PROPOSED BRINE TREATMENT WORKS AT TUTUKA POWER STATION, MPUMALANGA

LIFE-CYCLE ENVIRONMENTAL MANAGEMENT PROGRAMME

July 2010

CONSULTANT
Aurecon South Africa (Pty) Ltd.
81 Church Street
PO Box 494
Cape Town
8000

Tel: (021) 481 2400
Fax: (021) 424 5588
Email: louise.corbett@af.aurecongroup.com

PROPONENT
Eskom Holdings Ltd.
Eskom Generation
Megawatt Park
Maxwell Drive
Sandton, 2199

Tel: (011) 800 3501
Fax : (011) 800 5140
Website : www.eskom.co.za

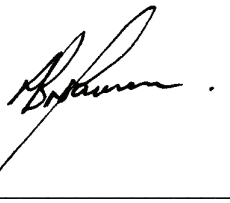
REPORT CONTROL SHEET

CLIENT	:	Eskom Holdings (Pty) Ltd (Generation Division)
CLIENT REPRESENTATIVE	:	Ms Deidre Herbst
PROJECT NUMBER	:	105684
REPORT TITLE	:	Proposed Brine Treatment Works at the Tutuka Power Station, Mpumalanga
AUTHORS	:	Louise Corbett and Brett Lawson
REPORT STATUS	:	Draft
PREPARED BY	:	Louise Corbett
REPORT NUMBER	:	5192
DATE	:	**JULY 2010**

Author(s):
Miss Louise Corbett

_____
ENVIRONMENTAL PRACTITIONER

Approved by:
Mr Brett Lawson *(Pr.Sci.Nat., Cert. EAPSA)*



_____
TECHNICAL DIRECTOR

This report is to be referred to in bibliographies as: AURECON. 2010. Proposed Brine Treatment Works at Tutuka Power Station, Mpumalanga: Life-cycle Environmental Management Programme. *Report No. 5192/105684*

CONTENTS

List of Tables:

List of Appendices:

ABBREVIATIONS

CEMP	Construction Environmental Management Programme
DEA	Department of Environmental Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
LEMP	Life-Cycle Environmental Management Programme
NEMA	National Environmental Management Act (No. 107 of 1998)
NEMWA	National Environmental Management: Waste Act (No. 59 of 2008)
OEMP	Operational Environmental Management Programme

This page has been left deliberately blank.

1 OVERVIEW

This document represents the Life-Cycle Environmental Management Programme (LEMP) for the proposed brine (referred to hereafter as reject) concentration plant at Tutuka Power Station, Mpumalanga.

1.1 PURPOSE OF THE LEMP

The LEMP has been included in the Environmental Impact Assessment Report (EIAR) in order to provide a link between the impacts identified in the Environmental Impact Assessment (EIA) process and the actual environmental management on the ground during project construction and operation. The purpose of this document is to provide for environmental management throughout the various life-cycle stages of the proposed development. The following stages are included:

- Planning and design,
- Pre-construction and construction,
- Operation, and
- Decommisioning.

Furthermore, this LEMP aims for alignment and optimisation of environmental management processes with conditions of authorisation that may arise, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

1.2 LEGAL REQUIREMENTS OF ENVIRONMENTAL MANAGEMENT PROGRAMMES

Environmental Impact Assessment (EIA) Regulations were promulgated in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998) on 21 April 2006 (GN R385, 386 and 387). Subsequently NEMA has been amended and on 1 May 2009 the National Environmental Management Amendment Act, 2008 (Act No. 62 of 2008) (the NEMA Amendment Act), came into operation. Regulations 385, 386 and 387 are now being implemented in terms of the NEMA Amendment Act. The proposed project triggers numerous listed activities in terms of both Regulation 386 and 387, requiring the submission of an EIA for Environmental Authorisation (EA) to the Department of Environmental Affairs (DEA).

Furthermore, the National Environmental Management: Waste Act (No. 59 of 2008) (NEMWA) provides various measures for the prevention of pollution and ecological degradation, as well as for ecologically sustainable development in order to protect human health and the environment. In this regard, NEMWA identifies and lists certain activities which require a waste management licence and EA via the NEMA EIA process, prior to commencement of those activities.

