lost will be exceptionally high;

- If the Camden Ash Expansion Project is not constructed then none of the positive social and economic impacts from the project will be realised; and
- The impact of closing Camden Power Station will be felt at the national level both socially and economically in excess of the 19 year life expansion.

Table 10-2: Summary Results: Comparative Assessment – Operational Phase

		ALTERNATIVE:																						
		Site 1							Site 3A + 3B								"No-Go"							
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Unmitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	
CODE:																								
	OPERATIONAL PHASE																							
G-2	Geology	Negative	Probable	0	0	3.7	3.7	3.7	Negative	Probable	0	0	3.7	3.7	3.7			0	0	3.7	3.7	3.7		
				NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH		
T-2	Topography	Negative	Definite	0	0	3.7	3.7	3.7	Negative	Definite	0	0	3.7	4	4			0	0	3.7	3.7	3.7		
				NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH		
SLC-2	Soil and Land Capability	Negative	Probable	1.8	1	3	3.7	3.3	Negative	Probable	2	1.2	3	3.7	3.7			0	0	3	3	3		
				LOW	VLOW	MOD	HIGH	HIGH			LOW	LOW	MOD	HIGH	HIGH			NO	NO	MOD	MOD	MOD		
SWW-2	Surface Water and Wetlands	Negative	Probable	1.9	0.8	3.7	3.7	2.7	Negative	Probable	2.4	1	3.7	3.7	3.7			0	0	3.7	3.7	3.7		
				LOW	VLOW	HIGH	HIGH	MOD			MOD	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH		
GW-2	Groundwater	Negative	Probable	2.7	0.8	3	3.3	3	Negative	Probable	2.7	0.8	3	3.3	3			0	0	3	3	3		
				MOD	VLOW	MOD	HIGH	MOD			MOD	VLOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD		
TE-2	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Definite	1.4	2.7	3	3	2.7	Negative	Definite	1.4	2.7	3	3.3	3			0	0	3	3	3		
				LOW	MOD	MOD	MOD	MOD			LOW	MOD	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD		
AF-2	Avifauna	Negative	Definite	0	0	3	3	3	Negative	Definite	0	0	3	3	3			0	0	3	3	3		
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD		
AQ-2	Air Quality	Negative	Possible	1.3	0.8	3.3	3.3	3.3	Negative	Possible	1.2	0.7	3.3	3.3	3.3			0	0	3.3	3.3	3.3		
				LOW	VLOW	HIGH	HIGH	HIGH			LOW	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH		
N-2	Noise	Negative	Probable	0	0	2.7	2.3	2.3	Negative	Probable	0	0	2.7	2.3	2.3			0	0	2.7	2.7	2.7		
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD		
SOC-2	Social Environment	Positive	Probable	0.3	0.6	2.7	2.7	2.7	Positive	Probable	0.6	0.9	2.7	2.7	2.7	Negative	Definite	0	0	2.7	4.7	4.7		
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			NO	NO	MOD	VHIGH	VHIGH		
EC-2	Economic	Positive	Definite	0	0	2.7	3	3	Positive	Definite	0	0	2.7	2.4	2.4	Negative	Definite	0	0	2.7	4.7	4.7		
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	VHIGH	VHIGH		
INF-2	Infrastructure and Traffic	Negative	Definite	0	0	2.7	4.3	2.7	Negative	Definite	0	0	2.7	4.3	2.7			0	0	2.7	2.7	2.7		
				NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	MOD	MOD		
V-2	Visual	Negative	Definite	2.3	2	3.7	3.7	3.7	Negative	Definite	2.3	2	3.7	3.7	3.7			0	0	3.7	3.7	3.7		
				MOD	LOW	HIGH	HIGH	HIGH			MOD	LOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH		
ArCH-2	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0	0	0	0	0	No Impact	Definite	0	0	0	0	0			0	0	0	0	0		
				NO	NO	NO	NO	NO			NO	NO	NO	NO	NO			NO	NO	NO	NO	NO		

10.3 CLOSURE PHASE – PROPOSED ASH DISPOSAL FACILITY

The following key findings from the assessment are pertinent to the Closure Phase:

General:

- Closure activities for both site alternatives will have a positive effect on the impacts incurred by this project, helping to remediate such impacts. In some instances closure activities when seen in conjunction with mitigation measures undertaken throughout the project will reduce the already highly impacted baseline environment (i.e. surface water and wetlands, and terrestrial ecology).
- The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project, during the closure phase, will be to the Groundwater and Visual elements of the receiving environment. This can be explained as follows:
  - **Visual Environment:** rehabilitation and re-vegetation of the dam will have a positive impact and must be implemented, failure to implement will have substantial negative impacts post closure;
  - **Groundwater:** the leachate draining from the facility will percolate through soil and into groundwater resources beyond the life of the facility if a barrier system is not installed or if it is not kept with good integrity.
- All of the aforementioned impacts can be improved substantially through mitigation measures;
- With mitigation measures the closure related impact risks do not extend beyond the local extent; and
- Similar to the construction phase the positive impacts that will occur will be to the social and economic environment. With mitigation measures these impacts can be elevated to a **Moderate Positive Impact** that acts in the Long-Term.

Site1 Alternative:

- The comparative assessment indicates during the closure phase, the primary difference between Site 1 and Site 3 would be the costs that will be incurred to rehabilitate the two areas comprising Site 3 (Site 3a and Site 3b) as opposed to a single area for Site 1.

Site 3 Alternative:

- Site 3 will be more costly to close as it will consist of two sites and a 19,7 % larger area compared to Site 1.

No-Go Alternative

- The impact of stopping power generation (and ash producing) activities at Camden Power Station will be felt at the national level both socially and economically beyond the closure phase of the project.

Table 10-3: Summary Results: Comparative Assessment – Closure Phase

		ALTERNATIVE:																					
		Site 1							Site 3A + 3B								"No-Go"						
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Unmitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**
CODE:																							
	CLOSURE PHASE																						
G-3	Geology	Negative	Probable	0	0	3.7	3.7	3.7	Negative	Probable	0	0	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
T-3	Topography	Negative	Probable	1.6	3	3.7	3.3	2.7	Negative	Probable	1.6	3	3.7	3.7	2.9			0	0	3.7	3.3	2.7
				LOW	MOD	HIGH	HIGH	MOD			LOW	MOD	HIGH	HIGH	MOD			NO	NO	HIGH	HIGH	MOD
SLC-3	Soil and Land Capability	Negative	Probable	1.9	0.6	3	3.7	3.3	Negative	Probable	2.1	0.6	3	3.7	3.7			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	HIGH			MOD	VLOW	MOD	HIGH	HIGH			NO	NO	MOD	MOD	MOD
SWW-3	Surface Water and Wetlands	Negative	Probable	1.2	0.5	3.7	3.7	2.7	Negative	Probable	1.5	0.6	3.7	3.7	2.7			0	0	3.7	3.7	3.7
				LOW	VLOW	HIGH	HIGH	MOD			LOW	VLOW	HIGH	HIGH	MOD			NO	NO	HIGH	HIGH	HIGH
GW-3	Groundwater	Negative	Probable	1.1	0.5	3	3.3	3	Negative	Probable	1.1	0.5	3	3.3	3			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	MOD			LOW	VLOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
TE-3	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Probable	1	1.5	3	3	2.7	Negative	Probable	1	1.5	3	3.3	3			0	0	3	3	3
				VLOW	LOW	MOD	MOD	MOD			VLOW	LOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
AF-3	Avifauna	Negative	Definite	0	0	3	3	3	Negative	Definite	0	0	3	3	3			0	0	3	3	3
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
AQ-3	Air Quality	Negative	Possible	1.3	0.8	3.3	3.3	2.7	Negative	Possible	1.3	0.8	3.3	3.3	2.7			0	0	3.3	3.3	2.7
				LOW	VLOW	HIGH	HIGH	MOD			LOW	VLOW	HIGH	HIGH	MOD			NO	NO	HIGH	HIGH	MOD
N-3	Noise	Negative	Probable	0	0	2.7	2.3	2.3	Negative	Probable	0	0	2.7	2.3	2.3			0	0	2.7	2.7	2.7
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
SOC-3	Social Environment	Positive	Probable	0	0	2.7	2.7	1.8	Positive	Probable	0	0	2.7	2.7	1.8	Negative	Definite	0	0	2.7	4.7	4.7
				NO	NO	MOD	MOD	LOW			NO	NO	MOD	MOD	LOW			NO	NO	MOD	VHIGH	VHIGH
EC-3	Economic	Positive	Definite	0	0	2.7	3	3	Positive	Definite	0	0	2.7	2.4	2.4	Negative	Definite	0	0	2.7	4.7	4.7
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	VHIGH	VHIGH
INF-3	Infrastructure	Negative	Definite	0	0	2.7	4.3	2.7	Negative	Definite	0	0	2.7	4.3	2.7			0	0	2.7	2.7	2.7
				NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	MOD	MOD
V-3	Visual	Negative	Probable	0.7	3.3	3.7	3.7	2.7	Negative	Probable	0.3	3.3	3.7	3.7	3.3			0	0	3.7	3.7	3.3
				VLOW	HIGH	HIGH	HIGH	MOD			VLOW	HIGH	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
ArCH-3	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0	0	0	0	0	No Impact	Definite	0	0	0	0	0			0	0	0	0	0
				NO	NO	NO	NO	NO			NO	NO	NO	NO	NO			NO	NO	NO	NO	NO

10.4 POST CLOSURE PHASE – ASH DISPOSAL FACILITY

The activities during the Post Closure Phase are the same for both alternatives and consist primarily of monitoring and maintenance of rehabilitated areas until a stable and sustainable condition is reached.

The residual impacts between the two alternatives is very similar, the impacts with regards to topography, soil and land capability, and terrestrial ecology are slightly higher (not enough to change the rating category); whilst the visual impacts are more substantial such that the rating category for Site 3 is HIGH by comparison to Site 1 which is considered MODERATE.

The comparative impact assessment indicates that the residual impacts post closure for the No-Go alternative is substantially higher than either of the other two alternatives and as such should not be pursued.

Table 10-4: Summary Results: Comparative Assessment – Post Closure Phase

		ALTERNATIVE:								
		Site 1			Site 3A + 3B			"No-Go"		
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact	Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact	Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact
CODE:										
	CLOSURE PHASE									
G-3	Geology	Negative	Probable	3.7 HIGH	Negative	Probable	3.7 HIGH			3.7 HIGH
T-3	Topography	Negative	Probable	2.7 MOD	Negative	Probable	2.9 MOD			2.7 MOD
SLC-3	Soil and Land Capability	Negative	Probable	3.3 HIGH	Negative	Probable	3.7 HIGH			3 MOD
SWW-3	Surface Water and Wetlands	Negative	Probable	2.7 MOD	Negative	Probable	2.7 MOD			3.7 HIGH
GW-3	Groundwater	Negative	Probable	3 MOD	Negative	Probable	3 MOD			3 MOD
TE-3	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Probable	2.7 MOD	Negative	Probable	3 MOD			3 MOD
AF-3	Avifauna	Negative	Definite	3 MOD	Negative	Definite	3 MOD			3 MOD
AQ-3	Air Quality	Negative	Possible	2.7 MOD	Negative	Possible	2.7 MOD			2.7 MOD
N-3	Noise	Negative	Probable	2.3 MOD	Negative	Probable	2.3 MOD			2.7 MOD
SOC-3	Social Environment	Positive	Probable	1.8 LOW	Positive	Probable	1.8 LOW	Negative	Definite	4.7 VHIGH
EC-3	Economic	Positive	Definite	1.8 LOW	Positive	Definite	2.4 MOD	Negative	Definite	4.7 VHIGH
INF-3	Infrastructure	Negative	Definite	2.7 MOD	Negative	Definite	2.7 MOD			2.7 MOD
V-3	Visual	Negative	Probable	2.7 MOD	Negative	Probable	3.3 HIGH			3.3 HIGH
ArCH-3	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0 NO	No Impact	Definite	0 NO			0 NO

10.5 CONCLUSIONS FROM THE COMPARATIVE ASSESSMENT

The following conclusions and recommendations can made when reviewing the summary results of the comparative assessment presented above:

- The No-Go alternative is fatally flawed (because of the unacceptable social and economic impacts for the country's development) and the project should therefore proceed;
- **Site 1 is the preferred alternative through all phases of the project and should be implemented**;
- Although Site 3 is a feasible alternative it is more difficult to manage and will have wider impacts to the biophysical, social and economic environment;
- The following key aspects of Site 1 are considered advantageous:
  - a single facility solution that is easier to construct, operate and manage, and is the least costly solution;
  - the site is more than 19,7 % smaller than Site 3 when all infrastructure is combined;
  - there is less impact to land use and agricultural activities;
  - drainage of the site is in one direction, allowing for impacts to be contained and managed easier;
  - this solution allows for easier and more cost effective integration with existing infrastructure;
  - the site does not cross the Richards Bay Coal Line;
  - with the exception of installing a barrier system (which is very costly, and also applicable to Site 3) all mitigation measures are relatively inexpensive to implement;
  - the impact risk post closure does not result in a substantial increase of the current baseline impacts to the receiving environment; and
  - there are no substantial water resources in close proximity to the site;
- The following key aspects of Site 1 are considered disadvantageous:
  - The site is located upwind and in close proximity to the Camden Village (~750m from the village), <u>if after monitoring it is established that impacts to the village residents are unacceptable further mitigation measures will need to be implemented, these could include relocation of the village should other measures not be deemed sufficient</u>; and
  - The site is visible from the N2.

11 ENVIRONMENTAL IMPACT STATEMENT

This section of the report presents the detailed Environmental Impact Statement (EIS) for Site 1 (the preferred alternative). The methodology for assessment is described below. Each environmental element is considered, the mechanism and extent of impact is described, and possible mitigation measures are presented in this section of the report.

11.1 IMPACT ASSESSMENT METHODOLOGY

The impact assessment methodology used in the compilation of the Environmental Impact Statement (EIS) and related impact assessment matrix is described in more detail below.

Approach to Assessing Impacts:

- Impacts are assessed separately for the construction, operational, closure, and post-closure phases of the project;
- Impacts to each environmental element documented in the baseline description above are considered in the impact assessment;
- Impacts are described according to the project impact, cumulative impact, mitigation measures and residual impact as follows:
  - The project impact assesses the potential impact of the development on an environmental element;
  - The cumulative impact on an environmental element is the description of the project impact combined with any initial baseline impacts that occur;
  - Mitigation measures that could reduce the impact risk are then prescribed; and
  - The residual impact describes the cumulative impact after the implementation of mitigation measures.
- Impacts are rated against a predetermined set of criteria including (magnitude, duration, spatial scale, probability, and direction of impact);
- Identified impacts are combined by weighting to produce a combined impact rating for each environmental element;
- Each impact is rated with and without mitigation measures; and
- A rating matrix is provided for each environmental element per project phase summarising all the aforementioned in a single table and giving a full breakdown of how the impact risk rating was calculated to produce the EIS.

More detailed description of each of the assessment criteria and any abbreviations used in the rating matrix is given in the following sections.

Magnitude / Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 11-1 below.

Table 11-1: Description of the significance rating scale.

Rating Matrix			Description
Score	Abbrev.	Category	Explanation
0	NO	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.
1	VLOW	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit.
2	LOW	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
3	MOD	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
4	HIGH	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts, mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
5	VHIGH	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 11-2.

Table 11-2: Description of the spatial rating scale.

Rating Matrix			Description
Score	Abbrev.	Category	Explanation
####	N/A	*NO IMPACT*	Not Applicable / No Impact
1	ISO	*Development Site / Isolated Site*	The impact will affect an area no bigger than the project site / servitude.
2	STUDY	*Study Area*	The study area was defined at the outset of the project, and is less than a 1,5km radius of the power station and existing ash disposal facility.
3	LOCAL	*Local*	The impact will affect an area up to 5 km from the proposed site.
4	REG	*Regional / Provincial*	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
5	NAT	*Global / National*	The maximum extent of any impact.

Duration / Temporal Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 11-3.

Table 11-3: Description of the temporal rating scale.

Rating Matrix			Description
Score	Abbrev.	Category	Explanation
####	N/A	NO IMPACT	Not Applicable / No Impact
1	INC	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	SHORT	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than five years, whichever is the greater.
3	MED	Medium term	The environmental impact identified will operate for the duration of life of the line.
4	LONG	Long term	The environmental impact identified will operate beyond the life of operation, but will likely dissipate over time.
5	PERM	Permanent	The environmental impact will be permanent.

Degree of Probability

The probability or likelihood of an impact occurring will be described as shown in Table 11-4 below.

Table 11-4: Description of the degree of probability of an impact accruing

Rating Matrix		Category Explanation
Score	Abbrev.	Explanation
1	IMPOS	Practically impossible
2	UNLIKE	Unlikely
3	COULD	Could happen
4	VLIKE	Very Likely
5	OCCUR	It is going to happen / has occurred

Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in Table 11-5 below. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 11-5: Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

Impact Risk Calculation

To allow for impacts to be described in a quantitative manner in addition to the qualitative description, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as a risk and can be expressed as the function of the consequence and the probability of the impact occurring. Consequence is the average of the MAGNITUDE, Spatial, and Temporal Scale Ratings; whilst probability is seen as a fraction of 1 on a scale of 1 to 5 as described above. The Impact Risk formula can be expressed mathematically as:

$$\text{Impact Risk} = \frac{(\text{MAGNITUDE} + \text{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below in Table 11-6:

Table 11-6: Example of rating scale

Impact	Magnitude	Spatial scale	Temporal scale	Probability	Rating
Greenhouse gas emissions	**2**	***3***	**3**	**3**	**1.6**
	LOW	***Local***	**Medium Term**	**Could Happen**	

***Note**: The magnitude, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a consequence rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The consequence rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.*

The impact risk is classified according to 5 classes as described in Table 11-7 below.

Table 11-7: Impact Risk Classes.

Rating	Impact class	Description
0.1 – 1.0	**1**	**Very Low**
1.1 – 2.0	**2**	**Low**
2.1 – 3.0	**3**	**Moderate**
3.1 – 4.0	**4**	**High**
4.1 – 5.0	**5**	**Very High**

Therefore with reference to the example used for greenhouse gas emissions above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a Low impact.

Weighting and Combining Impacts

In most cases there are numerous impacts to each environmental element. Each environmental impact is not necessarily equally important, thus it becomes necessary to give a weight to each impact when combining the impact rating into a single score that can be used in the EIS. Impact weightings are also made on a scale of 1 to 5. Where 1 is of least importance and 5 is the most importance. It is important to note that impact weightings are not like impact rankings i.e. two impacts may have the same score, which simply means the impacts are equally important.

Notation of Impacts

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Significance or magnitude- IN CAPITALS

- Duration – in underline
- Probability – *in italics and underlined.*
- Degree of certainty - **in bold**
- Spatial Scale – *in italics*

11.2 CONSTRUCTION PHASE

11.2.1 Geology

Project Impact (Unmitigated)

From the available literature as well as the observations during the site investigation, it is apparent that the site is underlain by the siltstone, mudstone and sandstone that belong to the Vryheid Formation of the Ecca Group, Karoo Supergroup.

During construction of the ash disposal facility and associated infrastructure the terrain will be profiled using conventional construction methods and equipment. This will require cut and fill operations using conventional plant equipment. In some rare instances, blasting may be required (although this is considered highly unlikely given the current underlying geology). Such cut and fill operations will likely affect only shallow geological strata (typically less than ~10m deep, using the existing topographic fall to create the depth required at facilities). The impact footprint on geology during the construction phase will not be greater than combined footprint of the ash facility and the return water dam 162.1 ha, or 9.4% of the study area.

The combined weighted project impact to geology (prior to mitigation) will **definitely** be of a VERY LOW negative significance, affecting the *development site*. The impact will be permanent and *could possibly occur*. The impact risk class is thus **Moderate**.

Cumulative Impact

The existing impacts to the geology within the study area have occurred as a result of the construction of the power station and its ancillary infrastructure such as the existing ash disposal facility and water storage facilities. Although unverified it is highly likely that these impacts are shallow (less than 10m), having occurred during any cut and fill operations that may have been undertaken during the construction of the aforementioned facilities.

Although not occurring within the study area, there are open cast coal mining activities occurring on the boundary of the study area to the east of Site 2; and within 1km to the north of the boundary of Site 1. Open cast mining activities are highly intrusive, destructive to geology, and usually are much deeper than this proposed project (typically ranging from 15m – 80m deep). Although not located within the study area, it is the EAP's opinion that this impact should be taken into account as it will certainly contribute to the cumulative impact rating on geology given below.

The baseline impacts are considered to be substantial, and thus although the project impact will not increase the significance of the existing baseline impacts, the cumulative unmitigated impact will **probable** be of a MODERATE negative significance, affecting the *local* extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

There are no mitigation measures that can be implemented to reduce the significance of geological impacts.

Residual Impact

As no mitigation measures are possible the residual impact will be the same as the cumulative impact above i.e. the impact will **probably** be of a MODERATE negative significance, affecting the local extent. The impact is going to happen and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-8 below.

Table 11-8: Construction Phase Impact Assessment Matrix: Geology

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
G-1	*Geology*								
	CONSTRUCTION PHASE			5					
Impact 1	Destruction of geology shallow than 10m	Negative	Definite	3	2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*None Possible.*				2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.2	0.6	3	3	**1**
					LOW	ISO	MED	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.2	0.6	3	3	**1**
					LOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**

11.2.2 Topography

Project Impact (Unmitigated)

During construction of the proposed Camden Ash Disposal Expansion facility and its associated infrastructure (incl. AWRD, pipelines and roads) the terrain will be profiled using conventional construction methods and equipment. Profiling of the terrain will be permanent, and will affect surface water drainage patterns beyond the life of the facility. The additional impact will affect an area of ~191.1 ha (11 % of the study area).

Without mitigation measures dirty water can flow freely from the facility into the surrounding environment, from where it can have secondary impacts on the surface water and wetlands located downslope of the facilities; this could be exacerbated by incorrect placement in the topographic landscape, leading to contaminated water flowing into more than one water catchment.

The combined weighted project impact to topography (prior to mitigation) will **probably** be of a MODERATE negative significance, affecting the *study area*. The impact will be permanent and *is going to occur*. The impact risk class is thus **High.**

Cumulative Impact

The topography within the study area has been altered by the Camden Power Station and ancillary infrastructure, most especially the existing ash disposal facility. Approximately 251.45 ha (14.5 %) of the natural topography has been permanently altered within the study area.

Open cast mining activities to the north-east and south-east of the study area are also having further impacts to the topography in the region; and this should be considered when assessing cumulative impacts.

There will definitely be a cumulative impact on topography, the combined impact footprint will be ~421.85 ha (24,36 %) of the study area. The unmitigated cumulative impact will thus **definitely** be of a MODERATE negative significance, affecting the *local* extent. The impact *is going to happen* and will be permanent. The impact class is thus **High.**

Mitigation Measures

- Utilise Site 1 for the development;
- Undertake a detailed water balance analysis to confirm the appropriate sizing and design of clean and dirty water management infrastructure;
- Install a clean water cut-off system that at a minimum ensures that:
  - clean water cut-off canals are installed such that they tie into the adjacent terrain;

- a free draining profile is established on all clean areas, and that storm water is allowed to move unhindered off the site;
- the clean water cut-off system is designed as close to the facilities as possible to maximise the clean water leaving the site;
- the clean water cut off system is installed prior to other construction activities are undertaken on the ash dam or AWRD;

- Ensure a profile is established that contains all dirty water within the facility footprint;
- Dirty water must be transferred to the AWRD as soon as practically possible; and
- Ensure that any areas impacted during the construction phase are rehabilitated as soon as practically possible.

Residual Impact

With mitigation measures the residual impact will **definitely** be of a MODERATE negative significance, affecting the *local* extent. The impact *is going to happen* and will be permanent. The impact class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 11.1 above. These ratings are provided in the matrix presented in Table 11-9 below.

Table 11-9: Construction Phase Impact Assessment Matrix: Topography

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
					ALTERNATIVES: Site 1				
T-1	*Topography*								
	CONSTRUCTION PHASE			5					
Impact 1	Alteration of surface water drainage patterns	Negative	Probable	5	3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**
Mitigation Measures:	*Stormwater management measures, have only one facility, site to drain only in one direction*				2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**

11.2.3 Soils and Land Capability

Project Impact (Unmitigated)

During the construction of the ash facility dam wall, access roads, pipelines, trenches / channels, Transmission lines re-routing, and installation of the barrier system impacts will occur to soils and consequently land capability. These impacts will occur as a result of vegetation clearing, excavation and stockpiling of soils, compaction of soils through vehicles traversing the site, and erosion of exposed and agitated soils. Unmanaged and littered waste on site as well as hydrocarbon spillage from construction vehicles / storage areas will further contribute to the pollution of soils.

Either of the barrier systems considered will require clay material in its construction. This material will be purchased from a supplier or a borrow pit will be established to extract this material from a suitable source. The potential impact of a clay borrow pit is not included in this assessment, and will have to be addressed through its own authorisation process if required. In the event that neither option is feasible a geo-synthetic clay liner (or GCL) will be utilised.

The total impact footprint of soils during the construction phase of the project is given in Table 11-10 below.

Table 11-10: Area of Impact per land Capability class

Soils and Land Capability	Study Area Composition (Before Impact)		Impact Footprint		Study Area Composition (After Impact)	
	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Study Area Composition	Area (Ha)	As (%) of Total Study Area
Grazing Land Capability	702.2	40.6	75.0	10.7	627.2	36.2
Wetland Soils / Moderate Grazing	43.3	2.5	1.1	2.5	42.2	2.4
Water	128.2	7.4			128.2	7.4
Arable Soils / Cultivation	568.4	32.8	138.2	24.3	430.2	24.8
Transformed / Developed	289.3	16.7	2.4	0.8	503.6	29.1
TOTAL	**1731.4**	**100.0**	**216.7**	**12.5**	**1731.4**	**100.0**

The combined weighted project impact to soil and land capability (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will act in the medium term and *very likely to occur*. The impact risk class is thus **Low.**

Cumulative Impact

The bulk of the existing negative impacts to soils within the study area occur as a result of the: Camden Power Station Infrastructure; current ash disposal facility; two borrow pits; Richards Bay Coal Line; Roads; and Transmission Lines. Existing cultivation undertaken in the area is well managed.