In accordance with Section 24N of NEMA (as amended) an EMP shall be submitted together with the EIAR. The contents of the EMP must meet the requirements outlined in Section 24N (2) and (3) of NEMA (as amended) and Section 34 of EIA Regulation 385. The EMP must address the potential environmental impacts of the activity throughout the project life-cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation (auditing). **Table 1** lists the requirements of an EMP as stipulated by Section 34 of the Regulations and as stipulated by Section 24N (2) and (3) of the NEMA (as amended).

The legislation hereby aims to ensure that effective environmental management is implemented throughout the life cycle of the project via the translation of EIA management actions into the LEMP.

Table 1 Section 34 of the EIA Regulations and Section 24N (2) and (3) of the NEMA (as amended) listing the requirements of an EMP

24N.(2)	*the environmental management programme must contain-*
(a)	*information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –*
	(i) planning and design;
	(ii) pre-construction and construction activities;
	(iii) the operation or undertaking of the activity in question;
	(iv) the rehabilitation of the environment; and
	(v) closure, where relevant.
(b)	*details of –*
	(i) the person who prepared the environmental management programme; and
	(ii) the expertise of that person to prepare an environmental management programme
(c)	*an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);*
(d)	*a detailed description of the aspects of the activity that are covered by the draft environmental management plan;*
(e)	*information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);*
(f)	*information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance.*
(g)	*as far as is reasonable practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and*
(h)	*a description of the manner in which it intends to-*
	(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
	(ii) remedy the cause of pollution or degradation and mitigation of pollutants; and
	(iii) comply with any prescribed environmental management standards or practices.
(3)	*the environmental management programme must , where appropriate-*
(a)	*set out time periods within which the measures contemplated in the environmental management programme must be implemented;*

(b)	*contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and*
(c)	*develop an environmental awareness plan describing the manner in which-*
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
	(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.

The LEMP aims to meet the EMP requirements as legislated by the NEMA Regulations (as amended). It should however be noted that no guideline or guidance exists in terms of best practice approach to LEMPs. This document should thus be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available.

1.3 STRUCTURE OF LEMP

As discussed above, the LEMP aims to address environmental management throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning. The LEMP has been structured to include the following sections:

1. Discussion summarising environmental management influencing the planning and design of the proposed reject concentration plant (Chapter 3 of the EIAR);
2. Construction EMP based on identified impacts and mitigation measures from the EIAR (Chapter 5 of the EIAR);
3. Operational Framework based on identified impacts and mitigation measures from the EIAR (Chapter 5 of the EIAR); and
4. Decommissioning Framework providing guidance on key considerations to be considered during decommissioning/closure.

1.4 EXPERTISE OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS

Section 34 of EIA Regulation 385 and Section 24N (2) and (3) of the NEMA (as amended) requires that an Environmental Management Programme must include the details of the person(s) who prepared the EMP, and the expertise of that person to prepare an EMP. In this regard, the *Curriculum Vitae* of the Environmental Assessment Practitioners who compiled the LEMP are included in **Appendix A**.

2 PLANNING AND DESIGN

This section has been divided into subsections which outline how environmental considerations have informed and been incorporated into the planning and design phases of the proposed

reject concentration plant. Detailed design is usually undertaken as part of the pre-construction phase as it is a costly undertaking which is generally only costed for once all required authorisations have been obtained. Thus, the planning and design phases discussed are limited to those associated with the pre-authorisation phases.

2.1 ASSESSMENT OF ALTERNATIVES

The EIA for the proposed project formed an integral component of the planning and design phase for the proposed reject concentration plant.

Various alternatives for the proposed development were considered and subsequently screened out during the EIA process, and the following alternatives were assessed in the EIAR:

- Activity alternatives:
  - Concentration of reject via a reject concentration plant;
  - "No-go" alternative to reject concentration plant;
- Location alternatives:
  - Three locations for the proposed reject plant.

In comparing the proposed reject concentration plant and the "no-go" alternatives it was seen that the "no-go" alternative results in greater negative impacts on the biophysical and socio-economic environment whilst the proposed reject concentration works results in some positive and lower negative impacts on the environment. As such the proposed reject concentration plant is the preferred activity alternative.

With regards to the site alternatives for the proposed reject concentration plant, the three alternatives have the same impacts, all of which are of limited significance. As such there is no site preference from an environmental perspective.

2.2 DESIGN OF PROPOSED REJECT CONCENTRATION PLANT

The siting of the proposed reject concentration plant was influenced by environmental as well as technical considerations. By locating the proposed reject concentration plant adjacent to the existing Reverse Osmosis plant a smaller footprint is ensured and the footprint is located on a brownfields area.

No design level mitigation measures were recommended in the EIAR.

3 CONSTRUCTION PHASE EMP

The Construction EMP (EMP) aims to address mitigation measures pertaining to the construction phase as identified during the course of the EIA. This section includes Specifications addressing general construction issues and issues. It should be noted that the

Specifications should be revised as required post authorisation to ensure that all relevant conditions of the EA have been addressed.

3.1 CONSTRUCTION EMP SPECIFICATIONS

The complete EMP Specifications have been included in Section 3.1.1 and includes the following sections:

- Scope
- Interpretations
- Supporting Specifications
- Application
- Definitions
- Requirements
  - Material
  - Material handling, use and storage
  - Hazardous substances
  - Plant
  - Ablution facilities
  - Solid waste management
  - Contaminated water
  - Noise control
  - Fuel (petrol and diesel) and oil
  - Equipment maintenance and storage
  - Construction
  - Methods statements
  - Environmental awareness training
  - Construction personnel information posters
  - Site clearance
  - Site division and site demarcation
  - Access routes/ haul roads
  - Cement and concrete batching
  - Fire control
  - Emergency procedures
  - Community relations
  - Protection of natural features
  - Protection of flora and fauna
  - Protection of archaeological and paleaontological remains
  - Stockpiling
  - Dust
  - Site closure and rehabilitation
- Compliance with requirements and penalties
  - Compliance
  - Penalties
- Measurement and Payment
  - Basic principles
  - Billed items
    - All requirements for environmental management specification
    - Method Statements: Additional work
    - Work "required by the Project Specification "

Construction phase impacts identified by the EIA and addressed by the CEMP include:

- Disturbance of flora and fauna;
- Sedimentation and erosion;
- Increase in traffic volumes;
- Interruption of road services;
- Storage of hazardous substances on site;
- Security risks; and
- Dust impact.

3.1.1 EMP SPECIFICATIONS

1.1.1.1. SCOPE

This Specification covers the requirements for controlling the impact of construction activities on the environment. It contains clauses that are generally applicable to the undertaking of civil engineering works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment.

1.1.1.2. NORMATIVE REFERENCES

a) Supporting Specifications

Where this Specification is required for a project the following specifications shall, *inter alia*, form part of the Contract Document.

- SANS 1200 Series of Standardized Specifications;
  - SANS 1200 A or SANS 1200 AA, as applicable;
- Specification AO
- Construction Regulations, 2003, and
- Standards listed below.

Applicable standards: Reference is made to the latest issues of the following standards:

- SANS 1200 A General
- SANS 1200 AA General (small works)
- Specification AO Occupational health and safety
- Construction Regulations, 2003.

1.1.1.3. DEFINITIONS

For the purposes of this Specification the definitions and abbreviations given in the applicable specifications listed in 2.1 and the following definitions shall apply:

Environment : The surroundings within which humans exist and that are made up of:
i) the land, water and atmosphere of the earth;
ii) micro-organisms, plant and animal life;
iii) any part or combination of i) and ii) and the interrelationships among and between them; and
iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Potentially hazardous Substance : A substance that, in the reasonable opinion of the Project Manager, can have a deleterious effect on the environment.

Method Statement : A written submission by the Contractor to the Project Manager in response to the Specification or a request by the Project Manager, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Project Manager when requesting the Method Statement, in such detail that the Project Manager is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

	The Method Statement shall cover applicable details with regard to construction procedures, materials and equipment to be used, transportation of equipment/materials to and from site, movement of equipment/materials on site, storage of materials on site, containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur, timing and location of activities, areas of non-compliance with the Specifications and any other information deemed necessary by the Project Manager.
Reasonable :	Unless the context indicates otherwise, reasonable in the opinion of the Project Manager after he has consulted with a person, not an employee of the Employer, suitably experienced in "environmental implementation plans" and "environmental management plans" (both as defined in Act No 107,1998).
Solid waste :	All solid waste, including construction debris, chemical waste, excess cement/ concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
Contaminated water :	Water contaminated by the Contractor's activities, e.g. concrete water and runoff from plant/ personnel wash areas.