Arable and wetland soils occurring in the study area are considered to be of higher sensitivity and/or conservation value than the other soils occurring. Wetland areas were avoided during the site layout phase, and are thus not a differentiating characteristic. The total impact on arable soil will thus be increased to 138,2 ha, a total of 24,3 % of the agricultural soils occurring in the study area.

The baseline impacts are considered to be substantial, and additional project impact (if no mitigation measures are implement) will increase the significance of the existing baseline impacts, the cumulative unmitigated impact will **probably** be of a HIGH negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

- Utilise Alternative 1 because Alternative 3 has a substantially larger percentage of arable soils that will be impacted;
- Construction waste (such as general waste from offices, paint cans, chemical containers, hydrocarbon contaminated soils etc.) is not to be buried on site, but must be managed in line with the station's waste management procedures. Any newly established waste management facilities must not exceed the thresholds triggering EIA processes, and must comply with environmental Duty of Care principles; should this not be possible a separate authorisation process for such facilities will be required. Records of safe disposal of all construction waste generated on site are to be obtained for auditing purposes;
- Hydrocarbons should be stored in a bunded storage area, with a capacity of 110%;
- Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur;
- Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling area in the hard park;
- Hydrocarbon contaminated soils are to be removed to a contained storage area and bio-remediated or disposed of at a licensed facility;
- Avoid unnecessary removal of vegetation cover by demarcating the construction area in advance of construction activities;
- Care must be taken to ensure that in removing vegetation adequate erosion control measures are implemented;
- A storm-water management plan, including sufficient erosion and sediment control measures must be compiled in consultation with a suitably qualified environmental practitioner / control officer during the detailed design phase prior to the commencement of construction;
- Use existing access roads as far as possible;

- All new roads are to include sufficiently designed storm-water protection and erosion and sediment control measures such as cut-off and mitre drains;
- Use berms to minimise erosion where vegetation is disturbed, including hard parks, plant sites, borrow pit and office areas;
- Ensure that the waste body has a storm water drainage system that prevents dirty water from contaminating the adjacent soil ;
- Ensure that the waste disposal facility have appropriate lining/barrier system and a leachate collection system installed to prevent leachate from entering the underlying soil;
- A detailed survey of all topsoil and subsoil is to be undertaken in advance of construction. All useable topsoil and subsoil is to be stripped in advance of the construction phase and stored in a suitably demarcated area for use in rehabilitation of the ash body at a later date;
- Soil stripping needs to be undertaken as follows:
- Soil stripped along road / pipeline construction alignments will be stockpiled upslope of the stripping works or excavation;
- Topsoil of 300mm (including the vegetation and seed bank) will be stripped and stockpiled separately for future use in rehabilitation;
- All useable sub-soils will be stripped and stockpiled separately for later use in capping and rehabilitation of the facility. A soil scientist will be consulted during the construction phase to ensure that all useable subsoil is properly identified;
- Separate stripping and stockpiling of soil layers will be undertaken, especially during construction activities undertaken in wetland areas (such as the construction of the return water pipeline).
- Soil layers will be replaced to the same place in the soil profile from where they were removed i.e. sub-soils, and then top soils. Special care must be taken where different subsoil layers occur in wetland areas (black soils, grey mottled soils, and topsoils);
- All topsoil / subsoil stock piles are to be located upslope and outside of any water-body or wetland area where a risk of erosion may exist. The stockpile will be protected with proper storm water management, erosion and sediment control measures; and
- Wherever possible soil stripping, stockpiling and handling activities should be undertaken during the dry season, especially in wetland areas; and
- All soils should be ameliorated with lime and a suitable N:P:K fertiliser ahead of seeding.

Residual Impact

The impact to soils and land capability will be permanent as pre-development land capability will not be restored, the best that can be hoped to achieve is a post closure land capability

that will be wilderness. In this regard the loss of grazing and arable soils is considered to be substantive (i.e. combined impact of ~200ha). With mitigation measures:

- the impacts will be contained to within the development footprint;
- the smallest impact footprint can be achieved of all alternatives considered; and
- valuable topsoil and sub-soil will be conserved, and reused in the rehabilitation of the area once ashing is complete;

The residual impact to soil and land capability beyond the closure phase of the project will be reduced through mitigation measures but not to within baseline conditions. After mitigation the impacts to soil and land capability will **probably** be of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 10.11 below.

Table 11-11: Construction Phase Impact Assessment Matrix: Soil and Land Capability

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
SLC-1	*Soil and Land Capability*								
	CONSTRUCTION PHASE			5					
Impact 1	Sterilisation of agricultural land	Negative	Definite	5	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Use Site (smaller area), Stockpile all useable topsoil & Subsoil*				3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Impact 2	Loss of soil resources - erosion	Negative	Definite	3	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Place soil stockpiles out of water courses, Revegetate Stockpiles, Stormwater Management*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Impact 3	Pollution of soils	Negative	Definite	3	3	1	4	4	**2.1**
					MOD	ISO	LONG	VLIKE	**MOD**
Mitigation Measures:	*Hydro-carbon management, waste management, Access Control*				1	1	1	1	**0.2**
					VLOW	ISO	INCID	IMPOS	**VLOW**
Impact 4	Net loss of soil volumes and utilistion potential (chemical properties, nutrients, structure etc)	Negative	Definite	3	1	1	4	5	**2**
					VLOW	ISO	LONG	OCCUR	**LOW**
Mitigation Measures:	*Strip and stockpile maximum top soil and subsoil for rehabilitation use. Rehabilitate all areas outside of Dam's storage area.*				1	1	4	5	**2**
					VLOW	ISO	LONG	OCCUR	**LOW**
Impact 5	Compaction of soils	Negative	Definite	3	3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
Mitigation Measures:	*Appropriate ripping and amelioration of construction impacted areas, outside of the Dam's storage area.*				1	1	2	2	**0.5**
					VLOW	ISO	SHORT	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.8	0.7	3	3.3	**1.2**
					LOW	ISO	MED	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.2	0.7	2.4	2.3	**0.7**
					LOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	2	5	5	**3**
					LOW	STUDY	PERM	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	2	5	5	**3.7**
					HIGH	STUDY	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**

11.2.4 Surface Water and Wetlands

Project Impact (Unmitigated)

During the construction phase the removal of vegetation and preparation of the construction area will result in a large area of exposed soils. In addition construction vehicles traversing the sites may result in hydrocarbon spillage that may enter the water courses. Without mitigation measures exposed soils will be mobilised during rainfall events which will result in increased sedimentation and turbidity in surface water. Hydrocarbons, even small amounts, entering the surface water resources can have significant detrimental effects on the wetlands and aquatic environment. Any decrease in water quality will result in a direct impact to surface water and wetland features and the ecological state of these features.

The receiving surface water bodies that could be impacted during the construction phase include:

- The non-perennial water course to the north-west of Site 1, which flows in a north-easterly direction;
- The off stream storage dam located at the co-ordinates: 26°35'38.21"S and 30° 3'59.34"E, is located at the toe of the ARWD and will be impacted; and
- The return water pipeline line will cross a wetland area.

Potential impacts on the Humanspruit and wetlands 'VBA' and 'VBB' that may arise as a result of the construction and operation of the proposed infrastructure of preferred Site 1 include:

Degradation of biotic integrity

Changes to the water quality could result in changes to ecosystem structure and function as well as a potential loss of biodiversity. Water quality deterioration often leads to modification of species composition, with loss of sensitive species and their replacement by organisms more tolerant to environmental changes, which tend to dominate the community structure within the degraded system.

The proposed new Ash Disposal Facility will be lined with an appropriately constructed barrier system. Furthermore, these facilities contain contaminated run-off and storm water systems and an associated pollution control dam sized to accommodate run-off from a one in 50 year rainfall event. The design of the new Ash Disposal Facility does mitigate the risk of contaminated surface run-off reporting directly to the aquatic environment. The effectiveness of this mitigation will however be influenced by the operational practices employed, particularly ensuring that the pollution control dam is regularly de-silted to ensure that the surge capacity inherent in the design is retained. Through good surface/storm water management, no polluted water should be allowed to leave the site as this water is often of poor quality due to exposure to various processes and chemicals. There is also risk that contaminated water may enter the Humanspruit through failure of pipes transporting ash water back from the ash return water system. Such events could have significant impacts on aquatic ecosystems, dependent on concentration and volume of pollutants accidentally released, especially in a system that is already under stress.

Degradation of aquatic ecosystems due to increased sedimentation

Habitat availability and habitat quality are major determinants of the aquatic community structure. Changes in the biological community of a river may be linked to changes in water quality, habitat or both. When naturally vegetated landscapes are transformed, physical and biological relationships with adjacent streams are affected, usually resulting in stream bank erosion, increased sedimentation and a change in biotic community structure.

Clearance of existing vegetation during construction will expose the upper layers of the soil horizon to soil erosion. Runoff after rain can give rise to erosion and sedimentation. The

disturbed areas of land and the ash disposal facility itself will be susceptible to erosion if not managed correctly. In addition to surface water runoff, dust fallout must also be considered. Severe fallout could potentially impact habitat and water quality, depending on the molecular composition.

The following adverse impacts on the wetlands that are associated with the development area may transpire during the Construction and Operational Phases of the proposed project:

Interruption in hydrology

The hydrological properties of both the channelled valley bottom (VBA) and the unchannelled valley bottom (VBB) are currently impacted by the impounding effects of the embankments on which the rail lines and the R29 are built. The proposed ash disposal facility will be situated in the catchments of both of these wetlands (Figure 9-19). Vegetation clearance works during construction, and the physical presence of the ash disposal facility during operation will interrupt the hydrology of the wetland systems through alteration of the soil profile and subsequent changes in sub-surface water supply to the wetlands.

The physical positioning of the ash disposal facility and return water dam in the catchment of the wetlands during operation will result in reduced quantities of surface water run-off being supplied to the wetlands. The presence of the ash disposal facility is also likely to impede or alter the natural subsurface flow in the catchment's soils and this could have indirect but potentially significant desiccating effects on the wetlands.

Erosion of catchment soils & increased sediment input to wetlands

Erosion may occur on exposed soils in the immediate catchment of the channelled valley bottom wetland (VBA) in particular, as a consequence of vegetation clearing during construction. Erosion of the catchment soils could lead to channelisation of surface water runoff in the catchment and subsequently the wetland unit itself, and associated changes in the natural wetland hydrology, concentration of flows, lowering of the water table within the wetland and possible desiccation of areas of the wetland.

During construction, excavations in the catchment of the channelled valley bottom wetland (VBA) may cause increased sediment deposition in this wetland downstream of the works, particularly during rainfall events. Excavations may also cause changes in the soil profile and soil permeability, which could increase the sediment load in surface water runoff. Dust fallout from the ash facility once it is in operation may occur; this may also contribute to increased sedimentation of the wetlands in question. These factors will affect the geomorphological integrity of the wetlands.

Water quality deterioration

During construction, standard site management practices for handling hazardous and potentially polluting goods during construction need to be built into the contractor plans.

During operation, dust fallout from the proposed ash disposal facility could contain toxicants that may contaminate surface water systems, contributing to water quality deterioration. Such deterioration may affect the composition of the wetland vegetation community and result in loss of diversity of plant species, reducing the (already compromised) ecological integrity and functioning of the wetlands in the Study Area.

The combined weighted project impact to surface water (prior to mitigation) will **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the medium term and *is going to occur*. The impact risk class is thus **Moderate**.

Cumulative Impact

The De Jager's Pan has been used as the AWRD for the existing ash disposal facility. As a result the water level of the pan has increased over time to the point where the Camden power station has implemented a RO Plant as a management measure to reduce water levels in the pan. Also, seepage from the existing ash facility has resulted in artificial wetlands establishing in these areas because of continued wetness. These artificial wetland areas are also contaminated with ash and silt from the current disposal facility. In addition the on-going discharge of ash water to the De Jager's Pan has also caused the water quality in the pan to decrease substantially.

As per the findings of the revised Aquatic and Wetland Study (refer to Appendix H2) the Humanspruit is highly impacted as is the larger area surrounding the Camden Power Station. Owing to integrity and poor condition of the Humanspruit, the cumulative impact of the proposed Ash Disposal Facility in relation to the larger catchment and not just the site footprint should be considered. Potential upstream impacts could include effects associated with municipal discharges from Ermelo town, and the Ermelo Yard associated with the Heavy-haul Coal Line. In addition to this there are extensive opencast mining operations within the catchment.

The baseline impacts are considered to be substantial, and additional project impact (if no mitigation measures are implement) will increase the significance of the existing baseline impacts, the cumulative unmitigated impact will **definitely** be of a HIGH negative significance, affecting the *local area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **High**.

Mitigation Measures

- Construction should be avoided within 100 m from the edge of a surface water body and/or wetland. This is not possible for the Site 3 alternative as the AWRD north of Site 3A is located in the wetland area as indicated on Figure 9-19 and thus the Site 1 alternative is highly recommended for use;
- A wetland / surface water rehabilitation and maintenance plan for the segment of the stream located along the north western boundary of the study area, and indicated on Figure 9-19, must be compiled and implemented as a component of the construction phase, as a means of improving the quality of wetlands and surface water resources in the area;
- The existing off-stream storage dam located at the co-ordinates: 26°35'38.21"S and 30° 3'59.34"E, needs to be removed and the area rehabilitated as part of the wetland / surface water rehabilitation and maintenance plan mentioned in the bullet above;
- The existing surface / ground- water monitoring plan needs to be updated to account for the proposed project and must include bio-monitoring (quarterly during construction), as well as a hydrocarbon (quarterly during construction), trace metals, ICP-MS, and Cation / Anion constituent monitoring (monthly);
- Demarcated areas where waste generated by construction activities, can be safely contained and stored on a temporary basis for the construction phase, should be provided at the hard park;
- All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment;
- Install a dirty-water collection system to prevent contaminated water entering the natural system. This water should be recycled or re-used in the existing power station processes;
- Demarcate the “no-go” areas with tape and ensure that the demarcation remains in place for the duration of the construction works;
- Install an authority approved barrier system at the new ash disposal facility to prevent contamination of the soils and water bodies;
- Once operations at the existing facility cease, ensure that the site is capped, top soiled and re-vegetated prior to leaving the site;
- Ensure that a WULA is obtained from the DWS prior to commencement of any work within 500 m of any wetland / surface water resource;
- In order to mitigate existing impacts that have occurred to the baseline environment the following is recommended:
    - The existing ash disposal facility must, during the closure phase, be profiled and rehabiliated such that clean surface water run-off does not recharge the De Jagers Pan;

  - The polluted water in the De Jagers Pan is treated in an appropriate manner in line with Eskom's Zero Effluent Discharge policy;

- A suitably qualified professional must be appointed to undertake a search and rescue operation of plant / animal species ahead of the construction phase;
- An alien invasive control programme needs to be established and maintained through all phases of the development; and
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas.
- The clean water diversion channel should be routinely monitored for acidity/alkalinity and Electric Conductivity as an early warning for potential contamination by ash dust;
- The discharge of clean water to the natural environment must not result in erosion or channelization of wetland areas – where necessary, engineered measures should be put in place to ensure diffuse discharge of water across wetland areas;
- Silt traps should be placed down-slope of where vegetation stripping will take place to minimise siltation in rivers and wetlands. These silt traps need to be regularly maintained to ensure effective drainage;
- The pollution control dam must be regularly de-silted to ensure that the surge capacity inherent in the design is retained; and
- It is recommended that a monitoring program of the adjacent wetland and aquatic ecosystem be implemented. These studies must consider results from the surface water monitoring, which must take cognisance of the pH and TDS. Monitoring of the receiving environment should consider sites on the Humanspruit and Witpuntspruit. In situ water quality measurements should not exceed the South African Water Quality Guidelines and ecological integrity should not differ from background values. Monitoring should be conducted bi-annually during the wet and dry season;
- Potential dust loading into wetland and aquatic systems should be quantified through air quality modelling, and dust load predictions established; and
- No construction activities should take place within the macro-channel, riparian zones, or wetland areas, to prevent disturbance of vegetation and limit the effects of soil compaction on hydrology and geomorphology of wetland catchments. The boundaries of these features should be clearly demarcated and no construction machinery or activities should pass beyond them.

Residual Impact

Mitigation measures will substantially reduce the cumulative impact. The residual impact will **probably** be of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in

Table 11-12 below.

Table 11-12: Construction Phase Impact Assessment Matrix: Surface Water and Wetlands

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SWW-1	*Surface Water and Wetlands*								
	CONSTRUCTION PHASE			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	1	3	**0.6**
					VLOW	ISO	INCID	COULD	**VLOW**
Impact 2	Decreased water quantity - runoff contained in "dirty" area.	Negative	Definite	5	3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
Mitigation Measures:	*Clean water cut-off close to facility. Locate facility high on water shed. Use Site 1 (smaller area). Line contaminated areas.*				2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**
Impact 3	Sedimentation of wetlands and surface water resources	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
Impact 4	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	5	1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.5	2	2.5	4.5	**2.1**
					MOD	STUDY	MED	OCCUR	**MOD**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.3	1.3	1.8	3	**0.9**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**

11.2.5 Groundwater

Project Impact (Unmitigated)

Cut and fill activities undertaken during the construction of the ash disposal facility, AWRD, and other supporting infrastructure may intersect the shallow perched aquifers occurring within the development footprint. The impact will result in the dewatering of these aquifers during construction. It is unlikely that the deeper production aquifers will be affected by any

of the construction activities that will be limited to the shallow soils and geologies present in the area.

The installation of the barrier system, designed to prevent ingress of water / leachate from ash disposal facility and other dirty water management infrastructure such as the solution trenches and AWRD will also prevent recharge from occurring. The total development footprint is only 12.5 % of the study area, and it is unlikely that containing the water recharge over the development footprint will substantially impact the groundwater levels in the area.

In addition, the use of dangerous chemicals during the construction phase such as paints, thinners, solvents and hydrocarbons introduces an environmental risk. Spills occur during the storage, handling, and use of such dangerous chemicals, and in most cases even a small amount entering the environment can cause damage to ecological systems and even pose human health risks.

The combined weighted project impact to groundwater (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low**.

Cumulative Impact

The baseline impacts to groundwater in the study area (explained more below) occur as a result of agricultural activities, mining, and the existing ash disposal facility from the Camden Power Station:

- Agricultural activities such as cultivation and livestock farming may contribute contaminants (such as ortho-phosphates and other fertilizers) into the soil and surface water that eventually percolate through to the groundwater;
- Mining activities will likely affect the groundwater quality and quantity[7] as open cast mining results in the dewatering of water carrying aquifers. Water entering open cast mining operations tends to become exposed to contaminated soils, ores, and heavy metals thereby decreasing their water quality. This impacts occur on the periphery of the study area, and in close proximity to Site 1 (~500m); and
- The leachate from the existing ash disposal facility will affect primarily the water quality. Water percolating through the ash body will pick up contaminants and exit the bottom of the currently unlined ash body as leachate. The leachate, a concentrated form of dissolved pollutants from the ash body, will then recharge to groundwater resources

[7] The extent of the impact from mining activities has not been verified using measurements and analysis and has been rated based on professional experience that such an activity will have on the regional groundwater regime

affecting the quality of groundwater resources. Fortunately the existing ash disposal facility (and potential future sites) is located within a climatic zone of significant moisture deficit (a deficit of mean annual precipitation relative to mean annual evaporation), rendering the formation of leachate as an insignificant impact. In addition the Karoo sediments (Vryheid Formation) underlying the study area are relatively impermeable; limiting the spread of possible pollution. The shallow perched aquifer serves as recharge zone along preferential pathways for the deep exploitable aquifer (aquifer that can be utilised for production purposes). However the hydro chemical data gathered during the last two decades from the deep aquifer in the vicinity of the ash stack shows little or no signs of pollution.

The initial impacts to groundwater within the *study area* are not considered to be that substantial, although further afield (the local extent) this impact starts becoming more significant. Additional project impacts are not of such a nature that they will result in a cumulative impact developing during the construction phase of the project.

Therefore in this instance the cumulative baseline impact is determined by the baseline conditions prevalent in the area or initial impact present, which is **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Mitigation Measures

- Utilise Site 1 for the construction of the ash disposal facility;
- Site the ash dam north of the sub-catchment watershed, and more than 100m away from the non-perennial stream occurring on the north-west boundary of the area.
- Install clean and dirty water cut off trenches to ensure that clean water is kept clean, and dirty water is contained;
- Ensure a suitable barrier system (i.e. composite barrier system of suitable protection layers / liners, and leak detection system) is installed below all contaminated areas (such as the ash disposal facility, dirty water solution trenches, and the AWRD) to ensure that leachate from the facility does not enter the environment;
- Borehole FBB23 must be sealed properly with a cement bentonite mixture (or similar) to prevent pollutants from entering the groundwater regime directly, as it is in the area recommended for siting the ash disposal facility;
- Install a groundwater monitoring system that ensures that early detection of groundwater pollution can be detected; and
- Trenches should be constructed around the ashing facility to minimise the spreading of pollutants through the shallow perched aquifer.

Residual Impact (Mitigated cumulative impact)

The mitigation measures will ensure that any additional impacts incurred from the construction of the proposed ash disposal facility are reduced in significance, spatial scale, and likelihood of occurrence. However, impacts already incurred from existing activities will not be reduced or mitigated through the implementation of the aforementioned measures.

Should the mitigation measures be implemented then the residual impact will be the same as the cumulative impact presented above i.e. the impact will **probably** be of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-13 below.

Table 11-13: Construction Phase Impact Assessment Matrix: Groundwater

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
GW-1	*Groundwater*								
	CONSTRUCTION PHASE			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
Mitigation Measures:	*Hydrocarbon and chemical management.*				1	1	1	1	**0.2**
					VLOW	ISO	INCID	IMPOS	**VLOW**
Impact 2	Decreased water quantity - less recharge to groundwater	Negative	Definite	3	2	1	4	5	**2.3**
					LOW	ISO	LONG	OCCUR	**MOD**
Mitigation Measures:	*None.*				2	1	4	5	**2.3**
					LOW	ISO	LONG	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.6	0.8	1.7	3	**0.8**
					LOW	ISO	SHORT	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.1	0.8	1.7	2	**0.5**
					LOW	ISO	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**

11.2.6 Terrestrial Ecology (Flora and Fauna)

Project Impact (Unmitigated)

The project impacts will occur as vegetation is removed from within the proposed footprint of the facility. In addition disturbance to vegetation leads to alien invasive species spreading in an area. These impacts will result in habitat loss and fragmentation. Impacts may be felt as a loss of habitat structure, function, and species composition. Once the facilities are constructed the vegetation will not be re-established until after the facility is rehabilitated and a sustainable vegetation cover is established on the facility. Any fauna present in this proposed footprint will be driven off onto the surrounding habitat.

During the construction phase the vegetation and animal life over the entire development footprint (~216.7 ha) will be impacted. The distribution of this impact per vegetation type is shown in Table 11-14. The greatest percentage of vegetation type impacted is cultivated lands (24% of the cultivated fields within the study area will be impacted), and only 10.8 % of the open grassland occurring the study area will be impacted.

Table 11-14: Vegetation composition and impact areas

Vegetation Type	Study Area Composition (Before Impact)		Impact Footprint Site 1		Study Area Composition (After Impact)	
	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Study Area Composition	Area (Ha)	As (%) of Total Study Area
Open Grassland	702.2	40.6	76.1	10.8	626.1	36.2
Moist Grassland	43.3	2.5			43.3	2.5
Water	128.2	7.4			128.2	7.4
Agriculture	568.4	32.8	138.2	24.3	430.1	24.8
Transformed / Developed	289.3	16.7	2.4	0.8	501.2	30.0
TOTAL	**1731.4**	**100.0**	**216.7**	**12.5**	**1729.0**	**100.0**

The natural habitat within the study area is considered highly transformed, more than 50% directly transformed (industrial infrastructure and cultivated land), and 40% is grazed, totalling more than 90% of transformed area. The habitat function will be entirely lost over the area developed for the duration of the construction and operational phase, and partially regained once the site is capped and re-vegetated. The transformation of this area will result in the transformed area increasing from 16.7% to 30% of the study area. Although the vegetation is in a currently transformed state, cultivated and grazing lands (comprising 72.8%) can be rehabilitated and restored to natural habitat if so desired, which will not be the case for areas impacted by the construction of the ash disposal facility – which will be permanently transformed. The conservation value of this land is however not considered to be very high, and the transformation of an additional 13,3 % of the study area is considered to be a low impact.

No red data plant or animal species were identified during site visits, and because of the highly transformed nature of the development site the impact on species composition is expected to be negligible.

The combined weighted project impact to terrestrial ecology (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will act in the medium term and *could occur*. The impact risk class is thus **Very Low**.

Cumulative Impact

The impact to terrestrial ecology described above continues outside of the study area as mining and agricultural activities are systematically impacting on the vegetation and consequently habitat of the region. The grassland biome prevalent in the area is widespread across the South African Highveld, but is poorly conserved, and is through systematic transformation is becoming more threatened.

The cumulative (unmitigated) impact of the project on the terrestrial ecology within context of its surroundings is thus considered **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and will *is going to happen*. The impact risk class is thus **Moderate**.

Mitigation Measures

- All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited only to the development footprint (including areas where vehicles may traverse);
- A suitable seed mix of indigenous plants should be used in all rehabilitation programmes on the site;
- All alien invasive species on-site should be removed and follow-up monitoring and removal programmes should be undertaken once construction is complete; and
- Adhere to the ESKOM transmission vegetation management guideline when relocating power lines.

Residual Impact

Mitigation measures will reduce the impact footprint and improve the success of any rehabilitation activities undertaken. The residual impact will **definitely** be of a LOW negative significance, affecting the *study area* in extent. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-15 below.

Table 11-15: Construction Phase Impact Assessment Matrix: Terrestrial Ecology

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
TE-1	*Terrestrial Ecology*								
	CONSTRUCTION PHASE			5					
Impact 1	Destruction of vegetation	Negative	Definite	5	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Search and Rescue, Alien invasive control, Separate topsoil stripping / stockpiling (including seedbed), Rehab Temp Impact*				2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
Impact 2	Loss of faunal populations	Negative	Definite	3	2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
Mitigation Measures:	*Search and Rescue, Alien invasive control, Rehab Temp Impact Areas*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
Impact 3	Loss of biodiversity	Negative	Definite	2	2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Mitigation Measures:	*Harvest Seeds, Alien invasive control, Indigenous Seedmix-Rehab areas, Separate topsoil stripping / stockpiling (including seedbed)*				1	1	5	1	**0.5**
					VLOW	ISO	PERM	IMPOS	**VLOW**
Impact 4	Loss of habitat and habitat fragmentation	Negative	Definite	5	3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
Mitigation Measures:	*Consecutive Rehab of Dam*				2	1	4	5	**2.3**
					LOW	ISO	LONG	OCCUR	**MOD**
Impact 5	Loss of species diversity	Negative	Definite	2	2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
Mitigation Measures:	*Search and Rescue Operations, Seedbank, Separate topsoil stripping and replacement (including seedbed)*				1	1	4	2	**0.8**
					VLOW	ISO	LONG	UNLIKE	**VLOW**
Impact 6	Increase in alien invasive species	Negative	Definite	3	3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
Mitigation Measures:	*Alien invasive control, Indigenous Seedmix - Rehab area*				1	1	4	5	**2**
					VLOW	ISO	LONG	OCCUR	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.8	0.8	2.6	2.9	**1**
					LOW	ISO	MED	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1	0.7	2.6	2.6	**0.7**
					VLOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

11.2.7 Avifauna

The impacts to avifauna were assessed by a specialist consultant; the study is attached in Appendix G. The specialist study was used to assist in the rating of the impacts to avifauna presented below.

Project Impact (Unmitigated)

Project impacts to avifauna will occur as natural vegetation is transformed by the construction of the proposed ash disposal facility and its associated infrastructure. The transformation of natural habitat will effectively displace the majority of avifauna currently utilizing the proposed development site to adjacent areas, and will result in the fragmentation of natural grassland habitat.

The impact to vegetation / habitat is assessed separately above. However it appears that there are sufficient adjacent open areas for avifauna species to relocate utilise during the construction phase of the project. The loss of 76.1 ha of grassland is however considered to be a significant impact on Avifauna.

During the specialist study undertaken no red data plant species were found to be foraging or breeding within the area earmarked for development. However, their presence should not be entirely discounted as the specialist study focused on available literature and limited snap shot site visits to the study area.

The combined weighted project impact to avifauna (prior to mitigation) will **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus **Moderate.**

Cumulative

The proposed development is situated in the grassland biome. The grassland biome in Mpumalanga is under severe threat from many sources, including crop cultivation, industrialisation, afforestation and urbanisation (see for example Alan 1997). The birds least likely to show the effects of these transformations are the small species which are able to persist in small pockets of undisturbed habitat. Conversely, the species most likely to show disrupted patterns of distribution are large species with large home ranges. This is particularly evident in the significant decline of cranes in the Mpumalanga Highveld where numbers have decreased by more than 80% in the past four decades (Barnes 2000). It is conceivable that the perceived absence of larger species such as cranes, bustards and korhaans in the study area may be linked to existing irreversible impacts (roads, industrial development, fences, power lines and agriculture) which have resulted in fragmentation of the remaining grassland. However, there are relatively large tracts of grassland remaining in the study area, and it is not inconceivable that these species may still sporadically use the areas for foraging or even breeding. In this respect, the results of the instantaneous sampling conducted in January 2012, although very valuable to give an indication of what occurs on the site, cannot be regarded as conclusive.

The cumulative impact of losing another ~76.1 ha hectares of grassland bird habitat in the Mpumalanga Highveld should therefore be regarded as a **Moderate** impact within the overall context of existing pressure on natural grassland habitat in Mpumalanga.

Mitigation Measures

- The potential for off-setting the loss of natural grassland by conserving an equivalent quantity and quality of grassland bird habitat elsewhere on the Mpumalanga Highveld should be considered;
- Alternatively, a financial contribution towards a legitimate conservation initiative for threatened grassland avifauna could also be considered as an off-set e.g. a contribution to Birdlife South Africa or the Highveld Crane Conservation Project of the Endangered Wildlife Trust; and
- Maximum use should be made of existing infrastructure (e.g. pipelines, access roads and fencing) to minimise the further fragmentation of natural grassland areas.

Residual Impact

With the successful implementation of the above mitigation measures the residual impact to avifauna will **definitely** be of a LOW negative significance, affecting the *study area* . The impact will act in the long term and *will occur.* The impact risk class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-16 below.

Table 11-16: Construction Phase Impact Assessment Matrix: Avifauna

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
AF-1	*Avifauna*								
	CONSTRUCTION PHASE			5					
Impact 1	Loss of foraging / breeding habitat	Negative	Definite	5	3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
Mitigation Measures:	*Use Site 3.*				3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
Impact 2	Electrocutions of birds (will be the same as existing Tx lines)	NO ADDITIONAL IMPACT	Definite		0				**0**
					NO				**NO**
Mitigation Measures:	*Eskom transmission line bird impact reduction standards to be implemented.*				0				**0**
					NO				**NO**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

11.2.8 Air Quality

Project Impact (Unmitigated)

Where construction activities are undertaken in conjunction with exposed soils there is a risk of generating dust. Construction vehicles also utilise hydrocarbon fuels and are known to have greenhouse gas exhaust fumes. These impacts are limited to the construction phase.

With regards to dust, the larger particles typically fallout within 500 m of the activity, this dust is known for its nuisance factor. Dust fallout on plants will cause a reduction in the plants ability to photosynthesise and may reduce production potential. Beyond 500 m the impact from fall out dust is considered negligible. The construction activities will mostly be located more than 500 m from Camden (the closest human settlement); however vehicles traversing the dirt roads to and from site will certainly have an impact on any residents in Camden that have not yet relocated after the village was closed down.

The finer particulates that also result in health impacts are known to travel much further. Sensitive receptors, such as children under five years of age and elderly people older than 65 years of age, may be more severely impacted.

No baseline assessment or monitoring was undertaken for the purpose of this study. The assessment given below is based on professional opinion.

The combined weighted project impact during the construction phase to air quality (prior to mitigation) will **possibly** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The air quality in the area is impacted on by the opencast coal mining activities, Camden Power Station, and agricultural activities in the area. These activities contribute fine particulate and dust particles to the air from exposed soils and spoil stockpiles, dust from vehicle entrainment (heavy mining / construction equipment), ash from the existing ash disposal facility, and stack emissions from the boilers at the power station.

The cumulative impact during the construction phase to air quality (prior to mitigation) will **possibly** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and will *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Ensure that vegetation clearing is limited to only the areas where construction will take place;
- Ensure that “no-go” areas are staked and marked clearly prior to construction commencing;
- Prevent construction vehicles from riding all over the site, and ensure that they stick to pre-determined routes and low speeds;
- Sequence the construction methodology in such a way so as to reduce the area of exposed soil to its minimum extent practically possible;
- Use chemical dust suppression (such as dust-a-side) on areas to be frequently used**, if** possible;
- Install wind breaks (e.g. growth of trees or shrubs serving tobreak the force of wind) to ensure that low level winds are reduced and partical mobilisation is reduced;
- Establish a dust monitoring programme to ensure compliance with the South African air quality standards; and
- Regularly undertake dust suppression using to ensure that dust mobilisation is prevented.

Residual Impact

The residual impact to air quality during the construction phase will be determined by the baseline impacts and will **possibly** be of a MODERATE negative significance, affecting the *regional area*. The impact will act in the medium term and *is already occurring*. The impact risk class is thus **High.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 Above. These ratings are provided in the matrix presented in Table 11-7 below.

Table 11-17: Construction Phase Impact Assessment Matrix: Air Quality

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
					ALTERNATIVES: Site 1				
AQ-1	*Air Quality*								
	CONSTRUCTION PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Mitigation Measures:	*Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab*				1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
Impact 2	Nuisance and fall out dust	Negative	Possible	4	4	3	2	5	**3**
					HIGH	LOCAL	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	2	2	3	**1.2**
					LOW	STUDY	SHORT	COULD	**LOW**
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	2	3	2	3	**1.4**
					LOW	LOCAL	SHORT	COULD	**LOW**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	1	2	2	**0.7**
					LOW	ISO	SHORT	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Possible		2.1	2.2	1.6	3.3	**1.3**
					MOD	LOCAL	SHORT	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Possible		1.4	1.3	1.6	2.1	**0.6**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**

11.2.9 Noise Impact

Project Impact (Unmitigated)

During the construction phase impacts will occur as a result of construction vehicles traversing the site and earth moving activities on site. During the day construction noise will not be noticeable over other background noise already experienced in the area, however during the night time construction noise can carry over vast distances. The Camden Village is located **~750m** from the site and represents the nearest sensitive receptor. Noise impacts at night are **probably** going to be of a LOW negative significance, affecting the *study area* in extent, and acting in the short term. The impact is very likely to occur. The impact risk class is **Low.**

Cumulative Impact

The ambient noise environment in the area is impacted on by the open cast mining activities, Camden Power Station, and agricultural activities in the area. These activities introduce noise from blasting, heavy vehicles traversing gravel and surfaced roads, construction vehicles, and massive earth moving equipment.

No baseline assessment or monitoring was undertaken for the purpose of this study. The assessment given below is based on professional opinion.

The cumulative impact during the construction phase from noise (prior to mitigation) will **probably** be of a MODERATE negative significance, affecting the *local area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and *will occur*. The impact risk class is thus **Moderate.**

Mitigation Measures

- Limit construction activities to daylight working hours;
- Establish a noise monitoring programme, in the event that mitigation measures are not successful further measures are to be investigated and implemented, this could include but is not limited to the relocation of the village;
- Inform residents in the area are informed of construction activities ahead of construction;
- Provide a complaints procedure for stakeholders to raise concerns, follow up, and feedback to stakeholders; and
- Plan vehicle routes ahead of construction and inform stakeholders within 500m of the route of the proposed activities to be undertaken.

Residual Impact

The mitigation measures will ensure that impacts from the construction activities are reduced. None of the mitigation measures will reduce the background noise quality. The residual impact after mitigation measures are implemented will thus be the same as for the initial impact i.e. the residual impact to the ambient noise environment within the study area is **probably** of a LOW negative significance. The impact will act for as long as the activities are undertaken (medium term). The probability is that the impact will occur. The impact class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-18 below.

Table 11-18: Construction Phase Impact Assessment Matrix: Noise

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
N-1	*Noise*								
	CONSTRUCTION PHASE			5					
Impact 1	Increased ambient noise levels	Negative	Probable	3	3	3	2	4	**2.1**
					MOD	LOCAL	SHORT	VLIKE	**MOD**
Mitigation Measures:	*6am - 6pm construction time, No Construction on Sundays*				2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Probable		1.8	1.8	1.2	2.4	**0.8**
					LOW	STUDY	SHORT	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Probable		1.2	0.6	0.6	1.8	**0.3**
					LOW	ISO	INCID	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**

11.2.10 Social Environment

The impacts to the socio-economic environment were assessed by a specialist consultant. The social impacts are summarised in the section below, but more detail can be obtained by reading the full report Social Impact Assessment (SIA) report attached in Appendix M.

Project Impact (Unmitigated)

Table 11-19 represents the social change processes that have been identified and the possible social impacts that may result because of these processes. It also identifies the stakeholder group that is most likely to be affected by the process.

Table 11-19: Summary of Socio-economic impacts

Social Change Process	Possible Social Impact	Affected stakeholder group
In-migration	• Increased pressure on local services & infrastructure • Increased incidence of STD's, HIV & AIDS • Disruption to existing power relationships and decision-making structures • Social nuisance e.g. prostitution, damage to property, discrepancy in income of workers	• Vulnerable communities • Surrounding towns • Tourism • Farmers
Resettlement	• Range of social impacts – specific procedures to be followed, best to be avoided • Uncertainty about future	• Vulnerable communities
Change in land use	• Decreased access to sources of livelihood resulting in poverty and/or drop in standard of living • Loss of productive land leading to loss of profit leading to job losses • Long term conflict about management of servitudes • Environmental nuisance e.g. noise, dust • Safety hazards • Communication and arrangements surrounding access to properties & management of servitude – can be positive or negative • Loss of sense of place	• Industry • Farmers • Vulnerable communities • Tourism
Deviant social behaviour	• Increase in crime and disorder • Acts of sabotage • Breakdown of traditional values	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns
Employment opportunities	• Loss of workers to construction process because of higher pay • Opportunity for local low skill employment • Indirect employment opportunities • Retention of jobs	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns

Social Change Process	Possible Social Impact	Affected stakeholder group
Legal processes	• Uncertainty resulting from EIA process (selection of route) • Fear and anxiety related to the land acquisition process • Feelings related to past experiences of management of servitude – Eskom's social license to operate.	• Industries • Farmers • Vulnerable communities • Tourism • Surrounding towns

The key social impact risks that were identified include employment opportunities; public uncertainty, and retention of jobs. Each of the impact risks described in Table 11-19 is discussed in detail in Appendix M. Individual social impact risks are rated in the impact matrix in Table 11-20.

It should be noted that some substantial positive impacts can be generated by this project, and the total significance of these positive impacts is whittled away by numerous smaller negative impacts. The potential for mitigation is thus large, and the potential benefits that could be generated by mitigation will show tremendous improvements in the overall rating of this impact.

However, without mitigation the combined weighted project impact to the social environment (prior to mitigation) will **definitely** be of a LOW positive significance, affecting the *study area*. The impact will act in the short term and will be *unlikely to occur*. The impact risk class is thus **Very Low.**

Cumulative Impact

Potential negative cumulative impacts:

- Local businesses in some parts of the project area have already lost labour to other construction processes and this process may escalate that impact.
- As far as the uncertainty is concerned, the perceived impact will be cumulative to the general impact of economic instability due to the worldwide recession, and is therefore not specifically related to the proposed project. Expectations about job creation are also a current reality in South Africa and will be an issue in any project that may generate jobs;
- Cumulative impacts on the agriculture industry may be negative and in the long term contribute to impacts on food production.
- Environmental nuisances that occur during construction will be temporary. Given the fact that there are existing impacts from Camden Power Station, many of the nuisances will be cumulative; and

- People lose faith in the EIA process if they experience a number of these processes in a negative light. The less faith they have in the process the higher the levels of stress and anxiety will be.

Potential positive cumulative impacts:

- The retention of jobs at Camden Power Station is a cumulative impact; and
- Cumulative impacts on local entrepreneurs will be positive and assist in developing their businesses further.

The cumulative impact to the social environment (prior to mitigation) will **definitely** be of a LOW positive significance, affecting the *local area*. The impact will act in the medium term and *will occur*. The impact risk class is thus **Moderate**.

Mitigation Measures

- Site 1 is the recommended site;
- Any infrastructure such as roads which may be impacted on by the project should be maintained in their present condition or improved upon.
- Contractors must adhere to the rules as set down by the property owner. This aspect should be included in their scope of work to ensure that they provide the financial means to execute the necessary maintenance and repair work required. Should they disobey the local rules regarding speeding a fine system must be implemented.
- During construction any incidences must be reported in a complaints register that should be inspected by the social / environmental monitor on a weekly basis. Eskom must audit this document on a monthly basis.
- The contractor should have a person trained in first aid on site to deal with smaller incidents that require medical input.
- Services should be negotiated with landowners and local municipalities and Eskom should audit the agreements that must be put in place to ensure that essential services are not taken away from communities.
- For the duration of the construction phase there must be a well-published, culturally appropriate grievance mechanism. This must be agreed with local communities at the start of the construction period in the area. The communities must give input in the process to ensure ownership.
- Grievances must be dealt with within a certain period.
- All grievances must be recorded in a register stating the grievance, date that it occurred and action taken.

- For the duration of the construction phase the ECO / WMCO will be responsible for assisting the aggrieved person should to complete a form or submission that explains the grievance, the process followed and what the outcomes were;
- Should the provision of bulk-services to contractors be to the detriment of the affected communities, these services should be brought in from outside the affected area.
- When investigating existing accommodation the contractor should ensure that the necessary sanitation services are available and have the capacity to meet the additional needs. This assurance should be given to the contractor in writing.
- Eskom cannot control squatter settlements surrounding towns. The contractor must ensure that no squatter settlements are erected near or adjacent to construction camps. People should be asked to leave before they have the opportunity to settle. The assistance of the local police in this matter will be crucial.
- The contractor must put up signs that no recruitment will take place on site, and all jobseekers must be shown away from site.
- The contractor should not allow his staff to utilise services from squatters. There must be a formal trading area for informal traders, but they must not be allowed to sleep where they trade or set up camps in close proximity to the construction camp.
- HIV/AIDS and Sexually Transmitted Disease (STD) awareness training must form part of the induction of staff.
- Condoms must be freely available on site.
- STD and HIV / AIDS awareness training should be provided in conjunction with local NGOs or the Department of Health;
- The workforce must be discouraged from engaging in casual sexual relationships with local people and informed of the consequences;
- The code of conduct as agreed with the affected communities and landowners should be adhered to;
- No alcohol should be sold in the camps, and the amount of alcohol allowed in the camp should be limited;
- Prostitutes should not be allowed to enter the camp;
- There should be fines for breaking the rules;
- Frequent inspections of the camps should take place, and if non-conformances are found payment to the contractor must be withheld until it is corrected;
- The contractor must take out insurance for the damage of local property – this should be a condition of the contract. The insurance should take the external environment into consideration;
- Develop and implement community relations programme;

- Involve the community in the process as far as possible – encourage co-operative decision-making and management and partnerships with local entrepreneurs;
- Be accessible and sensitive to community needs;
- Unspoilt natural areas should be avoided as far as possible and infrastructure should rather be erected in areas where similar infrastructure already occur, whilst considering cumulative impacts;
- To ensure local service providers benefit as much as possible from the proposed project, the use of these establishments by Eskom and its contractors is recommended;
- Dust suppression must be used;
- No construction work should take place on Sundays, public holidays and during the night, where this will need to happen, landowners must be notified, and their acceptance received;
- Access to the site and the servitude should be controlled as far as possible;
- Local unemployed people must be given preference in the recruitment process;
- Contractor must refrain from employing people who are currently employed in permanent positions;
- There must be employment desks in the towns or settlement areas;
- No recruitment may take place in the construction camps;
- No false expectations must be created and it must be underlined that the employment opportunities are specifically for the unemployed;
- Women must make up a percentage of the workforce;
- Eskom and the contractor must support local entrepreneurs as far as possible;
- It must be acknowledged that there will be local entrepreneurs trying to sell their goods to the construction force. Unless managed carefully this may lead to squatter camps near the construction camps. The contractor should provide a designated area where such services can be provided – the area should ideally form part of the construction camp and be cleared and fenced; and
- No open fires must be allowed. Food should rather be prepared off-site and transported in. Vendors must travel in and out of the area and should not be allowed in the construction area. The social monitor must assist in managing this process.

Residual Impact

Many of the impacts cannot be mitigated to such an extent that they are no longer significant. Many of the impacts will be short term, and disappear after the construction phase. Residual impacts that are mentioned are those impacts that will be long term or

permanent. Many of these impacts cannot be managed or controlled by Eskom, as some occur on an individual level.

- Damage to roads may not be repaired for a long period, and as a result local communities and travellers will be exposed to safety risks. The mitigation of this impact lies outside the scope of Eskom. Although they can enter into negotiations with the relevant parties, the influence that they have to prioritise repairs may be limited.
- Another residual impact is STDs and HIV/AIDS. For all practical purposes this is a permanent impact that will be felt on an individual level.
- Unplanned pregnancies resulting in female-headed households are also a long-term residual impact that Eskom can do little about.
- Changes in power relationships and community cohesion may have long-term implications resulting in permanent changes in the community. It must be acknowledged that social change occurs in any event, and that communities can adapt to this change.
- There may be a breakdown of traditional values as a result of crime and external influences.
- Residual impacts will be a positive impact on skills development and economic growth for small-scale entrepreneurs. There may be a negative impact on workers who were temporarily employed and lost their jobs, in that they might struggle to find new employment opportunities.

Should Eskom implement the mitigation, especially related to a community relations programme the results will be a positive neighbourly relationships. The residual impact to the social environment will **probably** be of a MODERATE positive significance, affecting the *local area*. The impact will act in the medium term and *is going to occur*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-20 below.

Table 11-20: Construction Phase Impact Assessment Matrix: Socio-Economic Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:					
				Site 1					
SOC-1	*Social Environment*								
	CONSTRUCTION PHASE			5					
Impact 1	Camden Close Down - loss of employement, loss of electricity	Negative	Definite		0				**0**
					NO				**NO**
Mitigation Measures:	*Don't close down the power station.*				0				**0**
					NO				**NO**
Impact 2	Retention of Jobs	Positive	Definite	5	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measures:	*None possible*				3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Impact 3	Employment Oportunities - direct and indirect	Positive	Definite	5	2	3	2	2	**0.9**
					LOW	LOCAL	SHORT	UNLIKE	**VLOW**
Mitigation Measures:	*Employ Unemployed Locals*				3	3	3	4	**2.4**
					MOD	LOCAL	MED	VLIKE	**MOD**
Impact 4	Public Uncertainty	Negative	Definite	1	3	2	2	3	**1.4**
					MOD	STUDY	SHORT	COULD	**LOW**
Mitigation Measures:	*Frequent communication, EO/ELO to be appointed, Complaints Register and Feedback, Community Relations Programme*				2	1	2	2	**0.7**
					LOW	ISO	SHORT	UNLIKE	**VLOW**
Impact 5	Deviant social behaviour, Community / Landowner health & safety (crime, STD's)	Negative	Definite	1	3	3	2	3	**1.6**
					MOD	LOCAL	SHORT	COULD	**LOW**
Mitigation Measures:	*Employ Unemployed Locals, Community Policing Forum, No workers housed in site, Access and Work Monitoring, STD*				1	2	2	1	**0.3**
					VLOW	STUDY	SHORT	IMPOS	**VLOW**
Impact 6	Environmental nuisance	Negative	Definite	2	3	3	2	4	**2.1**
					MOD	LOCAL	SHORT	VLIKE	**MOD**
Mitigation Measures:	*Complaints register and Feedback, Fines for breaking rules*				2	3	1	3	**1.2**
					LOW	LOCAL	INCID	COULD	**LOW**
Impact 7	Change in Land Use	Negative	Definite	1	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Demarcate impact footprint*				4	1	5	5	**3.3**
					HIGH	ISO	PERM	OCCUR	**HIGH**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Definite		1.3	1.4	1.3	1.8	**0.5**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Positive	Definite		1.4	1.3	1.4	2	**0.5**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Positive	Probable		3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**

11.2.11 Economic Environment

Project Impact (Unmitigated)

Both positive and negative economic impacts will occur as a result of the construction of the Camden Ash Disposal Facility. The negative impacts which will occur will primarily be as a result of the cost to build the facility. This direct cost to Eskom will translate into indirect costs to the consumer. Reckless or excessive spending will therefore be counterproductive as electricity costs will increase.

This expenditure will however translate into direct and indirect investment into the South African economy. Limited opportunities for employment and provision of services and goods will be created through this project.

Furthermore, the failure to construct the facility will result in Camden Power Station having to close down since there will not be an ashing space when the current facilities fill up. This will take out a large percentage (3,4 %) of the national grid's electricity capacity. Resulting in shut downs / black-outs. Electricity will become a more sought after commodity, also resulting in increased cost. Besides the direct impacts of job losses of the people employed at Camden, the indirect slowdown of the economy from less available energy will have national ramifications.

The positive economic ramifications from the project are considered to significantly outweigh the negative impacts associated with the cost to construct the facility. The combined weighted project impact to the economic environment (prior to mitigation) will **probably** be of a LOW positive significance affecting the *study area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Very Low.**

Cumulative Impact

Should the project proceed there will definitely be a significant cumulative impact as the power station will remain in operation, retention of jobs, and the creation of additional jobs being two of the most significant economic benefits. Other benefits include the on-going production of almost 3,4 % of the country's electricity.

The cumulative unmitigated impact on the economy will **possibly** be of a MODERATE positive impact. This impact *is going to occur* within the *local* area for the life of the power station (medium term). The impact risk class is thus **Moderate**.

Mitigation Measures

- Ensure that site 1 is developed.
- Employ locally – source local contractor companies, source labour locally, where possible source construction materials from responsible local suppliers; and
- Ensure that procurement is designed to provide the most appropriate costs without compromising on quality, or environmental protection.

Residual Impact

The residual impact to the economic environment as a result of the construction phase will **possibly** be of a MODERATE positive impact that affects the *local extent*. The impact will act in the medium term and *is going to occur*. The impact risk class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-21 below.