1.1.1.4. REQUIREMENTS

a) Materials

i) Materials handling, use and storage

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications. Materials shall be appropriately secured and covered to ensure safe passage between destinations. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

ii) Hazardous substances

Procedures detailed in the Materials Safety Data Sheets (MSDS) shall be followed in the event of an emergency situation. Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Project Manager.

b) Plant

i) Ablution facilities

The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are properly stored and removed from Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited. Washing, whether of the person or of personal effects and acts of excretion and urination are strictly prohibited other than at the facilities provided.

Should Eskom allow the contractor to use the existing ablution blocks temporary toilets may be foregone.

ii) Solid waste management

The Contractor shall provide sufficient bins with lids on Site and no on-site burying, dumping or burning of any waste materials, vegetation, litter or refuse shall occur. Bins shall be emptied a minimum of once daily. The waste may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, as approved by the Project Manager. All solid waste shall be disposed of off site at an approved landfill site. The Contractor shall supply the Project Manager with a certificate of disposal.

Waste may be disposed off along with the Tutuka Power Station waste should Eskom so allow.

iii) Contaminated water

Contractor shall set up a contaminated water management system, which shall include collection facilities, as well as suitable methods of disposal of contaminated water. The Contractor shall prevent the discharge of water contaminated with any pollutants, into the environment.

The Contractor shall notify the Project Manager immediately of any pollution incidents on Site. The Project Manager's approval is required prior to the discharge of contaminated water to the Municipal sewer system.

iv) Noise

The Contractor shall limit noise levels (e.g. install and maintain silencers on machinery). The provisions of SANS 1200 A Subclause 4.1 regarding "built-up areas" shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas. Appropriate directional and intensity settings are to be maintained on all hooters and sirens and no amplified music shall be allowed on Site other than in emergency situations. The Contractor shall restrict any of his operations that may result in undue noise disturbance to the hours of 08:00 to 17:00 on weekdays and Saturdays. Unless otherwise agreed to with the Project Manager.

v) Fuel (petrol and diesel) and oil

Fuel may be stored on site in an area approved by the Project Manager. The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut or in bowsers. The tanks/ bowsers shall be situated on a smooth impermeable surface (concrete or 250 µm plastic) with an earth bund (plastic must have a 5 cm layer of sand on top to prevent damage and perishing). The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with 250 µm plastic covered with a minimum of a 5 cm layer of sand.

The Contractor shall prevent unauthorised access into the fuel storage area. No smoking shall be allowed within the vicinity of the fuel storage area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

vi) Equipment maintenance and storage

Leaking equipment shall be repaired immediately or removed from the Site. Where practical, maintenance of plant shall not occur on site. Where emergency maintenance is necessary, the Contractor shall ensure that this does not result in contamination of the soil or vegetation. Drip trays shall be provided in construction areas for stationary and "parked" plant as well as during emergency servicing of vehicles. Drip trays shall be inspected and emptied daily. The contents of drip trays shall be disposed off at an authorised facility. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. The use of detergents for washing shall be restricted to low phosphate and nitrate containing, low sudsing-type detergents.

c) Methods and procedures

i) Method Statements

Any Method Statement required by this Specification or the Project Manager shall be produced within such reasonable time as is required by this Specification or the Project Manager. The Contractor shall not commence the activity until the Method Statement has been approved. Except in the case of emergency activities, the Contractor shall allow a period of two weeks for approval of the Method Statement by the Project Manager. Such approval shall not unreasonably be withheld.

Method Statements in respect of environmental management that shall be provided by the Contractor within 14 days of receipt of the letter of acceptance and prior to the activity covered by the Method Statement being undertaken, include:
1) Location and structure of the fuel storage site, including the type and volume of storage container and the design and capacity of the bund.
2) Solid waste (refuse) control and removal of waste from the Site, including the number, type and location of rubbish bins, the manner and frequency with which the waste will be removed from site and the disposal site.
3) Contaminated water management system, including an indication of the source and volume of contaminated water and how this would be disposed of.
4) Emergency procedures for fire, and accidental leaks and spillages of hazardous materials.

ii) Environmental awareness training

Within seven days of the Commencement Date, the Contractor's site staff including foremen and site management staff shall attend an environmental awareness training course, of approximately one-hour duration. The Contractor shall liase with the Project Manager prior to the Commencement Date to fix a date and venue for the course. The Contractor shall provide a suitable venue with facilities as required by the Specification, Data and ensure that the specified employees attend the course.