Table 11-21: Construction Phase Impact Assessment Matrix: Economic Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
EC-1	*Economic*								
	CONSTRUCTION PHASE			5					
Impact 1	Camden Close Down - Loss of Economic Development	Negative	Definite		0				0
					NO				NO
Mitigation Measures:	*Don't close down the power station.*				0				0
					NO				NO
Impact 2	Employment Oportunities - direct and indirect	Positive	Definite	5	2	3	2	2	0.9
					LOW	LOCAL	SHORT	UNLIKE	VLOW
Mitigation Measures:	*Employ Unemployed Locals*				3	3	3	4	2.4
					MOD	LOCAL	MED	VLIKE	MOD
Impact 3	Retention of Jobs	Positive	Definite	5	3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
Mitigation Measures:	*None possible*				3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
Impact 4	Loss of agricultural production	Negative	Definite	1	3	1	5	5	3
					MOD	ISO	PERM	OCCUR	MOD
Mitigation Measures:	*None possible*				3	1	5	5	3
					MOD	ISO	PERM	OCCUR	MOD
Impact 5	Development Cost	Negative	Definite	3	2	1	3	5	2
					LOW	ISO	MED	OCCUR	LOW
Mitigation Measures:	*Develop Site 1.*				2	1	3	5	2
					LOW	ISO	MED	OCCUR	LOW
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		1.7	1.7	2	2.8	1
					LOW	STUDY	SHORT	COULD	VLOW
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Positive	Probable		2	1.7	2.2	3.3	1.3
					LOW	STUDY	MED	VLIKE	LOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Possible		2	3	3	5	2.7
					LOW	LOCAL	MED	OCCUR	MOD
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Positive	Possible		3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Positive	Possible		3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD

11.2.12 Infrastructure

The construction of the ash disposal facility will require the relocation of three 400kV power lines. The relocation of these power lines will be undertaken as a component of this project. The impact of the power line construction, operation, and decommissioning is thus rated as an integral part of the impact assessment in each of the corresponding sections and is not rated separately. This section is merely included for the sake of completeness.

There will be no interruption in the supply of power and thus the impact to existing infrastructure is rated as NO IMPACT.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-22 below.

Table 11-22: Construction Phase Impact Assessment Matrix: Traffic and Infrastructure

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:					
				Site 1					
INF-1	*Infrastructure*								
	CONSTRUCTION PHASE			5					
Impact 1	Inturruption of Electrical Services	Negative	Definite	5	5	5	2	5	**4**
					VHIGH	NAT	SHORT	OCCUR	**HIGH**
Mitigation Measures:	*Construct Tx lines before switching*				0				**0**
					NO				**NO**
Impact 2	Traffic inturruptions	Negative	Possible	5	3	2	2	3	**1.4**
					MOD	STUDY	SHORT	COULD	**LOW**
Mitigation Measures:	*None required*				1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		5	5	2	5	**4**
					VHIGH	NAT	SHORT	OCCUR	**HIGH**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	No Impact	Definite		1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		3	2	3	5	**2.7**
					MOD	STUDY	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		5	5	3	5	**4.3**
					VHIGH	NAT	MED	OCCUR	**VHIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	2	4	**1.9**
					MOD	STUDY	SHORT	VLIKE	**LOW**

11.2.13 Traffic Impact

Project Impact (Unmitigated)

During the construction phase impacts will occur as a result of construction vehicles which will use existing roads for access.

The combined weighted project impact to the existing traffic environment (prior to mitigation) will **possibly** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low.**

Cumulative Impact

The road network in the study area is already highly impacted by the existing activities being undertaken at a regional extent. During site visits to the area a preponderance of heavy vehicles were observed using the roads for the hauling of coal, and other earth moving

activities. Upgrading of the road network also exacerbates the already negative situation as stop-and-go's in the area reduce the flow of traffic along key route segments.

The additional impact will **likely** produce a small but noticeable cumulative impact to the existing traffic congestion in the area for the duration of the construction phase for those people living in the study area.

The unmitigated cumulative impact to the existing traffic environment (prior to mitigation) will **probably** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Moderate.**

Mitigation Measures

- Use existing access roads, and links, on Eskom property wherever possible;
- Undertake access route planning for construction / heavy vehicles and./or abnormal loads ahead of the construction phase;
- Take local farmers and road users into account when sighting the contractors camp / hard park to ensure that impact to existing road users are minimised;
- Build required access roads early in the construction phase;
- Wherever possible ensure that Eskom owned property is used for site access;
- Upgrade roads in the affected area to ensure the damage incurred from vehicle traffic is remediated ; and
- Do not access privately owned land without pre-arranged permission.

Residual Impact

The mitigation measures will ensure that impacts from the construction activities are reduced. None of the mitigation measures will reduce the background traffic congestion. The residual impact after mitigation measures are implemented will thus be the same as for the initial impact i.e. the residual impact to the existing traffic environment will **probably** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology as outlined in Section 11.1. These are provided in the impact matrix represented in Table 11-23 below.

Table 11-23: Construction Phase Impact Assessment Matrix: Traffic and Infrastructure

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
INF-1	*Infrastructure*								
	CONSTRUCTION PHASE			5					
Impact 1	Inturruption of Electrical Services	Negative	Definite	5	5	5	2	5	4
					VHIGH	NAT	SHORT	OCCUR	HIGH
Mitigation Measures:	*Construct Tx lines before switching*				0				0
					NO				NO
Impact 2	Traffic inturruptions	Negative	Possible	5	3	2	2	3	1.4
					MOD	STUDY	SHORT	COULD	LOW
Mitigation Measures:	*None required*				1	2	2	3	1
					VLOW	STUDY	SHORT	COULD	VLOW
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		5	5	2	5	4
					VHIGH	NAT	SHORT	OCCUR	HIGH
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	No Impact	Definite		1	2	2	3	1
					VLOW	STUDY	SHORT	COULD	VLOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		3	2	3	5	2.7
					MOD	STUDY	MED	OCCUR	MOD
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		5	5	3	5	4.3
					VHIGH	NAT	MED	OCCUR	VHIGH
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	2	4	1.9
					MOD	STUDY	SHORT	VLIKE	LOW

11.2.14 Visual

Project Impact (Unmitigated)

The project impact of the proposed development during construction will be from the earthworks that have to be undertaken. The area will be visible from the roads traversing the area and residence at the Camden Village. Dust, heavy vehicles and construction camps will be characteristic views visible to those in the area. The exposed soils will appear no different to exposed cultivated areas during ploughing and planting.

The combined weighted project impact to the existing visual environment (prior to mitigation) will **definitly** be of a MODERATE negative significance affecting the *study area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The present visual landscape is one dominated by agriculture with intermittent rural residences, urban areas and industrial or mining activities. The study site includes the Camden Power Station, Camden Village, the existing ash disposal facility and several existing high voltage power lines that impact on the visual character of the landscape. The additional impact will not significantly alter the extent of the current impacts to the visual environment.

The cumulative impact to the visual environment (prior to mitigation) during the construction phase will **definitly** be of a HIGH negative significance affecting the *local area*. The impact will act in the long term and will *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Only the footprint of the proposed site should be exposed. In all other areas, the natural vegetation should be retained;
- Dust suppression techniques should be in place at all times during the construction phase;
- Access roads should be minimised to prevent unnecessary dust;
- Ensure that dust is monitored as part of the air quality management plan;
- Utilise non-shiny structures for the hard park and toilets, i.e. avoid unpainted roofs; and
- Ensure that all impacted areas during construction are top soiled and revegetated at prior to commencement with the operational phase to resemble the natural landscape.

Residual Impact

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-24 below.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-24 below.

Table 11-24: Construction Phase Impact Assessment Matrix: Visual Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
V-1	*Visual*								
	CONSTRUCTION PHASE			5					
Impact 1	Visual impact of barrier system installation (all infrastructure)	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Revegtate topsoil stockpiles, construction site screening*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 2	Visual impact of starter wall - Ash Dam	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*None possible*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 3	Visual impact of Ash Return Water Dam	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Revegetate exposed areas, construction site screening*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 4	Visual impact of relocated Tx Lines	Negative	Definite	3	0				**0**
					NO				**NO**
Mitigation Measures:	*None required.*				0				**0**
					NO				**NO**
Impact 5	Visual impact of construction of associated infrastructure	Negative	Definite	3	3	2	2	4	**1.9**
					MOD	STUDY	SHORT	VLIKE	**LOW**
Mitigation Measures:	*Revegetate exposed areas, construction site screening*				2	2	2	3	**1.2**
					LOW	STUDY	SHORT	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.2	1.4	1.4	3.5	**1.2**
					MOD	STUDY	SHORT	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.4	1.4	1.4	3.4	**1**
					LOW	STUDY	SHORT	VLIKE	**VLOW**
STATUS QUO	INITIAL IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**

11.2.15 Cultural Heritage Environment

Project Impact (Unmitigated)

Impacts that could occur to historically significant structures are limited to the physical removal of graves and historical buildings, vandalism or renovations to these structures resulting in permanent damage. There is presently no indication that any existing impacts to any historical structures have taken place.

No paleontological, archaeological, cultural, or heritage sites of any significant value were identified on Sites 1 there will probably be NO IMPACT to the archaeological or cultural heritage environment on this site.

Cumulative Impact

There is not expected to by any cumulative impact on the heritage environment.

Mitigation Measures

- Little data have been published on these potentially fossiliferous deposits. Around the coalmines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur, fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution.
- One or two sites must be preserved for posterity, the selection of them being determined by quality of the fossils, and practical issues such as being far away from development and interference by people and livestock, and also have some means of monitoring the safekeeping in place.
- Once construction has begun and if good exposures are found then the contractors and/or Eskom should contact a palaeontologist urgently to do a rescue operation.
- It is recommended that a palaeontologist do spot-checks on excavations base during the construction phase; and
- To minimize the effects on the landscape, it is recommended that the existing corridors be used, as far as possible for the relocation of any infrastructure.

Residual Impact

If the above mitigation measures are implemented, and adhered to then the residual impact on the cultural and heritage environment will **probably** be NO IMPACT.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-25 below.

Table 11-25: Construction Phase Impact Assessment Matrix: Archaeology, Palaeontology, and Cultural Heritage

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
ArCH-1	*Archaeology, Palaeontology, Cultural Heritage*								
	CONSTRUCTION PHASE			5					
Impact 1	NO ADDITIONAL IMPACT	No Impact	Definite	1	0				**0**
					NO				**NO**
Mitigation Measures:	*None required.*				0				**0**
					NO				**NO**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	No Impact	Definite		0	0	0	0	**0**
					NO	#N/A	#N/A	#N/A	**NO**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	No Impact	Definite		0	0	0	0	**0**
					NO	#N/A	#N/A	#N/A	**NO**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	No Impact	Definite		0				**0**
					NO				**NO**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	No Impact	Definite		0				**0**
					NO				**NO**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	No Impact	Definite		0				**0**
					NO				**NO**

11.3 OPERATIONAL PHASE

11.3.1 Geology

Once the facility is constructed it will not necessary to undertake any activities that may impact on the geology of the area. There is **definitely** expected to be NO ADDITIONAL IMPACT to the geology as a result of operational activities.

11.3.2 Topography

Once the facility is constructed there will be no additional changes in surface water drainage patterns as these will be strictly controlled by the clean and dirty water cut-off canals that will have been constructed. There is **definitely no expected impact** to the topography as a result of operational activities.

11.3.3 Soils and Land Capability

Project Impact (Unmitigated)

During the operational phase the activities that will impact on soils will primarily be the consecutive rehabilitation of the ash body and side slopes (rehabilitation of the ash facility will involve the handling and placement of soils), vehicles traversing the site, and leachate generated from the ash body.

The primary additional impact to soil and land capability will be the pollution of soil resources from leachate draining from the facility; followed by the erosion that will likely occur along roads, at soil stockpile areas, and exposed soils placed along the face of the ash body during capping and consecutive rehabilitation activities. Without mitigation measures the leachate will pollute soils within the entire development footprint of 216,7 ha. All exposed soils within the same footprint area will be at risk of erosion.

The combined weighted project impact to the soil and land capability (prior to mitigation) will **definitely** be of a MODERATE negative significance affecting the *development site*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The cumulative impact during the operational phase to soil and land capability (prior to mitigation) will remain the same as assessed for the construction phase i.e. the cumulative unmitigated impact will **probably** be of a HIGH negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that a suitably designed barrier system is installed with a leachate collection and leak detection layer included.
- Ensure that suitably designed storm water management infrastructure is installed and maintained for the duration of the operational phase, especially around soil stockpiles.
- Ensure that soils which are stockpiled for more than 1 year are suitably fertilised and vegetated to reduce the risk of erosion;
- Ensure that soils to be placed on the ash body during capping and consecutive rehabilitation of the ash body and side slopes are suitably ameliorated with a lime and fertiliser mixture. Soil fertility tests should be undertaken prior to placement to determine what additives need to be made to the soil to enhance its fertility;
- The facility is to be capped with a soil covering of at least 300 mm to ensure that a sustainable capping and vegetation layer can be established post closure. This must be monitored and reported on by an independent soil scientist on an annual basis until the rehabilitation of the facility is completed;
- Replaced soils need to be re-vegetated with an indigenous seed mix and regularly watered to ensure that vegetation successfully establishes within a single growing season; and
- No grazing is to be permitted on the facility. Fences will be established and regularly maintained.

Residual Impact

The residual impact to soil and land capability as a result of operational activities after the implementation of mitigation measures will be negligible in addition to the construction phase impacts already incurred. The residual rating thus remain as assessed for the construction phase i.e. **probably** of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-26 below.

Table 11-26: Operational Phase Impact Assessment Matrix: Soil and Land Capability

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SLC-2	*Soil and Land Capability*								
	OPERATIONAL PHASE			5					
Impact 1	Pollution of soils - leachate	Negative	Definite	5	4	1	5	4	**2.7**
					HIGH	ISO	PERM	VLIKE	**MOD**
Mitigation Measures:	*Install leachate collection system*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Impact 2	Erosion of soils	Negative	Definite	3	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Place soil stockpiles out of water courses, Revegetate Stockpiles, Stormwater Management*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.9	0.8	4	3.5	**1.8**
					MOD	ISO	LONG	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1.6	0.8	4	2.4	**1**
					LOW	ISO	LONG	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	2	5	5	**3**
					LOW	STUDY	PERM	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	2	5	5	**3.7**
					HIGH	STUDY	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**

11.3.4 Surface Water and Wetlands

Project Impact (Unmitigated)

During the operational phase the consecutive rehabilitation (capping and replacement of soils on the ash body side slopes), maintenance vehicles traversing the sites, and potential leaks / spills along pipelines could all result in impacts to the surface water environment.

The receiving water / wetland resources include:

- The non-perennial water course to the north-west of Site 1, which flows in a north-easterly direction; and
- The wetland crossing located at the following coordinates 26°36'37,384"S and 30°5'4.606"E.

These activities could result in the following impacts to surface water / wetland resources:

- Decrease in water quality:
  - hydrocarbon spillage that may enter the water courses;
  - increased sedimentation / suspended solids in water resulting in increased turbidity;
  - increased possibility of creating an environment for micro-organisms such as *E.coli* to proliferate; and
  - Decreased habitat conditions;
- Decrease in water quantity:
  - Surface water flow that is intercepted by the dirty water containment infrastructure will decrease the volume of runoff entering surface water resources. This impact is already assessed under construction phase impacts, and has not been assessed again in this section.

The combined weighted project impact to surface water and wetlands (prior to mitigation) will **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the medium term and will *very likely occur*. The impact risk class is thus **Low**.

Cumulative Impact

The cumulative impact during the operational phase to surface water and wetlands (prior to mitigation) will remain the same as assessed for the construction phase i.e. the cumulative unmitigated impact will probab**ly** be of a HIGH negative significance, affecting the *local area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **High**.

Mitigation Measures

- A wetland / surface water rehabilitation and maintenance plan for the segment of the stream located along the north western boundary of the study area, and indicated on Figure 9-19, must be compiled and implemented as a component of the construction phase, as a means of improving the quality of wetlands and surface water resources in the area;

- The existing surface water and groundwater monitoring plan needs to be updated to address the proposed facilities and must include bio-monitoring (quarterly during construction), as well as a hydrocarbon (quarterly during construction), trace metals, ICP-MS, and Cation / Anion constituent monitoring (monthly);
- All waste generated through maintenance activities are to be managed in line with the existing waste management procedure at Camden Power Station;
- Fence off "no-go" areas to ensure these areas are not impacted on by maintenance activities;
- Install an authority approved barrier system at the new ash disposal facility to prevent contamination of the water bodies;
- Ensure that soils placed during consecutive rehabilitation of the ash body and side slopes of the facility are ameliorated with a suitable mix of additives (fertilizers, lime etc) and that an indigenous seed mix is used for seeding of the slopes;
- In order to mitigate existing impacts that have occurred to the baseline environment the following is recommended:
  - The existing ash disposal facility must during the closure phase be profiled and capped such that clean surface water run-off does not recharge the De Jagers Pan;
  - The polluted water in the De Jagers Pan is treated in an appropriate manner in line with Eskom's Zero Effluent Discharge policy;
- Continue the alien invasive programme established in the construction phase. At a minimum the entire development footprint needs to managed through this programme; and
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas.

Residual Impact

Mitigation measures will substantially reduce the cumulative impact and if all measures are implemented will slightly improve the baseline impacts to surface water resources that already exist. The residual impact to surface water and wetlands will **probably** be of a LOW negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-27 below.

Table 11-27: Operational Phase Impact Assessment Matrix: Surface Water and Wetlands

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Site 1 Magnatude	Spatial	Temporal	Probability	Impact Risk
SWW-2	*Surface Water and Wetlands*								
	OPERATIONAL PHASE			5					
Impact 1	Decreased water quality - leachate, suspended solids, turbidity, hydrocarbons, E.coli and trace elements	Negative	Definite	5	4	3	3	5	**3.3**
					HIGH	LOCAL	MED	OCCUR	**HIGH**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	3	3	**1**
					VLOW	ISO	MED	COULD	**VLOW**
Impact 2	Sedimentation of wetlands and surface water resources	Negative	Definite	5	2	2	3	4	**1.9**
					LOW	STUDY	MED	VLIKE	**LOW**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	3	2	**0.7**
					VLOW	ISO	MED	UNLIKE	**VLOW**
Impact 3	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	5	1	1	3	3	**1**
					VLOW	ISO	MED	COULD	**VLOW**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	3	2	**0.7**
					VLOW	ISO	MED	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.3	2	3	4	**1.9**
					MOD	STUDY	MED	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1	1	3	2.3	**0.8**
					VLOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

11.3.5 Groundwater

Project Impact (Unmitigated)

During the operational phase of the facility, ash in slurry form will be deposited on the facility, systematically increasing the facility's footprint until it is fully developed. In an unmitigated scenario leachate will develop over time and will percolate into the groundwater below the facility from where it will disperse into the surrounding environment.

Site 1 is underlain by an unweathered dolerite soil with some sandstone layers that are slightly weathered to course, which might result in preferred pathways for potential contaminant transport.

The combined weighted project impact during the operational phase to groundwater (prior to mitigation) will thus **definitely** be of a MODERATE negative significance, affecting the *local* extent, and acting in the long term. The impact will very likely occur. The impact risk class is thus **Moderate**.

Cumulative Impact

There will **definitely** be a risk of cumulative impact to groundwater occurring because of the close proximity of the existing ash disposal facility (located within 100m of the proposed project), and adjacent coal mining activities that are being undertaken within a 1km radius of the proposed site. The coal mining activities are outside the control / influence of this project and are thus taken into account as existing base line impacts, which are considered substantial.

With respect to the existing Camden Power Station ash disposal facility the following is considered relevant in making the assessment of cumulative impacts to the groundwater environment:

- The proposed site is located within 150 m of the existing facility at its nearest point;
- The proposed project is 70 % of the size of Camden Power Station's existing ash disposal facility footprint, and represents 9 % of the study area; The breakdown of the existing, future and combined footprint is shown in Table 11-28.
- Based on the groundwater specialist study there is however no impact being detected from the existing ash disposal facility in any of the existing monitoring boreholes. This is ascribed to the moisture deficit that occurs climactically in the region, combined with the fairly impermeable geology. This is expected to continue into the future;
- Groundwater flow tends to emulate the surface topography, and the existing facility is located in a different sub-catchment to the proposed facility, and ground water is expected to flow in a different direction.

Thus the probability of the existing and proposed facility having a cumulative impact on groundwater resources is considered to be practically impossible.

Table 11-28: Breakdown of the existing and combined ash disposal footprint for Camden Power Station

Vegetation Type	Existing Dam		Impact Footprint Site 1		Combined Footoprint	
	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Total Study Area
Ash Disposal Dam	83,9 ha	4.8 %	154 ha	8.9 %	137.9	7.9 %
AWRD	155,9 ha	9.0%	8.1 ha	0.5%	164.0	9.5 %
TOTAL	**239,6 ha**	**13.8%**	**164.1 ha**	**9.4%**	**301.9**	**17.4 %**

The cumulative impact during the operational phase to groundwater (prior to mitigation) will thus be determined by the existing baseline conditions prevalent within the area, which in this instance is the same as the construction phase impact discussed in Section 11.2.5 above i.e. **probably** of a MODERATE negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the mitigation measures documented in the construction phase are implemented, especially the installation of a suitably designed barrier system below the facility;

Residual Impact

Mitigation measures will ensure that the impact to groundwater resources incurred during the operational phase of the propose project will be reduced to the baseline conditions prevalent on site. The impact will however result in the remediation of existing impacts, and thus the impact rating remains the same as the cumulative rating provided above i.e. **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-29 below.

Table 11-29: Operational Phase Impact Assessment Matrix: Groundwater

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
GW-2	*Groundwater*								
	OPERATIONAL PHASE			5					
Impact 1	Decreased water quality - Leachate (heavy metals)	Negative	Definite	5	3	3	4	4	**2.7**
					MOD	LOCAL	LONG	VLIKE	**MOD**
Mitigation Measures:	*Install leachate collection, Install Barrier System*				2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	3	4	4	**2.7**
					MOD	LOCAL	LONG	VLIKE	**MOD**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
STATUS QUO	INITIAL IMPACTS TO ENVIRONMENT	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	4	5	**3.3**
					MOD	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**

11.3.6 Terrestrial Ecology (Flora and Fauna)

Project Impact (Unmitigated)

During the operational phase of the project the primary impact to the terrestrial ecology will occur as a result of consecutive rehabilitation. Consecutive rehabilitation will involve the placement of soils on the developed slopes of the ash disposal facility, and then re-vegetation with a suitable seed mix of indigenous pioneer species. The effect of these activities will be the systematic recovery of the vegetation within the development footprint.

The combined weighted project impact during the operational phase to terrestrial ecology (prior to mitigation) is **definitely** of LOW positive significance. The impact is expected to act over the long term and will affect the *development site*. Without mitigation measures this impact could happen. The additional impact will be located at the proposed site. The impact risk class is thus **Low**.

Cumulative Impact

During the operational phase the footprint of rehabilitation will increase systematically, the accrual of positive impacts (without mitigation measures) through consecutive rehabilitation will however not be of significant enough proportions to reverse the impacts of the construction phase on the terrestrial ecology. Any real or lasting impact in this regard will only be fully realised in the closure phase when the facilities are finally capped and revegetated fully. Simultaneously, whilst the development of this proposed project is on-going the existing facility will be fully capped and rehabilitated. This represents a substantive positive impact to the terrestrial ecology in the study area. The effectiveness of the rehabilitation measures will be decreased by alien invasive species inhabiting the area, grazing on rehabilitated areas, and burrowing animals that forage on the facility. The positive impacts from the aforementioned activities will result in an improvement of the baseline environmental conditions prevalent within the study area, but will not result in a complete reversal of all negative impacts that exist at present.

The current baseline conditions will however still be affected by mining operations and agricultural activities that will be on-going. It stands to reason then that mining activities will also rehabilitate consecutively as per best practice standards prevalent in South Africa for opencast strip mining activities. An investigation of aerial photography for the mining operations north of Camden Village in fact proves this hypothesis to be true. An investigation of the success and standards of rehabilitation of these mining operations was however not made, and as a precautionary measure we have excluded this area in the assessment of cumulative impacts, this rating is thus considered conservative.

The cumulative unmitigated impact on the receiving environment will **definitely** be reduced to a Moderate negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Mitigation Measures

- Undertake consecutive rehabilitation to ensure that a sustainable vegetation cover is achieved on the slopes and areas rehabilitated during the construction phase;
- Ensure that newly placed soils and seeded areas are watered for the first two years on a regular basis to improve the success of re-vegetation activities;
- All “no-go” areas need to be fenced off to ensure that during maintenance of the facility no additional impact is incurred on the surrounding areas;
- A suitable seed mix of indigenous plants should be used in all rehabilitation programmes on the site;
- All alien invasive species on-site should be removed and follow-up monitoring and removal programmes should be undertaken throughout the operational phase of the project;
- Ensure that the mitigation measures for the stripping, stockpiling, and replacement of soils documented in the construction and operational phase (Section 11.2.3 and Section 11.3.3) are implemented;
- Adhere to the ESKOM transmission vegetation management guidelines / standards when maintaining power line servitudes

Residual Impact

Mitigation measures will ensure that positive impacts from this proposed project on the terrestrial ecology are maximised and possible negative impacts are controlled. The residual impact, like the cumulative impact, will be dictated by the current baseline conditions. The residual impact will however remain negative and will **definitely** be of a LOW negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-30 below.

Table 11-30: Operational Phase Impact Assessment Matrix: Terrestrial Ecology

Rated By: *Warren Kok* / Reviewed By:				ALTERNATIVES: Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
TE-2	*Terrestrial Ecology*								
	OPERATIONAL PHASE			5					
Impact 1	Consecutive rehabiliation	Positive	Definite	5	2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
Mitigation Measures:	*Alien invasive control, Ameliorate soils replaced, Indigenous seedmix, Watering of seeded areas*				3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Definite		2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Definite		3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

11.3.7 Avifauna

Impacts to avifauna are solely as a result of habitat destruction. This impact is assessed fully in the construction phase and as such there is **definitely** expected to be NO ADDITIONAL IMPACT to the avifauna as a result of operational activities.

11.3.8 Air Quality

Project Impact (Unmitigated)

During the operational phase impacts to air quality will occur as a result of maintenance activities and deposition of ash within the ash disposal facility. Where maintenance activities are undertaken in conjunction with exposed soils there is a risk of generating dust. Vehicles also utilise hydrocarbon fuels and are known to have greenhouse gas exhaust fumes. During the operational phase the surface of the ash disposal facility will be increased substantially. This area will be exposed to the elements. Additional impacts may occur from windblown particles from the exposed areas of ash. The professional opinion obtained indicated that, with mitigation measures impacts are very unlikely to be felt within a 750 m radius of the disposal facility. The Camden Village is located within the fallout zone. As the ash disposal facility is wet facility, the probability of this impact occurring is unlikely, mostly limited to the dry winter months, and only during high windfall events. In the event that fine particles are mobilised it is expected that the impact will be felt up to 1,7 km from the ash disposal facility (without mitigation measures).

The combined weighted project impact during the operational phase to air quality (prior to mitigation) will **possibly** be of a **moderate** negative significance, affecting the *local area*.

The impact will act in the medium term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The cumulative air quality impacts during the operational phase will be dictated by the current baseline conditions and will thus be the same as the assessment provided in the construction phase i.e. the cumulative unmitigated impact will **definitely** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Ensure that vegetation clearing is limited to only the areas where construction will take place;
- Ensure that “no-go” areas are fenced to ensure that on-going maintenance activities do not impact unnecessarily on the wider area;
- Use chemical dust suppression (such as dust-a-side) on areas to be frequently driven;
- Dust suppression on the ash body is to be undertaken in such a manner as to ensure that air quality impacts are within acceptable Air Quality Standards (especially for dust, PM2.5, and PM10 particulates);
- Install wind breaks (e.g. growth of trees or shrubs serving to break the force of wind) to ensure that low level winds are reduced and partical mobilisation is reduced;
- Establish a dust monitoring programme to ensure compliance with the South African air quality standards; and
- Regularly undertake dust suppression on all gravel roads using uncontaminated water to ensure that dust mobilisation is prevented.

Residual Impact

Mitigation measures will reduce the likelihood of the project resulting in additional impacts to the receiving air environment. The air quality screening study has indicated that with mitigation measures a buffer zone of 700m will be sufficient to ensure protection of the residents at the Camden Village. The facility has been designed to be more 750m away from the village. The residual impact thus remains as assessed for the cumulative impact i.e. will definitely be of a LOW negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and will *very likely occur*. The impact risk class is thus **High.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in the table below.

Table 11-31: Operational Phase Impact Assessment Matrix: Air Quality

Rated By: *Warren Kok*
Reviewed By:

				ALTERNATIVES:					
				Site 1					
	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
AQ-2	*Air Quality*								
	OPERATIONAL PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	1	2	3	**1**
					LOW	ISO	SHORT	COULD	**VLOW**
Mitigation Measures:	*Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab*				1	1	2	3	**0.8**
					VLOW	ISO	SHORT	COULD	**VLOW**
Impact 2	Nuisance and fall out dust	Negative	Possible	3	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				3	1	3	5	**2.3**
					MOD	ISO	MED	OCCUR	**MOD**
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	3	3	3	**1.6**
					LOW	LOCAL	MED	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Possible		2	2.1	2	3.3	**1.3**
					LOW	LOCAL	SHORT	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Possible		1.5	1.4	2	2.6	**0.8**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**

11.3.9 Noise Impact

None of the operational activities are expected to generate serious noise impacts as the majority of the processes are passive. The operational activities of the proposed facility will be the same as the existing facility. The existing facility will no longer be operational. Thus here is **definitely** expected to be NO ADDITIONAL IMPACT to the ambient noise as a result of operational activities.

11.3.10 Social Environment

Project Impact (Unmitigated)

During the Operational Phase of the project the activities that will have an impact on the social environment include the maintenance of pipelines, roads, associated infrastructure and servitudes, direct / indirect employment opportunities, and retention of jobs at Camden

Power Station which will extend through the extended life of the power station which will ensure continuous generation of power for the country.

Table 11-32 represents the social change processes that have been identified and the possible social impacts that may result because of these processes. It also identifies the stakeholder group that is most likely to be affected by the process.

Table 11-32: Summary of Socio-economic impacts

Social Change Process	Possible Social Impact	Affected stakeholder group
Change in land use	• Long term conflict about management of servitudes • Safety hazards • Communication and arrangements surrounding access to properties & management of servitude – can be positive or negative	• Industry • Farmers • Vulnerable communities
Deviant social behaviour	• Acts of sabotage	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns
Employment opportunities	• Indirect employment opportunities • Retention of jobs	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns

The combined weighted project impact to the existing social environment (prior to mitigation) will **probably** be of a LOW negative significance affecting the *local area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low.**

Cumulative Impact

Potential cumulative impacts include

- The retention of jobs at Camden Power Station; and
- Cumulative impacts on local entrepreneurs will be positive and assist in developing their businesses further.

The cumulative impact to the social environment (prior to mitigation) during the operational phase will **probably** be of a LOW positive significance, affecting the *local area*. The impact will act in the medium term and will *very likely occur*. The impact risk class is thus **Moderate**.

Mitigation Measures

Refer to the mitigation measures described in the construction phase. Implementation of these mitigation measures through the operational phase.

Residual Impact

The residual impact to the social environment will **probably** be of a MODERATE positive significance, affecting the *local area*. The impact will act in the medium term and will *is going to occur*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-33 below.

Table 11-33: Operational Phase Impact Assessment Matrix: Social Environment

Rated By: *Warren Kok*
Reviewed By:

				ALTERNATIVES:					
				Site 1					
	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
SOC-2	*Social Environment*								
	OPERATIONAL PHASE			5					
Impact 1	Employment Oportunities - direct and indirect	Positive	Probable	5	1	3	3	2	**0.9**
					VLOW	LOCAL	MED	UNLIKE	**VLOW**
Mitigation Measures:	*Employ Unemployed Locals*				2	3	3	3	**1.6**
					LOW	LOCAL	MED	COULD	**LOW**
Impact 2	Less environmental nuisance	Positive	Probable	1	2	3	3	2	**1.1**
					LOW	LOCAL	MED	UNLIKE	**LOW**
Mitigation Measures:	*Maintain - (Complaints register and Feedback, Fines for breaking rules)*				3	3	3	4	**2.4**
					MOD	LOCAL	MED	VLIKE	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		0.7	1.8	1.8	1.2	**0.3**
					VLOW	STUDY	SHORT	UNLIKE	**VLOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		1.3	1.8	1.8	1.9	**0.6**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**

11.3.11 Economic Environment

All potential economic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of operational activities.

11.3.12 Infrastructure

All potential infrastructure impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the infrastructure present in the area as a result of operational activities.

11.3.13 Traffic Impact

All potential traffic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the traffic in the area as a result of operational activities.

11.3.14 Visual

Project Impact (Unmitigated)

During the operational phase the primary impact to the receiving visual environment will occur as a result the deposition of ash, which will result in the height of the facility. The increased height of the facility makes the facility more visible.

The combined weighted project impact to the existing visual environment (prior to mitigation) will **definitely** be of a MODERATE negative significance affecting the *study area*. The impact will act in the short term and *is going to occur*. The impact risk class is thus **Moderate**.

Cumulative Impact

The cumulative visual impact (prior to mitigation) from the existing ash disposal facility, Camden Power Station, and the final visual footprint of the fully developed ash disposal facility will **definitely** have a HIGH negative impact on the *local* environment acting in the long term. The impact is going to happen. The impact risk class is **High**.

Mitigation Measures

- Undertake consecutive rehabilitation of the side slopes of the facility to reduce the visual impact; and
- Ensure that topsoil stockpiles that will be in place for more than two years are seeded and vegetated.

Residual Impact

The visual impact of the proposed ash disposal site cannot be mitigated entirely and a long term visual impact will probably persist post operational phase. With mitigation the impact will occur and is expected to be of a MODERATE negative significance affecting the *local extent*. The impact risk class is **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-34 below.

Table 11-34: Operational Phase Impact Assessment Matrix: Visual Impact

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
					ALTERNATIVES:				
					Site 1				
V-2	*Visual*								
	OPERATIONAL PHASE			5					
Impact 1	Visual impact - Ash Dam	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Revegetate exposed areas consecutively, clean litter and waste*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 2	Visual Impact - Associated Infrastructure	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Maintain revegetated areas, clean litter and waste*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**

11.3.15 Cultural Heritage Environment

Any impacts to the cultural or heritage aspects of the environment will occur during the construction phase (assessed separately in previous sections of this report) and there is **definitely** expected to be NO ADDITIONAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area as a result of operational activities.

11.4 CLOSURE PHASE

11.4.1 Geology

Once the facility is constructed it will not be necessary to undertake any activities that may impact on the geology of the area. There is **definitely** expected to be NO ADDITIONAL IMPACT to the geology as a result of closure activities.

11.4.2 Topography

Project Impact (Unmitigated)

During the closure phase the primary impact to topography will occur as a result of the final profiling and capping of the ash body to tie into the adjacent terrain. Associated infrastructure such as roads, pipelines, and the AWRD that are no longer required will also be decommissioned and the areas will be profiled to be free draining. These areas will be finally revegetated.

The primary additional impact to topography will be the alteration of surface water drainage patterns. Closure Phase activities will result in 199 ha (91.9 %) of the area impacted on by this project being reintegrated into the surface water drainage system of the sub-catchment. Incorrect profiling could lead to surface water pooling in undesired locations and / or increased erosion.

The combined weighted project impact to the topography (prior to mitigation) during the closure phase will **probably** be of a LOW positive significance affecting the *study area*. The impact will act in the long term and *could possibly occur*. The impact risk class is thus **Low**.

Cumulative Impact

Cumulative impacts will occur as both the existing and proposed ash disposal facilities and their supporting infrastructure will have been capped, profiled and tied into the adjacent terrain. The cumulative area affected is about ~16 % of the study area. The cumulative positive impact to the topography will reduce the accumulated baseline impact currently present in the study area, although not enough to change the overall risk class.

The cumulative impact to the topography (prior to mitigation) during the operational phase will **probably** be reduced to a LOW negative significance, affecting the *local area*. The impact will be permanent and *is going to occur*. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the final profile of the facility and associated infrastructure rehabilitated is free draining;

- Ensure that mitigation measures documented for soils and terrestrial ecology are implemented to ensure that erosion or the profiled area is reduced;
- Ensure that storm water infrastructure to be left in place post closure is suitably sized and designed to manage flow velocities so as to avoid erosion at outfall positions; and
- Ensure that all infrastructure not required post closure for maintenance and inspection of the post closure facility is identified, decommissioned / removed, and the area is made to be free draining.

Residual Impact

Mitigation measures will ensure that a positive result is achieved during closure activities, and that the impact reduction to the current baseline conditions as identified for the cumulative assessment above will be realised.

The residual impact at the end of the closure phase to topography will **probably** be of a LOW negative significance, affecting the *local area*. The impact is *very likely* going to happen and will be permanent. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 11.1 above. These ratings are provided in the matrix presented in Table 11-35 below.

Table 11-35: Closure Phase Impact Assessment Matrix: Topography

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
T-3	*Topography*								
	CLOSURE PHASE			5					
Impact 1	Alteration of surface water drainage patterns - stormwater runoff from rehabilitated areas	Positive	Probable	5	2	2	4	3	1.6
					LOW	STUDY	LONG	COULD	LOW
Mitigation Measure:	*Ensure suitable soil cover, vegetation covers, free draining areas, storm water attentuation, Regular surveying during profiling*				3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		2	2	4	3	1.6
					LOW	STUDY	LONG	COULD	LOW
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
STATUS QUO	INITIAL IMPACTS TO ENVIRONMENT	Negative	Definite		3	3	5	5	3.7
					MOD	LOCAL	PERM	OCCUR	HIGH
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		2	3	5	5	3.3
					LOW	LOCAL	PERM	OCCUR	HIGH
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	5	4	2.7
					LOW	LOCAL	PERM	VLIKE	MOD

11.4.3 Soils and Land Capability

Project Impact (Unmitigated)

During the closure phase the activities that will impact on soils will primarily be the excavation, transportation, and placement of soils that will be undertaken during the removal of associated infrastructure (such as pipelines and roads), and the capping of the disposal facility.

The primary additional impact to soil and land capability during the closure phase will be: the pollution of soil resources from vehicles using hydrocarbons, the compaction of soils, and the erosion of exposed soils. The area in which these impacts may occur was measured to be in the region of ~120 ha. All exposed soils within the same footprint area will be at risk of erosion.

The combined weighted project impact to the soil and land capability (prior to mitigation) will **definitely** be of a MODERATE negative significance affecting the *development site*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The cumulative impact to soil and land capability (prior to mitigation) during the closure phase will remain the same as assessed for the construction phase i.e. the cumulative unmitigated impact will **probably** be of a HIGH negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

- Rehabilitation of infrastructure such as roads / pipelines needs to take the following into account:
  - Soil contaminated by chemicals / hydrocarbons should be contained and disposed of at an appropriately licensed facility;
  - Areas where soils have become compacted, such as below soil stockpiles, or roads that are being rehabilitated, need to be ripped to a minimum depth of 300 mm prior to fertilizer being placed;
- Ensure that a suitably designed barrier system is installed with a leachate collection and leak detection layer included;
- Ensure that suitably designed storm water management infrastructure is installed and maintained for the duration of the operational phase, especially around soil stockpiles.
- Ensure that soils which are stockpiled for more than 1 year are suitably fertilised and vegetated to reduce the risk of erosion;

- Ensure that soils to be placed on the ash body during capping and consecutive rehabilitation of the side slopes are suitably ameliorated with a lime and fertiliser mixture. Soil fertility tests should be undertaken prior to placement to determine what additives need to be made to the soil to enhance its fertility;
- The facility is to be capped with a soil covering of at least 300 mm to ensure that a sustainable capping and vegetation layer can be established post closure. This must be monitored and reported on by an independent soil scientist on an annual basis until the rehabilitation of the facility is completed;
- Replaced soils need to be re-vegetated with an indigenous seed mix and regularly watered to ensure that vegetation successfully establishes within a single growing season; and
- No grazing is to be permitted on the facility. Fences will be established and regularly maintained.

Residual Impact

The residual impact to soil and land capability as a result of closure activities is negligible and the rating will be the same as for the construction phase i.e. **probably** of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-36 below.

Table 11-36: Closure Phase Impact Assessment Matrix: Soil and Land Capability

Rated By: *Warren Kok*
Reviewed By:

IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SLC-3	*Soil and Land Capability*								
	CLOSURE PHASE			5					
Impact 1	Pollution of soils - hydrocarbon / chemical spills, spills from pipelines during rehabilitation	Negative	Definite	5	2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
Mitigation Measure:	*Hydrocarbon and Chemical Management*				1	1	1	3	**0.6**
					VLOW	ISO	INCID	COULD	**VLOW**
Impact 2	Erosion of soils	Negative	Definite	3	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measure:	*Fertilize soils prior to seeding, Water seeded areas, ensure slopes are not steeper than 1:3, Water seeded areas*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Impact 3	Low soil fertility and usability	Negative	Definite	5	3	1	4	4	**2.1**
					MOD	ISO	LONG	VLIKE	**MOD**
Mitigation Measure:	*Ameliorate soils prior to resuse in capping facility.*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.3	0.9	4	4	**1.9**
					MOD	ISO	LONG	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1.1	0.9	1.7	2.3	**0.6**
					LOW	ISO	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	2	5	5	**3**
					LOW	STUDY	PERM	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	2	5	5	**3.7**
					HIGH	STUDY	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**

11.4.4 Surface Water and Wetlands

Project Impact (Unmitigated)

During the closure phase the profiling, capping and re-vegetation of the ash disposal facility will be the source of the primary impacts to the surface water and wetlands present. These activities will be undertaken through conventional construction methods (trucks, dozers, and other construction vehicles) and will involve the handling and deposition of soils and the amelioration of soils using fertilizers or other chemical additives. These activities present the similar risks to surface water resources as assessed in the construction phase i.e. the decrease in surface water quality as a result of:

- slurry or dirty water entering the environment during the decommissioning of slurry and return water pipelines;
- hydrocarbon spillage that may enter the water courses;
- increased sedimentation / suspended solids in water resulting in increased turbidity;
- increased possibility of creating an environment for micro-organisms such as *E.coli* to proliferate; and
- Decreased habitat conditions.

The receiving water / wetland resources include:

- The non-perennial water course to the north-west of Site 1, which flows in a north-easterly direction; and
- The wetland crossing located at the following coordinates 26°36'37,384"S and 30°5'4.606"E.

The combined weighted project impact of closure activities to surface water and wetlands (prior to mitigation) will **probably** be of a LOW negative significance, affecting only the *study area*. The impact will act in the medium term and is *very likely* going to occur. The impact risk class is thus **Low**.

Cumulative Impact

Closure activities are not expected to increase the cumulative impacts (prior to mitigation) on the surface water and wetland elements of the receiving environment that may have ocurred during the construction and operational phases. The cumulative impacts will thus be the same as what was rated in the operational phase i.e. **probably** of a HIGH negative significance, affecting the *local area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the mitigation measures documented in Operational Phase are implemented, especially with regards to improving the quality of the surface water and wetlands of De Jagers Pan
- During the decommissioning of the slurry and return water pipelines:
  - care must be taken that the pipelines are properly flushed with clean water prior to decommissioning;
  - spills of ash contaminated effluent from the pipelines must be immediately contained, and contaminated soils must be taken to a suitably licensed disposal facility;
  - all plinths on which the slurry pipeline are located need to be removed up to at least 500 mm below the natural ground profile;
  - the steel slurry pipeline is to be removed, cleaned and recycled or disposed of at an appropriate licensed facility;
  - HDPE pipelines buried below 500 mm can be left in-situ;
- On-going maintenance of the wetland / surface water rehabilitation plan developed during the construction phase and maintained through the operational phase for the segment of the stream located along the north western boundary of the study area must be continued until post-closure monitoring has indicated that a stable improved state has been attained;

- The surface water monitoring plan needs to be continued beyond the closure phase until a stable and acceptable state of surface water quality has been established;
- Demarcated areas where waste generated by closure activities, can be safely contained and stored on a temporary basis for the construction phase, should be provided at the hard park;
- All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment;
- Install an authority approved barrier system at the new ash disposal facility to prevent contamination of the soils and water bodies;
- Fence off "no-go" to ensure these areas are not impacted on by maintenance activities;
- Ensure that a WUL is obtained from the DWS prior to commencement of any work within 500 m of any wetland / surface water resource;
- An alien invasive control programme needs to be established and maintained through all phases of the development;
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas; and
- Ensure that soils placed during consecutive rehabilitation of the side slopes of the facility are ameliorated with a suitable mix of additives (fertilizers, lime etc) and that an indigenous seed mix is used for seeding of the slopes.

Residual Impact

The primary purpose of closure activities is to create a sustainable clean and safe final profile that is suitably tied into the natural drainage pattern, and that will not produce pollution on an on-going basis post closure of the project. If this is achieved the surface water resources will ultimately experience a net positive impact to surface water and wetland resource because the surface water intercepted by containment infrastructure will be reintroduced back into the environment as the final profile will be deemed clean. However without mitigation measures this will not be realised as the project related impacts will result in on-going negative impacts post closure.

Mitigation measures will assist to reduce the cumulative impacts that will have accrued as a result of the already high baseline impacts and the additional impacts that may occur as a result of this project. The residual impact to surface water and wetlands will **probably** be of a LOW negative significance, affecting the *local area* in extent. The impact is *very likely* going to happen and will be long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-37 below.

Table 11-37: Closure Phase Impact Assessment Matrix: Surface Water and Wetlands

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:					
				Site 1					
SWW-3	*Surface Water and Wetlands*								
	CLOSURE PHASE			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	2	2	4	4	2.1
					LOW	STUDY	LONG	VLIKE	MOD
Mitigation Measure:	*Rehab of unnecessary infrastructure, Water treatment of De Jager's Pan, Slope not exceed 1:3*				1	1	1	4	0.8
					VLOW	ISO	INCID	VLIKE	VLOW
Impact 2	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	3	3	2	4	4	2.4
					MOD	STUDY	LONG	VLIKE	MOD
Mitigation Measure:	*Fertilise topsoil, Indigenous Seeding, Water rehabed areas*				1	1	4	4	1.6
					VLOW	ISO	LONG	VLIKE	LOW
Impact 3	Sedimentation of wetlands and surface water resources	Negative	Probable	3	2	2	2	5	2
					LOW	STUDY	SHORT	OCCUR	LOW
Mitigation Measure:	*Fertilise topsoil, Indigenous Seeding, Water rehabed areas*				1	1	1	2	0.4
					VLOW	ISO	INCID	UNLIKE	VLOW
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Probable		1.7	1.5	2.5	3.1	1.2
					LOW	STUDY	MED	VLIKE	LOW
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Definite		0.7	0.7	1.3	2.5	0.5
					VLOW	ISO	SHORT	COULD	VLOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	3.7
					HIGH	LOCAL	LONG	OCCUR	HIGH
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	3.7
					HIGH	LOCAL	LONG	OCCUR	HIGH
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	3	4	4	2.7
					MOD	LOCAL	LONG	VLIKE	MOD

11.4.5 Groundwater

Project Impact (Unmitigated)

During the closure phase the use of dangerous chemicals such as paints, thinners, solvents and hydrocarbons introduces an environmental risk. Spills occur during the storage, handling, and use of such dangerous chemicals. If not contained and remediated such spills may enter the groundwater and cause pollution. In most cases even a small amount of these chemicals entering the environment can cause damage to ecological systems and even pose human health risks.

Decommissioning and closure activities (such as pipeline removal, and capping of the ash body) will be undertaken over the majority of the development site, however such spills will be very small and isolated in extent.

The probability of spills occurring is considered very high, however the risk of such spills entering the groundwater environment is considered to be quite remote. So the probability rating has been adjusted accordingly.

The combined weighted project impact to the groundwater environment (prior to mitigation), as a result of closure activities will **probably** be of a LOW negative significance, affecting only the *development site*, and acting in the long term. The impact will *could* occur. The impact risk class is thus **Low**.

Cumulative Impact

Closure activities are not expected to increase the cumulative impacts to groundwater as assessed in the operational phase i.e. **probably** of a MODERATE negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the mitigation measures documented in the construction phase are implemented, especially the installation of a suitably designed barrier system below the facility;

Residual Impact

Mitigation measures will ensure that the impact to groundwater resources incurred during the closure phase of the propose project will be negligible. The residual impact after the closure phase is complete and mitigation measures have been implemented will therefore be the same as the residual impacts after the operational phase of the project has been completed i.e. **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-38 below.

Table 11-38: Closure Phase Impact Assessment Matrix: Groundwater

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
GW-3	*Groundwater*								
	CLOSURE PHASE			5					
Impact 1	Decreased water quality - hydrocarbon / chemicals used on site during the closure phase	Negative	Definite	5	2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
Mitigation Measure:	*Hydrocarbon / Chemical Management*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
Impact 2	Surface water ingress into the ash body producing polluted ground water	Negative	Probable	3	3	1	4	4	**2.1**
					MOD	ISO	LONG	VLIKE	**MOD**
Mitigation Measure:	*Topsoil layer >300mm, Sustainable Indigenous Vegetation Cover*				2	2	4	3	**1.6**
					LOW	STUDY	LONG	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Probable		1.9	0.8	3.2	2.7	**1.1**
					LOW	ISO	LONG	COULD	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1.1	1.1	1.7	1.9	**0.5**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	4	5	**3.3**
					MOD	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**

11.4.6 Terrestrial Ecology (Flora and Fauna)

Project Impact (Unmitigated)

During the closure phase of the project the ash body will be finally capped and all unnecessary infrastructure will be removed and the affected areas will be rehabilitated. The rehabilitation of these areas will cause a short term impact as vegetated areas may again be impacted by vegetation clearing, excavation, soil handling, and profiling. Alien invasive species infestation will also happen naturally causing a negative impact on vegetation. Faunal species that returned to the area during the operational phase will again be temporarily displaced.

Negative impacts will however be negligible in context of the overall positive impacts to the terrestrial ecology in the area as a result of capping and rehabilitation of the impacted areas. The closure activities include the amelioration of soils and reseeding of the area to create a sustainable land use post closure. It is envisaged that the post closure land use will be Wilderness, as grazing and cultivation land uses will not be compatible with the rehabilitated areas for the following reasons:

- The maximum topsoil depth on the facility will be 300 mm before the ash body is encountered, which is not suitable for planted crops;
- Ploughing of the rehabilitated areas may cause slope instability and will not be permitted; and

- Grazing animals, especially cattle, will damage the vegetation cover and capping of the facility, resulting in erosion and ash dispersion into the environment.

The restoration of wilderness land use will result in defragmentation which would have occurred during the construction and operational phases of the project.

The combined weighted project impact to terrestrial ecology (prior to mitigation) as a result of closure activities will **probably** be of LOW positive significance. The impact is expected to act over the long term and will affect the *development site*. Without mitigation measures this impact could happen. The impact risk class is thus **Very Low**.

Cumulative Impact

There is expected to be a cumulative impact that occurs as both ash disposal facilities will be capped and all unnecessary infrastructures for both facilities will be decommissioned and the affected areas rehabilitated. The cumulative area affected is about ~16 % of the study area. In a similar manner the adjacent land uses such as the mining operations will also rehabilitate their affected areas. An investigation of aerial photography for the mining operations north of Camden Village in fact proves this is occurring. An investigation of the success and standards of rehabilitation of these mining operations was however not made, and as a precautionary measure we have excluded these areas in the assessment of cumulative impacts.

As mentioned above the rehabilitation activities of the proponent will negate any closure impacts occurred, but will also contribute a positive impact on the already negatively impacted baseline environment.

The cumulative unmitigated impact on the receiving environment will **probably** remain of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Mitigation Measures

- Ensure that newly placed soils and seeded areas are watered for the first two years on a regular basis to improve the success of re-vegetation activities;
- All “no-go” areas need to be fenced off to ensure that during maintenance of the facility no additional impact is incurred on the surrounding areas;
- A suitable seed mix of indigenous plants should be used in all rehabilitation programmes on the site;
- All alien invasive species on-site should be removed and follow-up monitoring and removal programmes should be undertaken throughout the operational phase of the project;

- Ensure that the mitigation measures for the stripping, stockpiling, and replacement of soils documented in the construction and operational phase (Section 11.2.6 and Section 11.3.6) are implemented;
- Adhere to the ESKOM transmission vegetation management guidelines / standards when maintaining power line servitudes

Residual Impact

In time the rehabilitated landscape will again start becoming a functional natural habitat for small fauna including insects, mammals and birds. If the mitigation measures for surface water and wetlands are implemented it is also likely that an improved conditions for aquatic ecology will also be observed in the De Jagers Pan. The rehabilitated area will however never return to its pre-development condition, and will also likely never carry large grazing animals.

The residual impact will **probably** of a LOW negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-39 below.

Table 11-39: Closure Phase Impact Assessment Matrix: Terrestrial Ecology

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
TE-3	*Terrestrial Ecology*								
	CLOSURE PHASE			5					
Impact 1	Capping of the waste body	Positive	Probable	5	2	1	4	2	0.9
					LOW	ISO	LONG	UNLIKE	VLOW
Mitigation Measure:	*Alien invasive control, Ameliorate soils replaced, Indigenous seedmix*				3	1	4	5	2.7
					MOD	ISO	LONG	OCCUR	MOD
Impact 2	Increase in alien invasive species	Negative	Probable	3	3	1	4	5	2.7
					MOD	ISO	LONG	OCCUR	MOD
Mitigation Measure:	*Alien invasive control, Indigenous Seedmix - Rehab area*				1	1	4	5	2
					VLOW	ISO	LONG	OCCUR	LOW
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		1.9	0.8	3.2	2.5	1
					LOW	ISO	LONG	COULD	VLOW
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		1.8	0.8	3.2	4	1.5
					LOW	ISO	LONG	VLIKE	LOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	2	4	5	2.7
					LOW	STUDY	LONG	OCCUR	MOD

11.4.7 Avifauna

Impacts to avifauna are solely as a result of habitat destruction. This impact is assessed fully in the construction phase and as such there is **definitely** expected to be NO ADDITIONAL IMPACT to the avifauna as a result of closure activities.

11.4.8 Air Quality

Project Impact (Unmitigated)

The capping of the ash body will require the transportation, handling, and placement of soils. The working area will be approximately 120 ha during the closure phase. There is not expected to be any additional impact from these closure activities. In contrast it is expected that the capping of the ash body and revegetation of exposed soils is expected to reduce the impacts to air quality that will occur as a result of the operational phase activities. Failure to establish a sustainable vegetation cover will result in positive impacts from closure activities not being realised.

The combined weighted project impact to air quality (prior to mitigation) during the closure phase will **possibly** be of a LOW negative significance, affecting the *local area*. The impact will act in the short term and *could very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The current ash disposal facility will be capped and rehabilitated during the operational phase of this project, and there will certainly be a cumulative positive impact on the air quality by capping and rehabilitating both facilities. Without mitigation measures however, there is no surety that a sustainable vegetation cover will be established, and positive impacts may be diluted.

Other impacts to the receiving environment from mining as well as the Camden Power Station may still continue however, and will largely thus dictate the cumulative rating given.

The cumulative air quality impacts during the closure phase will **possibly** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Ensure that the mitigation measures for soil and land capability as well as terrestrial ecology are implemented;

- Ensure that regular watering is undertaken of exposed soils and re-vegetated areas to assist in the rapid establishment of a sustainable vegetation cover;
- Ensure that vegetation clearing is limited to only the areas where construction will take place;
- Ensure that “no-go” areas are fenced to ensure that closure activities do not impact unnecessarily on the wider area;
- Use chemical dust suppression (such as dust-a-side) on areas to be frequently driven; and
- Ensure that the installed dust suppression is maintain end and operational on all uncapped areas of the facility;
- Dust suppression on the ash body is to be undertaken in such a manner as to ensure that air quality impacts are within acceptable Air Quality Standards (especially for dust, PM2.5, and PM10 particulates);
- Maintain all installed wind breaks to ensure that low level winds are reduced and particle mobilisation is reduced;
- Maintain ongoing dust monitoring programme to ensure compliance with the South African Air qualiy stanards; and
- Regularly undertake dust suppression using uncontaminated water to ensure that dust mobilisation is prevented.

Residual Impact

The residual impact will remain for as long as the power station and mining activities are undertaken within the study area. The residual impact will thus remain as assessed for the cumulative assessment above i.e. **possibly** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and is *very likely*. The impact risk class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-40 below.

Table 11-40: Closure Phase Impact Assessment Matrix: Air Quality

Rated By: *Warren Kok*				ALTERNATIVES:					
Reviewed By:				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
AQ-3	*Air Quality*								
	CLOSURE PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	1	2	3	**1**
					LOW	ISO	SHORT	COULD	**VLOW**
Mitigation Measure:	*Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab*				1	1	1	3	**0.6**
					VLOW	ISO	INCID	COULD	**VLOW**
Impact 2	Nuisance and fall out dust	Negative	Possible	3	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measure:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				3	1	3	5	**2.3**
					MOD	ISO	MED	OCCUR	**MOD**
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
Mitigation Measure:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	3	3	3	**1.6**
					LOW	LOCAL	MED	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Possible		2	2.1	2	3.3	**1.3**
					LOW	LOCAL	SHORT	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Possible		1.5	1.4	1.8	2.6	**0.8**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Possible		3	4	3	4	**2.7**
					MOD	REG	MED	VLIKE	**MOD**

11.4.9 Noise Impact

None of the operational activities are expected to generate serious noise impacts as the majority of the processes are passive. The operational activities of the proposed facility will be the same as the existing facility. The existing facility will no longer be operational. Thus here is **definitely** expected to be NO ADDITIONAL IMPACT to the ambient noise as a result of closure activities.

11.4.10 Social Impact

All potential social impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

11.4.11 Economic Environment

All potential economic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

11.4.12 Infrastructure

All potential infrastructure impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

11.4.13 Traffic Impact

All potential traffic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

11.4.14 Visual

Project Impact (Unmitigated)

During the closure phase the profiling, capping and revegetation of the ash disposal facility will be the primary impact to the receiving visual environment. This will result in the facility being less visible. Capping and rehabilitation activities will likely impact ~120 ha of the proposed development footprint. Without proper management this positive impact might not be realised.

The combined weighted project impact to the existing visual environment (prior to mitigation) as a result of the closure activities listed above will **probably** be of a VERY LOW positive significance affecting the *study area*. The impact will act in the short term and *is unlikely to occur*. The impact risk class is thus **Very Low**.

Cumulative Impact

The cumulative visual impact (prior to mitigation) from the capping and revegetation of: the existing ash disposal facility; as well as the final footprint of the fully developed ash disposal facility will result in a reduction of the already highly impacted baseline environment. Without mitigation measures though this positive impact will be diluted by a high preponderance of alien invasive species that will proliferate in the area, barren or poorly vegetated areas, erosion, and dust that will likely occur.

Without these positive visual impacts, the cumulative impact to the receiving visual environment will be as assessed for the operational phase above: **probably** be of a MODERATE negative impact on the *local* environment acting in the long term. The impact *is going to happen*. The impact risk class is **High**.

Mitigation Measures

- Ensure that all mitigation measures documented for soil and land capability, terrestrial ecology, and air quality impacts are implemented.

Residual Impact

The visual impact of the proposed ash disposal site cannot be mitigated entirely and a long term visual impact will **probably** continue post closure. However, with mitigation measures in place the visual impact that *very likely occur* is expected to be of a MODERATE negative significance affecting the *local extent*. The impact risk class is **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 11-41 below.

Table 11-41: Closure Phase Impact Assessment Matrix: Visual Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
V-3	*Visual*								
	CONSTRUCTION PHASE			5					
Impact 1	Capping of Ash Dam	Positive	Probable	5	1	2	2	2	0.7
					VLOW	STUDY	SHORT	UNLIKE	VLOW
Mitigation Measure:	*Utilise indigenous seedmix*				3	3	4	5	3.3
					MOD	LOCAL	LONG	OCCUR	HIGH
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		1	2	2	2	0.7
					VLOW	STUDY	SHORT	UNLIKE	VLOW
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		3	3	4	5	3.3
					MOD	LOCAL	LONG	OCCUR	HIGH
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		4	3	4	5	3.7
					HIGH	LOCAL	LONG	OCCUR	HIGH
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	3.7
					HIGH	LOCAL	LONG	OCCUR	HIGH
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	3	4	4	2.7
					MOD	LOCAL	LONG	VLIKE	MOD

11.4.15 Cultural Heritage Environment

Any impacts to the cultural or heritage aspects of the environment will occur during the construction phase (assessed separately in previous sections of this report) and there is **definitely** expected to be NO ADDITIONAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area as a result of closure activities.

11.5 POST CLOSURE PHASE

The post closure phase activities will consist of primary monitoring and the occasional maintenance activity such as alien invasive control. The impacts are considered to be negligible. Presented below is a summary of the residual impact the will continue beyond the life of this project if the project is undertaken and all mitigation measures are implemented.

- In assessing closure impacts a few key assumptions have been made:
- The existing ash disposal facility will be profiled, capped, and re-vegetated;
- Surface water run-off from the existing ash disposal facility will be clean;
- All mitigation measures documented in this report have been implemented successfully;
- The power station will still be operational; and
- Open cast coal mining will still be on-going in the area.

11.5.1 Geology

As no mitigation measures are possible the residual impact will be the same as the cumulative impact above after construction is complete i.e. the impact will **definitely** be of a MODERATE negative significance. Although the projects impact to geology will only occur on the *development site*, widespread mining and development activities have impacted geology at a *local* extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

11.5.2 Topography

The changes to topography are permanent, but with mitigation measures implemented the project impact to surface drainage patterns can be reduced to negligible conditions post closure.

The residual impact to topography beyond the closure phase of the project will **probably** be of a LOW negative significance, affecting the *local area*. The impact *is very likely to occur* and will be permanent. The impact risk class is thus **Moderate**.

11.5.3 Soils and Land Capability

The impact to soils and land capability will be permanent as pre-development land capability will not be restored i.e. the post closure land capability will be wilderness. In this regard the loss of grazing and arable soils is considered to be substantive (i.e. combined impact of ~200ha). With mitigation measures:

- the impacts will be contained to within the development footprint;

- the smallest impact footprint can be achieved of all alternatives considered; and
- valuable topsoil and sub-soil will be conserved, and reused in the rehabilitation of the area once ashing is complete;

The residual impact to soil and land capability beyond the closure phase of the project will be managed to be within the existing baseline conditions and after mitigation will **probably** be of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

11.5.4 Surface Water and Wetlands

Mitigation measures if successfully implemented will assist to reduce the cumulative impacts that will have accrued as a result of the already high baseline impacts and the additional impacts that may occur as a result of this project.

The residual impact to surface water and wetlands will **probably** be of a LOW negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **Moderate**.

11.5.5 Groundwater

Mitigation measures if successfully implemented will ensure that residual project related impacts will be negligible.

The post closure residual impact will **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

11.5.6 Terrestrial Ecology (Flora and Fauna)

In time the rehabilitated landscape will again start becoming a functional natural habitat for small fauna including insects, mammals and birds. If the mitigation measures for surface water and wetlands are implemented it is also likely that an improved conditions for aquatic ecology will also be observed in the De Jagers Pan. The rehabilitated area will however never return to its pre-development condition, and will also likely never carry large grazing animals.

The residual impact will **probably** of a LOW negative significance, affecting the *local area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

11.5.7 Avifauna

Impacts to avifauna are directly linked to natural habitat, therefore as the condition of the natural habitat improves as documented above, avifaunal populations and species diversity on the impacted areas are expected to improve.

With the successful implementation of mitigation measures the residual impact to avifauna post closure of the project will **definitely** be of a LOW negative significance, affecting the *Local area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

11.5.8 Air Quality

The successful implementation of mitigation measures such as a sustainable vegetation cover on the disposal facility will ensure that there will be NO IMPACT to air quality from this project post closure.

The residual impact to air quality post closure will remain for as long as the power station and mining activities currently present in the area are on-going. There is however a reduction in the rating of probability as a major source of pollution (i.e. the existing ash disposal facility) will have already been rehabilitated. The residual impact will thus **probably** of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and *is very likely to occur*. The impact risk class is thus **Moderate.**

11.5.9 Noise Impact

Post closure there is **definitely** expected to be NO RESIDUAL IMPACT to the ambient noise levels. Any existing impacts the receiving environment will remain unchanged and thus the residual impacts will be the same as the rated status quo at the commencement of the project i.e. **probably** be of a LOW negative significance, affecting the *local area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and *are going to occur*. The impact risk class is thus **Moderate.**

11.5.10 Social Impact

This project will ensure that the power station can continue operating for the next 17 years. This on-going operation of the power station will likely have indirect positive impacts to the community that extends beyond the life of the power station. These positive impacts will however decrease over time.

The residual impact to the social environment will **likely** be of a LOW positive significance, affecting the *local area*. The impact will act in the long term and *could occur*. The impact risk class is thus **Low**.

11.5.11 Economic Environment

This project will ensure that the power station can continue operating for the next 17 years. This on-going operation of the power station will likely have indirect positive impacts to the community that extends beyond the life of the power station. These positive impacts will however decrease over time.

The residual impact to the economic environment will **likely** be of a LOW positive significance, affecting the *local area*. The impact will act in the long term and *could occur*. The impact risk class is thus **Low**.

11.5.12 Infrastructure

Post closure there is **definitely** expected to be NO RESIDUAL IMPACT to infrastructure present in the area as a result of this project. The impact to infrastructure will therefore be the same as presented for the status quo at the commencement of the construction phase i.e. **probably** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Moderate.**

11.5.13 Traffic Impact

Post closure there is **definitely** expected to be NO RESIDUAL IMPACT to traffic present in the area as a result of this project. The impact to traffic will therefore be the same as presented for the status quo at the commencement of the construction phase i.e. **probably** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Moderate.**

11.5.14 Visual

The visual impact of the proposed ash disposal site cannot be mitigated entirely and a long term visual impact will **probably** continue post closure. However, with mitigation measures in place the visual impact that will *very likely occur* is expected to be of a MODERATE negative significance affecting the *local extent*. The impact risk class is **Moderate**.

11.5.15 Cultural Heritage Environment

There is **definitely** expected to be NO RESIDUAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area.

11.5.16 Summary Matrix – Residual Impacts

The residual impacts as discussed above are summarised in Table 11-42.

Table 11-42: Summary Matrix: Residual Impacts Post Closure

		ALTERNATIVE:		
		Site 1		
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact
CODE:				
	CLOSURE PHASE			
G-3	Geology	Negative	Probable	3.7 HIGH
T-3	Topography	Negative	Probable	2.7 MOD
SLC-3	Soil and Land Capability	Negative	Probable	3.3 HIGH
SWW-3	Surface Water and Wetlands	Negative	Probable	2.7 MOD
GW-3	Groundwater	Negative	Probable	3 MOD
TE-3	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Probable	2.7 MOD
AF-3	Avifauna	Negative	Definite	3 MOD
AQ-3	Air Quality	Negative	Possible	2.7 MOD
N-3	Noise	Negative	Probable	2.3 MOD
SOC-3	Social Environment	Positive	Probable	1.8 LOW
EC-3	Economic	Positive	Definite	1.8 LOW
INF-3	Infrastructure	Negative	Definite	2.7 MOD
V-3	Visual	Negative	Probable	2.7 MOD
ArCH-3	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0 NO

12 KNOWLEDGE GAPS AND LIMITATIONS

The mandatory contents of an Environmental Impact Report are stipulated in Regulation 31 of the EIA Regulations (2010) (Government Notice No. R543[8]). In terms of Regulation 31(2)(m) of the EIA Regulations (2010) (Government Notice No. R543) an account of any assumptions, uncertainties and gaps in knowledge that were taken into account in the preparation of the Environmental Impact Report must be provided. Although care has been taken to ensure that the contents of the Environmental Impact Report considers all aspects of the proposed project and the anticipated impacts which may result from the implementation, certain knowledge gaps and limitations have been identified.

Information used to populate the Environmental Impact Report have been obtained from various sources. Information relating to the project description and therefore planned project activities was received from the proponent (i.e. Eskom SOC Limited) and formed the basis of the study. A number of Specialist Studies were also identified during the Scoping Phase and was carried out during the subsequent Environmental Impact Assessment Phase. The project information obtained from the proponent as well as the findings made during the Scoping Phase served to guide these Specialist Studies. The Specialist Studies also served to provide more information relating to impacts of the proposed project activities on various environmental elements. Included in the findings of each of the specialist studies were certain assumptions on which the study was based as well as knowledge gaps. The subsequent sections provide an overview of the various knowledge gaps and limitations to the studies that were identified.

12.1 AVIFAUNA STUDY

Information was drawn from various sources to determine the impact of the proposed project on avifauna within the development area. The following information sources and literature were referred to, in order to inform the Avifauna Study:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) was obtained from the Animal Demography Unit website (http://sabap2.adu.org.za,), for the Quarter-Degree Grid Cell (QDGC) where the proposed development is located (2630CA);
- The conservation status of all species considered likely to occur in the area was determined as per the most recent iteration of the southern African Red Data list for birds (Barnes 2000), and the most recent and comprehensive summary of southern African bird biology (Hockey *et al*. 2005). QDGCs are grid cells that cover 15 minutes of latitude

[8] Government Notice No. R543: National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations published under Government Notice No. R543 in Government Gazette 33306, dated 18 June 2010.

by 15 minutes of longitude (15. × 15.), which correspond to the area shown on a 1:50 000 map.

- Additional bird distribution data and a classification of the vegetation types in the QDGCs were obtained from Southern African Bird Atlas Project 1 (SABAP[9]1) (Harrison *et al*. 1997).
- Information on the micro habitat level was obtained through visiting the area in January 2012 and obtaining a first-hand perspective. Transect counts were conducted to establish the densities and diversity of the avifauna at the different alternative sites. Three transects were identified and each transect was counted three times;
- The Mpumalanga Biobase Report (Emery *et al*. 2002) was consulted to establish which bird habitats are regarded as conservation priorities in the province;
- Data from the Co-ordinated Avifaunal Road count project (CAR[10]) for the Mpumalanga precincts were obtained (Young, Harrison, Navarro, Anderson and Colahan, 2003). This data was of particular importance in order to establish what densities of large terrestrial birds could be expected to occur in the study area, and to determine the habitat preferences of those species; and
- Interviews were conducted with Ms Ursula Franke, Senior Field Officer: Highveld Crane Conservation Project of the Endangered Wildlife Trust, with regard to the occurrence of cranes and other Red Data species in the Ermelo district.

This Avifauna study made the assumption that the information provided by the sources and literature listed above are correct and adequately reliable. The following factors may potentially detract from the accuracy of the predicted results:

- Sources of error in the SABAP2 database, particularly limited coverage of some QDGC[11]s. This means that the reporting rates of species may not be an accurate reflection of the true densities in QDGCs that has to date been sparsely covered during the data collecting. The 2630CA QDGC has not been well covered by SABAP2 with a total of only 15 checklists. Despite the relatively low sample sizes, it does provide a reasonably comprehensive set of data with regard to the species that are likely to occur;
- The SABAP2 information was supplemented with actual counts at the different site alternatives. The counts were conducted in January after good rains. These are the type of conditions which is most suitable for instantaneous sampling bouts on the Mpumalanga Highveld i.e. in the wet season when the highest species diversity and abundance is to be expected. However, it must be accepted that bird distribution patterns may fluctuate in response to climatic conditions, particularly rainfall, and that

[9] SABAP: Southern African Bird Atlas Project
[10] CAR: Co-ordinated Avifaunal Road count project
[11] QDGC: Quarter-Degree Grid Cell

sampling over several seasons is required to get a representative picture of the species that occur at the site.

12.2 WETLAND AND AQUATIC ASSESSMENT

An initial study was carried out in January / February 2012 to determine the Present Ecological State assessment of the Aquatic Resources within the proposed Camden Power Station Ash Disposal Facility Project footprint and the immediate surrounding areas. The aforementioned Aquatic Study was also intended to assess and survey the general habitat integrity, habitat conditions for aquatic macro-invertebrates, aquatic macro-invertebrate and fish community integrity. Susbsequent to the initial Aquatic study conducted in January / February 2012, an updated and revised Aquatic and Wetland Study was conducted in May 2014. The Assumption and Limitations associated with both the initial and updated Aquatic Study are provided below.

12.2.1 Assumptions and Limitations of initial Aquatic Study

The following Assumptions and Limitations were identified for the **initial Aquatic Study**:

- Reference conditions are unknown: The composition of aquatic biota in the study area, prior to major disturbance, is unknown. For this reason, reference conditions are hypothetical, and are based on professional judgement and/or inferred from limited data available.
- Temporal Variability: The data presented in this report are based on a single site visit, undertaken in summer (January 2012). The effects of natural seasonal and long term variation in the ecological conditions and aquatic biota found in the streams are, therefore, unknown.
- Ecological Assessment Timing: Aquatic and terrestrial ecosystems are dynamic and complex. It is likely that aspects, some of which may be important, could have been overlooked. A more reliable assessment of the biota would require seasonal sampling, with sampling being undertaken under both low flow and high flow conditions.

12.2.2 Assumption and Limitations of updated Aquatic Study

The fieldwork took place during the peak dry season (16-17 July 2014). Most flowering plants, grasses and sedges that are normally indicative of wetland conditions were dormant at the time of the Site visit; furthermore much of the area had been burnt. This posed a significant limitation in terms of accurate delineation of some of the wetland areas, in particular the highly-modified areas west and east of the existing ash dump facility. The fieldwork was therefore focussed on delineation of the wetlands ‘VBA’ and ‘VBB’, which were

located within 500m northwest and northeast of the preferred Site 1. These wetlands were concentrated on because they are not directly impacted by the ongoing existing activities at Camden Power station.

The De Jager's Pan and its associated hillslope seeps were not surveyed in the field as tentative delineations derived from aerial imagery and the previous wetland assessment report were referred to. The De Jager's Pan is operated as a return water facility for the current Ash Disposal Facility and consequently is extensively modified. The heavily modified wetland area to the east of the existing ash dump is considered a tentative delineation, largely derived from historical imagery. This aforementioned area was almost completely burnt at the time of survey / fieldwork.

12.3 NOISE IMPACT STUDY

The Noise Impact Study did not include the quantification of impacts. The findings of the Noise Impact Study that are provided in the report are based on the specialist's experience and previous findings of work carried out for similar projects. The Noise Impact Study Report serves as a specialist opinion. Furthermore it is recommended that the findings of the Noise Impact Study should be confirmed with measurements.

12.4 HERITAGE IMPACT STUDY

The following assumptions and limitations were taken into account for the Heritage Impact Study:

- It is assumed that the SAHRA database locations are correct;
- It is assumed that the paleontological information collected for the project is comprehensive;
- It is assumed that the outcome of the Social Impact Assessment and Public Participation Process may result in the identification of any intangible sites of heritage potential.

12.5 AIR QUALITY STUDY

A qualitative approach, using available meteorological data and pollutants typically associated with the proposed activities to evaluate the potential for off-site impacts, was adopted for the Air Quality Study. A qualitative assessment is undertaken based on the evaluation of existing windblown dust from Ash Disposal Facility studies, together with the dispersion potential of the site and magnitude of expected impacts from the proposed activities. Based on the qualitative evaluation, mitigation measures are proposed.

12.6 BIOPHYSICAL STUDY

Owing to landowner objections access could not be gained to the southernmost section of the study area, posing a limitation on the Biophyscial Assessment Study.

12.7 CONCEPTUAL ENGINEERING DESIGN

The following assumptions and limitations have been taken into account and should be considered for the design of the proposed Ash Disposal Facility and supporting infrastructure:

- The remaining life of the power station for the new proposed Ash Disposal Facility was taken as 2017 to 2033;
- The existing method of mixing, transporting and placing of ash would be retained;
- The sizing of the new Ash Water Return Dam was based on the water balance compiled by Zitholele Consulting (Pty) Ltd;
- The use of De Jagers Pan as an Ash Water Return Dam is unacceptable under current legislation and hence a new Ash Water Return Dam is required;
- None of the Site Alternatives have taken into account the requirements for the closure of the existing Ash Disposal Facility;
- As the current facility is operated safely operating methods are to be retained, it was assumed that for the conceptual designs no stability analysis or material testing is required;
- The requirements for clean and dirty water systems stipulated in Regulation 704 (Section 6) and Regulation 1560 of the National Water Act, 1998 (36 of 1998) will be adhered to; and
- The quality of the ash and hence the water to ash ratio will not change from what is currently being placed on the existing Ash Disposal Facility.

12.8 SOCIAL IMPACT STUDY

The following assumptions and limitations have been taken into account and should be considered when interpreting the findings of the Social Impact Study:

- Not every individual in the community could be interviewed, therefore only key people in the community were approached for discussion. Additional information was obtained using existing data, records of public meetings and personal interviews;
- The social environment constantly changes and adapts to change, and external factors outside the scope of the project can offset social changes, for example changes in local

political leadership. It is therefore difficult to predict all impacts to a high level of accuracy, although care has been taken to identify and address the most likely impacts in the most appropriate way for the current local context;

- Social impacts can be felt on an actual or perceptual level, and therefore it is not always straightforward to measure the impacts in a quantitative manner;
- Social impacts commence when the project enters the public domain. Some of these impacts are thus already taking place, irrespective whether the project (or a specific alternative) continues or not;
- There are different groups with different interests in the community, and what one group may experience as a positive social impact, might be experienced as a negative impact by another group. This duality will be pointed out in the impact assessment phase of the project; and
- Social research is time-consuming and limited time was available to conduct the study.

13 SPECIALIST STUDIES SUMMARY

A number of specialist studies were undertaken for the proposed Camden Power Station Ash Disposal Facility Project as was identified during the preceding Scoping Phase. Determining which specialist studies will be required for the proposed project was driven by the environmental issues and concerns identified during the Scoping Phase, and throughout the public consultation process. The findings of these specialist studies informed the assessment of the potential environmental impacts associated with the proposed project.

Regulation 32 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment Regulations (Government Notice No. R543[12]) includes provisions specific to the appointment and content of the resultant specialist report. Regulation 32(3) stipulates all information which must be provided in the specialist report. These information requirements served as guidance for the Environmental Assessment Practitioner (EAP) in determining the most pertinent information to include in the specialist studies summary. This chapter of the Environmental Impact Report (EIR) will therefore provide a detailed account of the following:

- Details of the specialist who prepared the report;
- An overview of the scope of the study;
- Overview of the findings and potential implications of such findings on the impact of the proposed activity on the receiving environment; and

Regulation 32(e) requires that a description of any assumptions made and any uncertainties or gaps in knowledge concerning the particular specialist study be provided. A description of all assumptions, uncertainties and gaps in knowledge that were taken into account in the preparation of this EIR are detailed in Part 11 of this document.

13.1 WETLAND DELINEATION AND ASSESSMENT STUDY

As was explained in Part 11.2 of this document two Aquatic and Wetland Studies were carried out for the proposed project. Scientific Aquatic Services was tasked to conduct a Wetland Delineation and Assessment Study for the proposed Camden Power Station Ash Disposal Facility (ADF) Project. The initial Aquatic and Wetland Study was carried out by Scientific Aquatic Services in 2012. A copy of the initial Wetland Assessment and Delineation Study is included in **Appendix H1** of this EIR. The revised and updated Aquatic and Wetland Study was carried out by Golder Associates Africa in 2014 (refer to **Appendix H2**). The primary objectives of the study included identifying the areas within the study area and assessing the important ecological functions performed by the wetlands as well as their

[12] South Africa. 2010. National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations, 2010 (Notice 543). *Government gazette* 33306:3, 18 June

likely level of eco-service provision. Furthermore the study was also intended to identify and assess the potential impacts associated with the proposed project activities in relation to the identified wetlands. A number of mitigation measures to avoid or reduce the significance of these impacts were recommended by the specialist.

The Scope of Work Provided to Scientific Aquatic Services included the following:

- Provide detailed information of the aquatic resources in the vicinity of the study area to guide the proposed development and to ensure that the ongoing functioning of the aquatic resources is facilitated with specific mention of the following:
  - Ongoing availability of suitable instream and riparian habitat to support aquatic biota;
  - Ongoing functionality of the aquatic community; and
  - To ensure ongoing functioning of the aquatic resources in the vicinity of the proposed development.

Golder Associates Africa (Pty) Ltd. was tasked to ground-truth and update (where necessary) previously-delineated wetland boundaries, assess the status and level of functioning of delineated wetlands, and conduct an aquatic assessment of the Humanspruit in the vicinity of the preferred Site 1 and its associated supporting infrastructure.

13.1.1 Findings of Wetland Assessment and Delineation Study

Four wetland types were identified within the Study Area:

- Channelled valley bottom ('VBA')
- Unchannelled valley bottom ('VBB')
- Pan ('De Jager's Pan')
- Hillslope seep (west of De Jager's Pan)

Heavily-modified wetland conditions exist to the east of the existing ash disposal facility, which is located along the eastern edge of De Jager's Pan ('modified wetland'). The presence of the existing ash disposal facility, and site roads that intersect the former wetland area at a number of junctures have almost completely modified this wetland. A description for each of the wetland types identified within the Study Area is provide in the subsequent sections.

<u>Channelled Valley Bottom (VBA)</u>

A channelled valley bottom wetland is located approximately 100 m northwest of the boundary of the proposed ash facility and return water dam. Hydrophilic vegetation observed in this wetland included Imperata cylindrica grass and Juncus sp., with the exotic species Verbena sp. also recorded. At the time of survey (during the dry season), flow was limited and open water was restricted to areas where water had pooled. This channelled valley bottom system flows into the nearby Humanspruit.

Unchannelled Valley Bottom (VBB)

An unchannelled valley bottom wetland is located approximately 600 metres northeast of the proposed return water dam. Imperata grass is abundant in this area, and dead flower heads of a diversity of sedges (Cyperus sp., Pycreus sp., inter alia) were observed during the dry season survey. The wetland soils augured here showed wetness signatures indicating permanent, seasonal and temporary wetland zones; however these zones could not be clearly established as vegetation types could not be easily identified at the time of survey.

The southern extent of the wetland boundary is defined by the edges of cultivated fields. The wetland is intercepted by the main R29 road at its north-eastern extent, which has impounded it. The area that previously formed part of this wetland to the north of the intersecting R29 has now been disturbed by cultivation.

De Jager's Pan

A heavily-modified pan exists in the shape of the former De Jager's Pan, which has been utilised as a return water dam for the existing ash facility and has been integrated into the dirty water management circuit of the power plant for over 40 years (Zitholele Consulting, 2013). This area was not surveyed during the field visit; the boundary shown on Figure 4 was derived from recent aerial imagery and delineated from desktop only.

Hillslope Seep

Inflow to De Jager's Pan comes from hillslope seep areas to the west of the pan. This area was not surveyed during the field visit; the boundary shown on Figure 9 was derived from recent aerial imagery and delineated from desktop only.

Present Ecological Status

The wetlands and wetland catchments within the study area exist within a landscape dominated by Camden Power Station and associated infrastructure, and agricultural cultivation. In particular, linear infrastructure such as the railway lines and the R29 road have had a substantial influence on the current extent and condition of the wetlands VBA and VBB, as a result of their influence on the hydrological and geomorphological characteristics of the wetlands in question.

The Present Ecological Status (PES) of the channelled valley bottom is C or Moderately Modified i.e. a moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact. The change in ecosystem processes is largely attributable to the two railway lines (operational and disused) that intersect this wetland. Although culverts beneath are present, the embankments form a barrier to surface and sub-surface water supply to the wetland and as such has modified the hydrological integrity of the system. The presence of dams at intervals along the valley

bottom cause flow impoundment and reduce the supply of water to the wetland downstream, particularly during the dry season.

The PES of this wetland is D or Largely modified, i.e. a large change in ecosystem processes and loss of natural habitat and biota and has occurred. Again, the PES classification of this wetland is mainly due to the presence of the embankment on which the R29 road is built. The embankment is a barrier to both surface and sub-surface water flow in the wetland; comparison of historic and current aerial imagery clearly illustrates that a large part of this wetland to the north of the R29 has become desiccated and is now cultivated. Nonetheless, although the survey was done in the dry season the indications are that a relatively diverse wetland flora remains in this wetland.

Ecological Importance and Sensitivity

The 'Ecological Importance' of a wetland resource refers to its importance in the maintenance of ecological diversity and functioning on local and wider scales; while the 'Ecological Sensitivity' relates to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (DWAF, 1999a). Considered together, the EIS determinant methodology is used to evaluate wetlands in terms of:

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

According to the findings of a terrestrial ecology survey done at the site the plant Boophone disticha was observed in the Study Area. This species is listed as 'Declining' by the Red List of South African Plants (SANBI, 2014), due to habitat loss and unsustainable harvesting. No other species of conservation concern were reported in that study.

During the site visit of July 2014, no species of conservation concern were observed; however the survey was done in the dry season so flowering plants of interest would have been overlooked. Both wetlands have the potential to support Grass Owl Tyto capensis which is regionally Vulnerable (BirdLife South Africa, 2014), due to the presence of suitable habitat in the form of extensive stands of Imperata cylindrica grass; however no evidence of the presence of this species was observed.

In summary, in terms of the support of important biodiversity provided by wetlands within the Study Area, both the channelled valley bottom (VBA) and the unchannelled valley bottom (VBB) in proximity to the footprint of preferred Site 1 were both ranked D or of Low/Marginal ecological importance and sensitivity. This is because their biodiversity features are largely ubiquitous, being prevalent in other similar wetland systems in the local area, and the wetlands themselves play a relatively insignificant role in moderating the quantity and quality of surface and ground water systems in the locality. The primary value of the wetlands is

their contribution to erosion control and regulation of soil and water nutrients in their respective catchments.

Wetland Functioning

The nature of the functions that the wetlands perform and the services they provide were assessed using the Wet Ecoservices tool. Each wetland was assessed separately. The assessment considers each HGM unit in the context of unit type and the land-use setting in which it occurs (i.e. power station and ancillary infrastructure, agricultural cultivation) as these factors determine the potential functions provided by the wetlands and the opportunities available to perform certain functions and services.

The findings of the assessment of VBA (channelled valley bottom wetland) adjacent to the infrastructure of preferred Site 1 indicate that it principally controls exacerbation of erosion that could potentially arise as a result of tilled agricultural fields in its catchment, and increased levels of surface water runoff. Phosphate trapping and stream flow regulation are regulated in tandem with erosion control. The wetland has a more limited role in flood attenuation and maintenance of biodiversity, as a function of its size and apparently limited biological diversity (refer to Figure 12-1).

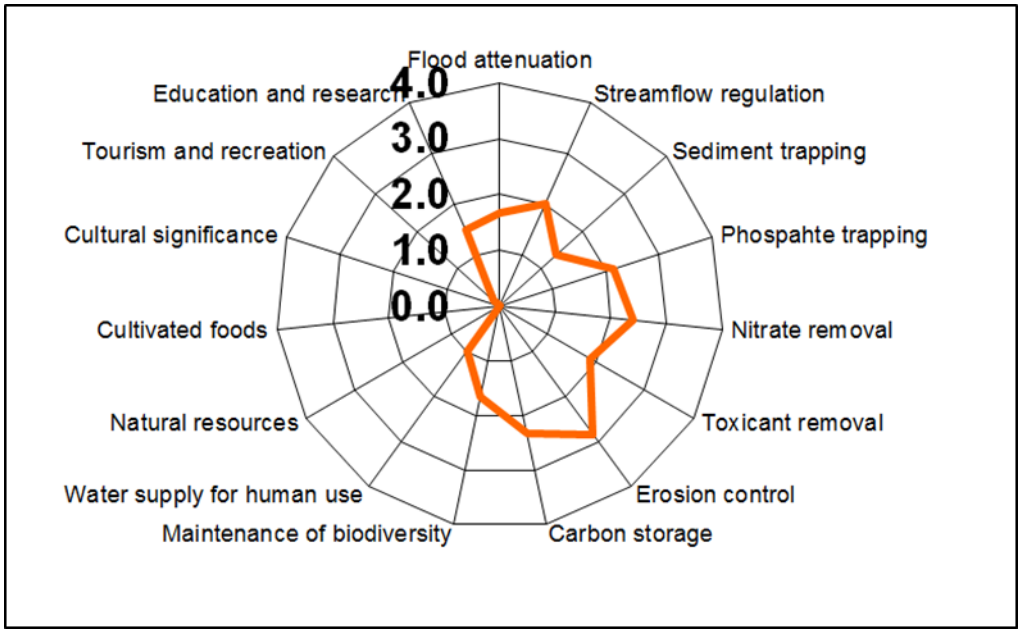

Figure 13-1: Spider diagram showing scores for ecosystem services supplied by channelled valley bottom wetland (VBA)

Although the unchannelled valley bottom (VBB) northeast of the infrastructure of preferred Site 1 (Figure 12-2) provides a number of ecosystem services, the value of these services is low, due to the impacted extent and ecological integrity of this wetland. It contributes to regulation of soil nutrients and may have an influence on toxicant removal; such toxicants

may enter the wetland in the form of contaminants and sediments transported in surface water run-off from the adjacent roadway, or from dust blown off the ash disposal facility.

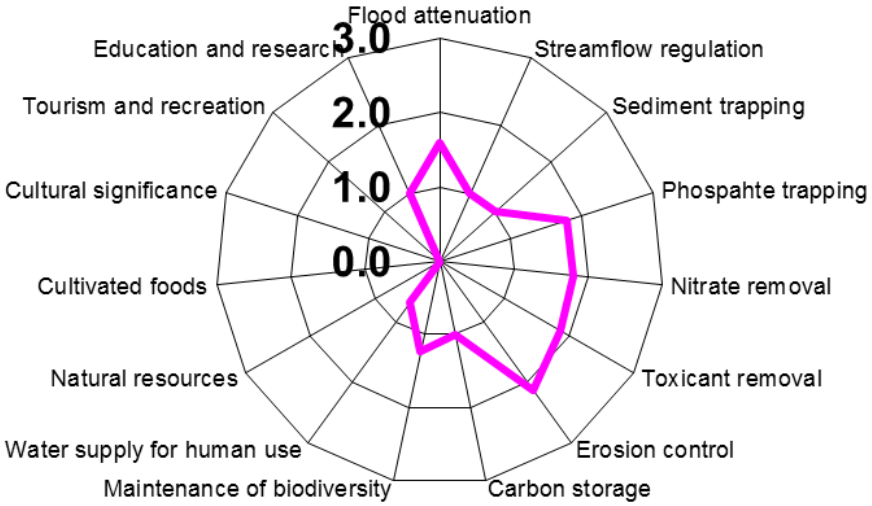

Figure 13-2: Spider diagram showing scores for ecosystem services supplied by unchannelled valley bottom wetland (VBB)

Ecological Assessment of Aquatic Resources

Five biomonitoring sites (refer to Table 12-1) and two toxicological sites representative of the aquatic resources in the area were assessed.

Table 13-1: Geographical information pertaining the assessed sites

Site	Description	Co-ordinates	
		South	East
CB1	This site is situated on the Unknown tributary 1 of the Vaal River downstream of the confluence of this river with a small unknown tributary 2 shortly upstream of this point.	S26º38'54.0"	E30º02'11.9"
CB2	This site is situated on the Unknown tributary 1 of the Vaal River upstream of the confluence of this river with the small Unknown tributary 2 shortly downstream of this point.	S26º40'06.7"	E30º03'00.0"
CB3	Small Unknown tributary 2 of the Vaal River.	S26º38'33.4"	E30º02'50.6"
CB4	Downstream point on the Humanspruit River. Any impacts asa result of the activities of the proposed expansion will beevident at this point.	S26º35'18.8"	E30º04'00.3"
CB5	Upstream point on the Humanspruit River. This site may be used as a reference point indicating the condition of the stream before any impacts as a result of the activities of the Camden Power Station.	S26º35'13.6"	E30º02'40.5"
CT1	Representative. This site will indicate the impacts of the Camden Power Station ash disposal facility on the adjacent water body.	S26º37'20.1"	E30º04'10.4"
CT2	Representative. This site will indicate the degree to	S26º39'00.0"	E30º03'01.7"

Site	Description	Co-ordinates	
		South	East
	which the toxicological pollution plume extends downstream of the Camden Power Station.		

Physico-Chemical Water Quality

The general water quality at each of the biomonitoring sites may be considered good. Dissolved salts present in the system are considered to be slightly elevated in relation to the natural conditions expected to occur and fall within the limits stipulated by the DWS TWQR for aquatic ecosystems. The recorded data (refer to Table 12-2) indicates that there may have been some impact from the activities of the Camden Power Station as well as agricultural and mining activities on the dissolved salt concentrations within these drainage systems.

Table 13-2: Biota specific water quality data along the main drainage feature.

Site	COND mS/m	pH	Temperature
CB2	37.0	8.80	26.3
CB1	33.6	8.72	28.3
CB3	34.4	9.99	31.5

The pH levels at each of the sites may be considered to be slightly alkaline and this may limit some of the more sensitive aquatic species from colonising these sections of the stream. The alkalinity of existing Ash Disposal Facility associated with the Camden Power Station may be contributing to the increased pH levels observed in these streams, with special mention of the CB3 site, where the pH is 14.6% higher than that observed at the CB1 site and 13.5% higher than that observed at the CB2 site. These differences exceed the DWS TWQR for aquatic ecosystems and some impact on the aquatic communities as a result is deemed likely. Temperatures can be regarded as normal for the time of year and time of assessment at each point.

Habitat Assessment

There are some moderate impacts at each point with regard to the instream habitat as well as the riparian zone. At the CB2 site, instream impacts included moderate impacts as a result of water quality modifications and inundation. Smaller impacts from flow, bed and channel modifications were also observed. Riparian zone impacts included only small impacts from exotic vegetation encroachment, bank erosion and inundation. At the CB1 site, instream impacts included moderate channel and water quality modifications with smaller impacts from flow and bed modifications, while riparian impacts were limited to bank erosion and channel modifications. Impacts at the CB3 site were limited to small impacts as a result of water quality modifications and inundation. Overall, an Intermediate Habitat Integrity Assessment rating of 83.3%, 77.1% and 94.6% was achieved at the CB2, CB1 and the CB3 sites, which indicates natural (class A conditions) at the CB1 and CB3 sites and minimally

modified (class B conditions) at the CB2 site. The sites therefore fall within the Desired Ecological Management Class (DEMC) for the quaternary catchment. The proposed expansion project may result in a decline in the aquatic ecological integrity of these systems.

Impacts on the aquatic resources in this area should be limited. Any impacts from further activities in the area should be managed in such a way as to limit the impact on habitat integrity and to limit impacts on aquatic habitat. Habitat diversity and structure at the CB2 point was considered adequate, while at the CB1 and CB3 points the habitat was considered inadequate for supporting a diversity of aquatic macro-invertebrate community structures (refer to Table 12- 3). However, the abundant marginal and aquatic vegetation present at the CB2 and the CB3 points, is likely to aid in the diversity of the aquatic community at these points and as such, it is likely that higher SASS5 scores may be observed at these two points in relation to those at the CB1 assessment point.

Table 13-3: Summary of the results obtained from the application of the IHAS index to the assessment sites.

Site	CB1	CB2	CB3
IHAS Adjustment Score	65	60	49
McMillan, 1998 IHAS description	Habitat diversity and structure is adequate for supporting a diverse aquatic macroinvertebrate community.	Habitat diversity and structure is inadequate for supporting a diverse aquatic macroinvertebrate community.	Habitat diversity and structure is inadequate for supporting a diverse aquatic macroinvertebrate community.
Stones habitat characteristics	Bedrock and some large boulders were present at this point. The absence of small interstitial spaces may limit the communities likely to occur at this point.	Bedrock and some large boulderswere present at this point. The absence of small interstitial spaces may limit the communitieslikely to occur at this point.	No rocky habitat was available at this point.
Vegetation habitat characteristics	Adequate marginal and aquatic vegetation was present.	Some marginal vegetation was present at the time of the assessment. The absence of leafy overhanging vegetation will limit the aquatic macro-invertebrate communities likely to occur at this point.	Some instream vegetation was present at the time of the assessment.
Other habitat characteristics	There were some mud and sand deposits present in the area.	There were some limited GSM deposits present in the area.	There were some sand and mud deposits present in the area.
IHAS general stream characteristics	A shallow stream consisting of slow flowing pools and glides. The water in the system was opaque at the time of assessment.	A narrow slow flowing stream consisting of slow flowing pools habitat with some areas of faster flowing riffles and glides. The water in the system	A shallow slow flowing stream consisting of pools. The water in the system was clear at the time of

	Bankside cover is considered to be very good at the present time.	was clear at the time of assessment. Bankside cover is considered adequate at the present time.	assessment. Bankside cover is considered very good at the present time.

Aquatic Macro-invertebrates

The SASS5 data indicates that the aquatic macro-invertebrate communities in these tributaries of the Vaal River have suffered a serious loss in integrity when compared to the reference score for a pristine Highveld Ecoregion stream. At present, the CB2 and CB3 sites site can be considered as being in a Class D (largely impaired) condition and the CB1 site in a Class E (seriously impaired) condition according to the Dickens & Graham (2001) classification system and all of the sites as a Class E / F condition according to the Dallas (2007) classification system thus falling below the DEMC for the catchment according to both the Dickens and Graham (2001) and the Dallas (2007) classification systems. Between the CB3 and the CB2 sites, the SASS5 score increased by 15.3%, while no change was observed in the ASPT score. Between the CB1 and CB2 sites, the SASS5 score increased significantly by 47.8% and the ASPT score decreased negligibly by 3.9%.

13.2 AVIFUANA STUDY

An Avifauna Study for the proposed Camden Power Station Ash Disposal Facility project was carried out to determine the potential impact of the proposed project activities on avifauna. The Avifauna Study was carried out by Chris Van Rooyen Consulting Engineers and is included in this Draft EIR as Appendix G.

13.2.1 Findings of Avifauna Study

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the broad vegetation type above, it is as important to examine the micro habitats available to birds. These are generally evident at a much smaller spatial scale than the vegetation types, and are determined by a host of factors, such as vegetation type, topography, land use and manmade infrastructure. The land use in the study area is a variety of mixed farming practices. Grazing is developed in parallel with crop farming.

The most important bird micro-habitats other than natural grassland that were identified during the field visit include the following:

- Dryland cultivation: The habitat in the study area has been transformed through dryland cultivation, mostly maize but also other crops. The region has summer rainfall and therefore intensive crop farming is practiced on a wide scale; and
- Wetlands and dams: None of the three site alternatives for the proposed ADF contains any significant wetlands or dams. This habitat is however present in the study area in the form of the existing De Jagers Pan as a waterbody. This dam is characterised by

relatively steep edges with little exposed shallow shoreline. In places, the edges are fringed by bulrush (*Typha capensis*) and reeds (*Phragmites australis*).

Data from the Co-ordinated Avifaunal Road Count (ARC) project indicates that agricultural land in the Mpumalanga Highveld is used to a limited extent by large terrestrial birds, and that they prefer natural grassland. Although the preference is for grassland, fallow fields are used to a limited extent by Blue Cranes in summer whilst they might use recently ploughed fields in winter (Young et al. 2003). Other grassland Red Data species that may make limited use of agricultural areas on the Mpumalanga Highveld is the Grey Crowned Crane, Blue Korhaan, Southern Bald Ibis and Black-winged Lapwing Vanellus melanopterus. None of these species were recorded in cultivated fields during on site surveys. Overall, the cultivated areas in the study area have significantly fewer species than the remaining grassland.

None of the three site alternatives contains any dams or significant wetlands. Site 2 contains a small drainage line, but not significant enough to justify a separate habitat classification from an avifaunal ultilisation perspective. The existing ash dam offers refuge to a number of waterbird species, mostly being deep water species that do not require shallow dam edges, or species that utilise the dense reeds and bulrushes on the dam edges. The construction of return water dams will create additional habitat for a limited suite of water associated species currently using the existing ADF, but will not benefit any priority avifauna listed in the Mpumalanga Biobase Report that could potentially occur in the study area. All threatened species that could potentially occur at the three potential site alternatives are listed in Table 12-4.

Table 13-4: Threatened species potentially occurring at the three site alternatives, based on the existence of suitable habitat.

No.	Species	Conservation status	Preferred habitat in Mpumalanga (Harrison et al 1997, Barnes 2000, Hockey et al 2005, personal observations)	Likelihood of occurrence
1.	YELLOW-BILLED STORK *Mycteria ibis*	Near threatened	Always associated with water – dams, wetlands, rivers, marshes, even small pools.	Low. Could be a visitor to larger water bodies in the study area. Could be attracted to the new proposed ADF, but existing ADF not very suitable due to steep edges and water depth.

No.	Species	Conservation status	Preferred habitat in Mpumalanga (Harrison et al 1997, Barnes 2000, Hockey et al 2005, personal observations)	Likelihood of occurrence
2.	SECRETARYBIRD *Sagittarius serpentarius*	Near threatened	Prefers open grassland, densities low in maize growing areas.	Medium. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.
3.	WHITE-BELLIED KORHAAN *Eupodotis senegalensis*	Vulnerable	Often in the interface between grassland and savanna. Avoids severely grazed and recently burnt sites.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.
4.	BOTHA'S LARK *Spizocorys fringillaris*	Endangered Mpumalanga Biobase Report priority species	Heavily-grazed upland grassland in sour grassveld.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.
5.	BLACK-BELLIED BUSTARD *Lissotis melanogaster*	Near threatened	Tall dense grassland and grassy savanna, in both hilly and flat country, where rainfall > 600 mm.	Low. Could be encountered in any of the grassland areas in tall grassland. High level of grassland fragmentation reduces the chances of occurrence.
6.	LANNER FALCON *Falco biarmicus*	Near threatened	Generally prefers open habitat, but exploits a wide range of habitats.	Medium. Could be encounteredanywhere in the grassland and agricultural areas.
7.	PEREGRINE FALCON *Falco peregrinus*	Near threatened	Generally associated with cliffs and tall buildings (e.g. grain reservoirs).	Low. Most likely to be recorded near suitable high buildings e.g. at Camden Power Station.
8.	BLUE CRANE *Anthropoides paradiseus*	Vulnerable Mpumalanga Biobase Report priority species	Short grassland, often near wetlands.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence. No historical records in the study area (U. Franke 2012).

No.	Species	Conservation status	Preferred habitat in Mpumalanga (Harrison et al 1997, Barnes 2000, Hockey et al 2005, personal observations)	Likelihood of occurrence
9.	AFRICAN GRASS-OWL *Tyto capensis*	Vulnerable	Normally associated with pristine, well managed grasslands usually in close proximity of water, but also in alien vegetation structurally resembling tall grass.	Low. Could be encountered in any of the grassland areas, I grass taller than 75cm. High level of grassland fragmentation reduces the chances of occurrence.
10.	GREY CROWNED CRANE *Balearica regulorum*	Vulnerable	Wetlands, adjoining grasslands and agricultural fields.	Low. Could be encountered in any of the grassland areas. Hig level of grassland fragmentation reduces the chances of occurrence. No historical records at any of the sites (U.Franke 2012).
11.	SOUTHERN BALD IBIS *Geronticus calvus*	Vulnerable Mpumalanga Biobase Report priority species	Likely to be found on recently burnt ground and unburnt, shortgrazed grassland, cultivated pastures,reaped Maize fields and ploughed lands.	Medium. Could be encountered in grassland areas and freshly ploughed lands.
12.	BLACK-WINGED PRATINCOLE *Glareola nordmanni*	Near threatened	Agricultural landscapes, ploughedlands and damp grassland.	Medium. Could be encountered in agricultural areas.
13.	BLACK-WINGED LAPWING *Vanellus melanopterus*	Near threatened	Highland plateaux and slopes, fallow fields, meadows and pastures. Short grassland.	Medium. Could be encountered in the short grassland areas.
14.	BLUE KORHAAN *Eupodotis caerulescens*	Near threatened Mpumalanga Biobase Report priority species	Flat and undulating terrain in grassland. Favours short vegetation, limited use of fallow fields.	Low. Could be encountered in any of the grassland areas. Highlevel of grassland fragmentationreduces the chances of occurrence.
15.	RUDD'S LARK *Heteromirafra ruddi*	Critically endangered Mpumalanga Biobase Report priority species	High-rainfall (> 600 mm) grassland on hilltops, plateaux and ridges at 1 700-2 200 m. Favours sites with short, dense grass cover.	Low. Could be encountered in any of the grassland areas. High level of grassland fragmentation reduces the chances of occurrence.

13.2.2 Specialist Recommendations

A financial contribution towards a legitimate conservation initiative for threatened grassland avifauna could also be considered as an off-set e.g. a contribution to Birdlife South Africa or the Highveld Crane Conservation Project of the Endangered Wildlife Trust. Irrespective of which alternative is used, the proposed recommendations of the Terrestrial Ecology Specialist Study for the Environmental Management Programme should be strictly applied to minimise the impact on the natural environment, specifically on the remaining natural grassland, as this is the most

important bird habitat in the study area. Maximum use should be made of existing infrastructure (e.g. pipelines, access roads and fencing) to minimise the further fragmentation of natural grassland areas.

13.3 NOISE IMPACT STUDY

A Noise Impact Study for the proposed Camden Power Station Ash Disposal Facility project was carried out to determine the potential noise impacts on the receiving environment that are associated with the proposed project. The Noise Impact Study was carried out by Airshed Planning Professional and is included in this Draft EIR as Appendix P.

13.3.1 Effected Noise Environment

It is understood that two locations are considered for the proposed ash dam. The proposed locality of Site lies approximately 200m north of the existing ash dam. The closest residences in Camden lie approximately 400m from the eastern corner of the proposed ADF. A farmstead, located approximately 1 km west of the proposed as dam was also identified from Google Earth imagery. The second alternative, referred to as Site 3, consists of two ADFs (Site 3A and Site 3B) and is located south of the existing ADF. Farmsteads or residences, identified from Google Earth imagery include buildings located approximately 2 km west of Site 3A and 2.3 km south-east of Site 3A and Site 3B. Camden town lies approximately 3 km north-east of Site 3.

13.3.2 Key findings of Noise Impact Study

The main findings of the noise impact study includes the following:

- The closest noise sensitive receptors are residents of Camden, approximately 400 m[13] from the eastern corner of Site 1. Farmsteads are located approximately 2 km west of Site 3A and 2.3km south-east of Site 3A and Site 3B;

[13] **Note: The proposed Return Water Pipelines Pump Station as well as the Slurry Pipeline Pump Station constitute the most prominent noise sources associated with the operation of the proposed CPS ADF. The Return Water Pipelines**

- Ground cover in the study area is considered ‘acoustically soft’ i.e. conducive to noise attenuation;
- The prevailing wind field indicate that day-time noise impacts will most likely be most significant to east and west; and night-time impacts to the south-southeast;
- An increase of 5dB in ambient noise level is considered the indicator of noise impacts. This is the level at which ‘little’ community reaction with ‘sporadic’ complaints can be expected;
- The following baseline day and night-time noise levels are expected to prevail:

  Camden:

  Day-time noise level – 50 to 55 dBA

  Night-time noise level – 40 to 45 dBA

  Rural/Remote Areas:

  Day-time noise level – 45 to 50 dBA

  Night-time noise level – 35 to 40 dBA

- Although the difference between noise impacts from Site 1 and 3 is not considered significant, the following was found:
  - Due to lower baseline noise levels the impact area round Site 3 will be slightly larger

than around Site 1.

  - For both Site 1 and 3, night time impacts will be more significant;
  - If unmitigated ‘medium’ community reaction with ‘widespread’ complaints may be expected, specifically during the night. If mitigated ‘little community reaction with ‘sporadic’ complaints may be expected, again during the night. The increase in day time noise levels will most likely not be noticeable at Camden and surrounding farmsteads.

13.3.3 Baseline Noise Levels

It is important to note that the increase in ambient noise level as a result of the introduction of an industrial/mining noise source into the environment depends largely on existing noise levels in the project area. Higher ambient noise levels will result in the less noticeable noise impacts. The opposite also holds true. Increases in noise will be more noticeable in areas

Pump Station is located at a distance of 1260 meters from the Camden Village, while the Slurry Pipeline Pump Station is located an estimated 810 meters from the Cameden Village.

with low ambient noise levels. In the absence of site specific baseline noise data, reference is made to SANS 10103 and reported noise levels in districts.

The following can be considered as representative baseline noise levels at noise sensitive areas:

- Farmsteads and remote areas:
    - Day-time noise level – 45 to 50 dBA
    - Night-time noise level – 35 to 40 dBA
- Camden town:
    - Day-time noise level – 50 to 55 dBA
    - Night-time noise level – 40 to 45 dBA

13.3.4 Specialist Recommendations

The recommendations provided in the Noise Impact Study include that a noise management zone be considered around the operations. This area should correspond to the area over which noise levels may result in annoyance, i.e. complaints and occasional community action. Complaints and noise levels in this area should be recorded and monitored and results communicated to interested and affected parties.

Should the project continue, ambient noise measurements should be conducted prior to construction as well as during the construction, operational and closure phases to assess and confirm the impact area. Specific attention should be paid to noise levels at Camden and other noise sensitive areas. In addition to the measurement of sound pressure levels, the 3rd octave band frequency spectra should also be recorded. Frequency spectrum data can provide useful insight into the nature of recorded sound pressure levels and assist with distinguishing between potential sources of noise that contribute to noise levels at a certain location. Source noise measurements could be conducted to confirm equipment manufacturer sound power data and assumed sound power data used for the study.

13.4 SOCIAL IMPACT STUDY

A Social Impact Study for the proposed Camden Power Station Ash Disposal Facility project was carried out to determine the potential social impacts on the receiving environment that are associated with the proposed project. The Social Impact Study was carried out by Ptersa Environmental Management Consultants and is included in this Final EIR as Appendix M.

13.4.1 Key Findings of Social Impact Study

Most of the impacts will be experienced in the construction phase. This is the phase when there will be an influx of people to the area looking for employment, and impacts such as HIV/AIDS, prostitution and safety are associated with this influx. There will be additional traffic and construction activities which will create dust, noise and other environmental nuisances that may impact on mental or physical health. Only the chosen site will be affected and the affected landowner and/or land user will loose access to the land, thus impacting on his livelihood. Although most of the impacts in this phase are temporary, they are usually experienced as quite severe.

When considering the social impacts of the ash disposal facility, the importance of Camden Power Station on a national scale must be considered. Electricity supply is a critical issue in South Africa at the moment and the proposed project will add to the stability of the service. From a greater societal perspective the project will thus have a positive impact, as Camden Power Station is of strategic importance in the South African economy. The power station employs a significant number of people. Neighbours of the power station report good relationships. The new ash disposal facility will extend the life of the power station, and in the current economic conditions the No-Go option will have dire negative social consequences. The biggest impact on the surrounding communities will be during the construction phase of the project, as communities are already living with the operational impacts. These construction impacts will be of a temporary nature, and most of them can be managed. The adjacent farmers will experience permanent impacts on their livelihoods, depending on which alternative is chosen.

13.4.2 Specialist Recommendations:

- Compile and implement a community relations strategy. This strategy can be aligned to the station's EMS,
- Appoint a community liaison officer to assist with management of social impacts and dealing with community issues;
- Consult with the directly affected communities and note special concerns;
- Install proper grievance and communication systems;
- Employ and procure locally as far as possible;
- Honour existing lease agreements or resolve to satisfaction of all parties involved;
- Make sure construction teams can be identified easily; and
- Make monitoring activities part of the Safety, Health and Environmental systems

The need for the proposed project is undeniable in the current economic conditions. It is therefore recommended that the project proceed with Site 1 as the preferred alternative. The

mitigation measures should be adhered to to ensure the proper management and mitigation of impacts.

13.5 TRAFFIC IMPACT STUDY

A Traffic Impact Study for the proposed Camden Power Station Ash Disposal Facility project was carried out to determine the potential noise impacts on the receiving environment that are associated with the proposed project. The Traffic Impact Study was carried out by Corli Havenga Transportation Engineers and is included in this Draft EIR as Appendix O.

13.5.1 Site Location and Accessibility

Access to the existing ADF can be obtained from the N2 via Eike Avenue to the Camden Power Station. At the four-way stop where this road crosses the haul road (Road A for the purposes of this report), the haul road can be followed to the ash disposal facility. There is also an alternative road from the main access road through the Camden Village that will link up with the haul road. From Eike Avenue the Camden Village access road can also be used to the existing ADF. This aforemeniontед road is a surfaced road and sections of it are in a bad condition.

13.5.2 Onsite Trips during the Construction Phase

Onsite Trips during the Construction Phase can vary significantly. The initial stage of the Construction Phase is anticipated to include major earthmoving operation, followed by an increase in activity as construction work commences on the cut-off drain, return water dam and ash disposal area.

On-site construction activities can generate a significant number of daily trips. These trips are accommodated within the boundaries of the construction site on the gravel access road and road around the ash disposal facility as well as within the ash disposal facility area. These roads need to be maintained and dust suppression applied for the duration of the construction period.

13.5.3 External Trips

External trips during the Construction Phase are likely to include the following:

- Staff transport;
- Transportation of material;
- Transportation of consumable; and
- Trips for Maintenance.

It is estimated that 70 - 122 external trips will be undertaken during a normal construction day when this site is operating at its peak. In terms of peak hour traffic on the adjacent road network, it is not expected that to have more than 10 to15 additional peak hour trips during the afore-mentioned periods. In terms of the Manual for Traffic Impact Studies this is well below the values required to conduct a Traffic Impact Study. Access road to be used for external trips:

- Following our site visit and discussion with the official from Eskom, the Camden Village access road from Eike Avenue to the new ash disposal facility past the school is not a preferred route. The road runs right alongside the school and this is a safety concern for the school-children; and
- The existing access road via Road A and Road B and then Road C should be used for the external trips during the construction phase. This road is to be maintained and dust suppression applied as is currently done during the Construction Phase.

13.5.4 Traffic Impact on the National Road N2

The Construction Phase could contribute an additional 2% to the average annual daily traffic. This anticipated additional traffic travelling on the N2 will however remain only for a few months after which it will then revert back to the normal traffic flow pattern. The impact during the closing down-phase in 18 years' time is expected to be of the order of 0,5%.

13.6 AIR QUALITY STUDY

Airshed Planning Professionals (Pty) Ltd was appointed to determine the potential for dust impacts on the surrounding environment with specific reference to air quality. A copy of the Air Quality Study is included in Appendix N of this EIR.

13.6.1 Potential Sources of Air Pollution

Closure of the ADF operations will include rehabilitation of the site through the covering of the ADF with topsoil before vegetation can take place. Tipping of topsoil onto the cleared areas will generate dust and the freshly exposed topsoil will be prone to wind erosion before vegetation takes over. Movement of vehicles will also be a source of pollution.

The main pollutant of concern associated with operations is particulate matter. Particulates are divided into different particle size categories with Total Suspended Particulates (TSP) associated with nuisance impacts and the finer fractions of PM_{10} (particulates with a diameter less than 10 µm) and $PM_{2.5}$ (diameter less than 2.5 µm) linked with potential health impacts. PM is primarily associated with mechanically generated dust whereas $PM_{2.5}$ is associated with combustion sources. Gaseous pollutants (such as sulphur dioxide, oxides of nitrogen, carbon monoxide, etc.) derive from vehicle exhausts and other combustions

sources such as vehicles. These are however insignificant in relation to the particulate emissions and are not discussed in detail.

Gaseous pollutants (such as sulphur dioxide, oxides of nitrogen, carbon monoxide, etc.) derive from vehicle exhausts and other combustions sources such as vehicles. These are however insignificant in relation to the particulate emissions and are not discussed in detail. Potental sources of air pollution associated with the Construction Phase of the proposed project includes clearing of groundcover, levelling of area, wind erosion from topsoil storage piles as well as the tipping of topsoil to storage pile /stockpiles. The subsequent sections provide a generic description of the parameters influencing dust generation from the various aspects identified.

13.6.2 Specialist Recommendation

PM10 concentrations due to unmitigated operations are likely to exceed the NAAQS 2015 limit of 75 µg/m³ for ~1700m from the source. PM2.5 concentrations due to unmitigated operations are likely to exceed the NAAQS 2030 limit of 25 µg/m³ for ~1700m from the source. The predicted elemental concentrations from unmitigated windblown ash material are predicted to exceed the most stringent effect screening levels up to a distance of 1100m from the source. With water sprays in place, these impacts will reduce significantly. It should be noted that the potential for impacts at the sensitive receptors will also depend on the wind direction and speed which could not be accounted for in this assessment.

Taking the preferred site into consideration (Site 1), the predicted daily PM2.5 (47 µg/m³) and PM10 (140 µg/m³) unmitigated impacts at the sensitive receptor of Camden Village (~700m from the site) exceeded the NAAQS that will come into force in 2016 and 2015 respectively. With mitigated operations, the impacts at the sensitive receptor of Camden Village were in compliance with PM2.5 and PM10 NAAQS. The elemental concentrations ~700m from the ash disposal facility due to proposed unmitigated operations were predicted to be within all effect screening levels (non-carcinogenic effects) with the exception of phosphorus. Phosphorus was within health effect screening levels ~700m from the ash disposal facility with mitigated operations. The predicted cancer risk due to windblown elements ~700m from the ash disposal facility due to mitigated and unmitigated operations was predicted to be very low.

In conclusion, if unmitigated, the windblown dust from the ash disposal facility may result in exceedances of effect screening levels up to a distance of 1100m from the source with exceedances of PM10 NAAQ limits up to a distance of 1700m. As the background ambient PM10 ground level concentrations may also be elevated in the area it is recommended that the ash disposal facility be mitigated where possible in order to minimise the impacts from this source on the surrounding environment.

Concerns of the close proximity of the Camden Village to the proposed ash disposal facility have been raised. In terms of potential air quality health impacts from the ash disposal

facility, a buffer zone of at least 1700m for unmitigated ash facility operations and 700m for mitigated ash facility operations is recommended. The proposed ADF has been positioned 750 m from the Camden Village.

Fugitive dust can easily be mitigated. It is recommended that the dust management measures as stipulated in the EMP (Appendix R) be applied to ensure the proposed activities have an insignificant impact on the surrounding environment and human health.

It is also recommended that single dust fallout buckets be installed downwind of the ash disposal facility in order to monitor the impacts from this source.

13.7 HERITAGE IMPACT STUDY

A Heritage Impact Study was carried out by G&H Heritage Management Consultants to determine possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment served to provide the proponent with measures managing any heritage resources which are found within the development footprint. A copy of the Heritage Impact Assessment is included in **Appendix L** of this EIR.

13.7.1 Key Findings of Heritage Impact Study

No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities. Due to the extent of this development and the location of the site, it is recommended that archaeological monitoring of the excavations should be performed during the construction phase. A small graveyard is located within the study area (Site 1). It contains at least five marked graves and appears to be of western origin.

Figure 13-3: Identified Graveyard in Study Area (Co-ordinates: S26° 37' 50" E30° 04' 36")

13.7.2 Specialist Recommendations

Several recent burial sites were identified on some of the alternatives. No culturally sensitive landscape types could be identified within any of the study areas. Alternative 2 is the only area with sites of any heritage significance.

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact; and
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered;
- All construction in the immediate vicinity (50m radius of the site) should cease;
- The heritage practitioner should be informed as soon as possible;
- In the event of obvious human remains the South African Police Services should be notified;
- Mitigation measures (such as refilling etc.) should not be attempted;
- The area in a 50m radius of the find should be cordoned off with hazard tape;
- Public access should be limited;
- The area should be placed under guard; and
- No media statements should be released until such time as the heritage practitioner has had sufficient time to analyze the finds.

Due to the anticipated level of excavation for the ash disposal facility it is also recommended that an archaeologist is on site during the construction phase to monitor possible sub-surface features. Where bedrock is to be affected, it is also recommended that a palaeontologist be employed to investigate the paleontological value of the bedrock.

13.8 GEOHYDROLOGY STUDY

A Geohydrological Impact Study was carried out to determine the potential impact of the proposed project activities on the local aquifer underlying the development area. A copy of the Geohydrological Impact Study is included in Appendix K of this EIR.

13.8.1 Specialist Recommendations

The following conclusions and recommendations are provided in the Geohydrological Study Report:

<u>Site 1</u>

- Site 1 is the most suitable area for constructing a new ash dam;

- If Site 1 is used, the ADF should be built on the eastern side of this area as far away as possible from the stream north-west of the area;

- It is also advisable that the entire ADF must be constructed on the west to east slopes of the drainage area;

- The existing borehole FBB23 must be sealed properly with a cement bentonite mixture to prevent pollutants to enter the groundwater regime directly;

- Trenches can be constructed around the ashing facility to minimise the spreading of pollutants through the shallow perched aquifer;

- The shallow perched aquifer serves as recharge zone along preferential pathways for the deep exploitable aquifer (aquifer that can be utilised for production purposes). However the hydrochemical data gathered during the last two decades from the deep aquifer in the vicinity of the ash stack shows little or no signs of pollution.

Site 3

- If the ADF is contructed in the area demarcated for Site 3, it is recommended that the ADF be built on the north-eastern side of this area as far away as possible from the stream draining west of the area;
- The close proximity of production borehole FBB17 is also a reason of concern;
- Trenches can be constructed around the ashing facility to minimise the spreading of pollutants through the shallow perched aquifer; and
- The shallow perched aquifer serves as recharge zone along preferential pathways for the deep exploitable aquifer (aquifer that can be utilised for production purposes). However the hydrochemical data gathered during the last two decades from the deep aquifer in the vicinity of the ash stack shows little or no signs of pollution.

14 EAP OPINION

The reasoned opinion of the principal EAP who conducted this assessment is provided below.

Should this project proceed?

The EAP recommends the implementation of the project for the following reasons:

- The Camden Power Station was re-commissioned as part of the "Return-To-Service" (RTS) process, specifically to circumvent the power crises in South Africa, and its on-going operation is of strategic significance to further the objectives of sustainable energy production in South Africa;
- The proposed infrastructure is required for the on-going operation of the Camden Power Station and there is no other feasible solution that can be implemented within reasonable cost and with less environmental impacts;
- There is no alternative means available for the disposal of the ash waste stream, disposal on land is the only feasible solution for this waste stream;
- The No-Go alternative is considered to be fatally flawed because it will result in the closure of Camden Power Station – having an unacceptable impact to the social and economic environment at a national level. This impact will persist beyond the post closure life of this project if it were implemented;
- Site 1 is the preferred alternative through all phases of the project and should be implemented;
- Although Site 3 is also a feasible alternative it is more difficult to manage and will have wider impacts to the biophysical, social and economic environment; and
- No specific issues or concerns have been raised by I&APs that indicate the project should not proceed.

Given the aforementioned the EAP states that the project is not fatally flawed, and all reasonable measures have been taken and included in the EMPr for the avoidance and reduction of environmental impacts, and as such recommends the implementation of the project.

Which site should be developed?

The EAP recommends the implementation of the project on Site 1 for the following reasons:

- A single facility can be constructed on Site 1 as opposed to two facilities for Site 3, thus making it an easier alternative to construct and manage;

- Site 1 is more than 19,7 % smaller than Site 3 when all infrastructure is combined;
- There will be a smaller impact to land use and agricultural activities if Site 1 is implemented;
- The drainage of dirty water on Site 1 is only in one direction, allowing for any pollution to be contained and managed easier, whereas Site 3 has divergent dirty water directions ;
- The site allows for easier and more cost effective integration with existing infrastructure;
- This site alternative does not cross the Richards Bay Coal Line;
- No complicated mitigation measures are required in order to reduce the impact on the receiving environment;
- With the exception of installing a barrier system (which is very costly) all mitigation measures are relatively inexpensive to implement;
- This site is the least costly to construct and operate;
- The impact risk post closure does not result in an increase of the current baseline impacts to the receiving environment; and
- There are no substantial water resources in close proximity to Site 1.

What are the primary impact risks that must be managed?

The most significant impact risk to the environment from the Camden Ash Disposal Facility expansion project (without mitigation measures), during the construction phase, will be to the Topography, Surface Water and Wetlands Resources, and existing infrastructure. This can be explained as follows:

- **Topography:** permanent alternation of surface water drainage patterns;
- **Surface Water and Wetlands:** potential for increased suspended solids and sedimentation of surface water resources from construction activities, decreased recharge of surface water resources from alterations of topography, and installation of a barrier system to prevent water from leaving the ash disposal facility area of the development site; and
- **Existing infrastructure:** no power lines will have to be relocated;
- Site 1 is located ~750m from the Camden Village, a sensitive receptor in the area. The distance is based on a screening assessment assuming a worst case scenario. The village should be adequately protected if mitigation measures are successful, however monitoring should be undertaken to ensure that the impacts are within acceptable limits. The predominant wind direction is east to east-southeasterly, which is in the opposite direction and will also reduce the impacts on the Camden Village,

- The only residual impacts that are still HIGH after the construction phase is complete are the Geological, Topographic, Groundwater, and Visual impacts. This is as a result of the already highly impacted receiving environment. The project will not increase the significance of these existing impacts, but mitigation measures cannot reduce these impacts either.

The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the operational phase, will be to the Soil and Land Capability, and groundwater environment. This can be explained as follows:

- **Soil and Land Capability:** leachate will form below the facility and will pollute soil resources; and
- **Air Quality:** particulates may be mobilised, especially during high windfall events, that may impact on the surrounding study area; and
- **Groundwater:** any leachate draining from the facility will percolate through soil and into groundwater resources, but the facility will have an appropriate barrier system.

The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the closure phase, will be to the Groundwater and Visual elements of the receiving environment. This can be explained as follows:

- **Visual Environment:** capping and vegetation of the dam will have a positive impact;
- **Groundwater:** any leachate draining from the facility will percolate through soil and into groundwater resources; and
- Closure activities will have a positive impact on the environment, although the residual impact in almost all cases remains negative. This is as a result of the already high baseline impacts that mitigation measures specific to this project will not reduce.

The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the post closure phase, will be to the Groundwater and Visual elements of the receiving environment. This can be explained as follows:

- **Soil and Land Capability:** any leachate will form below the facility and will pollute soil resources; and
- **Groundwater:** the leachate draining from the facility will percolate through soil and into groundwater resources;

Are the impact risks considered to be unacceptable?

Unmitigated project impact risks to the soil and land capability, surface water and groundwater environment would be unacceptable if not mitigated. Fortunately these impacts can be mitigated. With mitigation measures implemented at Site 1 all impacts can be reduced to within acceptable or kept to within background limits. The primary mitigation measures that will substantially reduce the impacts to the receiving environment are:

- The installation of a suitably designed barrier system needs to be installed below the ash disposal facility. This barrier system must include composite layers and include a leak detection and leachate collection system;
- A storm water management plan that includes clean and dirty water separation must be implemented;
- Rehabilitation of the existing and proposed ash disposal facility; and
- Dust suppression through all phases of the development.

Can the environment carry this additional impact?

The baseline environment is already substantially impacted by industrial (Camden Power Station and associated activities), mining (opencast and underground mining), and wide spread agricultural (cultivated lands) activities. The geology, topography, surface water, groundwater, and terrestrial environments are most affected. Should Site 1 be implemented it is expected that the additional impact will not increase the current impact on the environment. It is the EAP's opinion that the environment can accommodate the proposed development if mitigation measures are successfully implemented.

Can the impact risks be mitigated or managed?

Mitigation measures identified are relatively well understood, and with the exception of the installation of a liner system below the dirty water facilities (such as the Ash Disposal Facility and Ash Water Return Dam), the mitigation measures are relatively inexpensive to implement.

15 CONCLUSION AND WAY FORWARD

Eskom appointed Zitholele Consulting to undertake the EIA for the proposed expansion of ashing facilities at the Camden Power Station. This EIA study was undertaken with the aim of investigating potential impacts both positive and negative on the biophysical and socio-economic environment and identifying issues, concerns and queries from I&APs.

This Final EIR documents the process followed and the findings and recommendations of the study. Additionally attached to this document is a Final EMPr that has been developed in order to implement the proposed mitigation measures.

The way forward recommended by this study is as follows:

- The Final EIR and EMPr is submitted to the Department of Environmental Affairs (DEA) for decision making;
- The Final EIR and EMPr is also made available simultaneously for stakeholders to review for a period of 30 days;
- Once the DEA has reached a decision, DEA will issue their decision;
- Upon receipt of the decision, Zitholele will notify all I&APs on the stakeholder database of the DEA's decision by means of letters; and
- The Eskom negotiation process with affected stakeholders will then commence.

ZITHOLELE CONSULTING (PTY) LTD

Tani Oosthuizen
Project Manager

Sharon Meyer-Douglas
Project Associate