Any new employees coming on to site after the initial training course and the Contractor’s suppliers and subcontractors shall also attend this course. The Contractor shall ensure that all attendees sign an attendance register, and shall provide the Project Manager with a copy of the attendance register the day after each course.

iii) Construction personnel information posters

As required by the Specifications, the Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters will be supplied by the Project Manager and shall be erected at a location specified by the Project Manager.

iv) Site clearance

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be subject to the Project Manager’s approval.

Should fauna be encountered during site clearance, earthworks shall cease until such fauna have been safely relocated.

v) Site division and Site demarcation

The Contractor shall restrict all his activities, materials, equipment and personnel to within the area specified. As required by the Specifications, the Contractor shall erect and maintain permanent and/ or temporary fences of the type and in the locations directed by the Project Manager. Such fences shall, if so specified, be erected before undertaking designated activities.

vi) Access routes/ haul roads

On the Site, and, if so required by the Specifications, within such distance of the Site as may be stated, the Contractor shall control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition such vehicles and plant shall be so routed and operated as to minimise disruption to regular users of the routes not on the Site. On gravel or earth roads on Site and within 500m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 20km/h.

Mud and sand deposited onto public roads by construction activities shall be cleared on a daily basis.

vii) Cement and concrete batching

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Project Manager. The concrete/cement batching plant shall be kept neat and clean at all times. The batching plant shall be located on a smooth impermeable surface (plastic) and shall be bunded and sloped towards a sump to contain spillages of substances.

All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment. Empty cement bags shall be stored in temporary weatherproof containers and shall be disposed of on a regular basis via the solid waste management system. The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Where “readymix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system.

viii) Fire control

No fires may be lit on site. Any fires that occur shall be reported to the Project Manager immediately. Smoking shall not be permitted in those areas where it is a fire hazard. In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.

The Contractor shall ensure that there is basic fire-fighting equipment available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and fynbos areas, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken.

ix) Emergency procedures

The Contractor shall ensure that his employees are aware of the procedure to be followed for dealing with spills and leaks, which shall include notifying the Project Manager and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Project Manager. In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The

Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill.

x) Community relations

The Contractor shall record any complaints or queries from the public, as well as the action taken in response, in the site request book. Complaints and associated responses shall be communicated to the Project Manager on a weekly basis. The Contractor's contact details shall be posted on the site board to enable the public to telephone should they have any queries or complaints.

xi) Protection of natural features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Project Manager. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Project Manager. The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

xii) Protection of flora and fauna

Except to the extent necessary for the carrying out of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without authorisation. Trapping, poisoning and/or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on Site.

xiii) Protection of archaeological and palaeontological remains

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the Project Manager immediately of such a discovery and carry out the Project Managers instructions for dealing therewith. All works within the vicinity of the discovery must cease immediately and the area shall be cordoned off until such time as the Project Manager authorises resumption of the works in writing.

xiv) Stockpiling

The Project Manager will identify suitable sites for stockpiling. Stockpiles shall be convex in shape, shall be no higher than 2 m and shall be located so as to cause minimal disturbance. Where required, appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not cause the damming of water or run off, or is itself washed away.

xv) Dust

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Project Manager. Appropriate dust suppression measures, e.g. dampening with water, shall be used when dust generation is unavoidable, particularly during prolonged periods of dry weather in summer. Dust suppression measures shall be agreed upon in consultation with the Project Manager.

1.1.1.5. COMPLIANCE WITH REQUIREMENTS AND PENALTIES

a) Compliance

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Project Manager to certify the imposition of a penalty as detailed below.

b) Penalties

Penalties will be issued for certain transgressions listed below. Penalties may be issued per incident at the discretion of the Project Manager, as advised by the ECO. Such penalties will be issued in addition to any remedial costs incurred as a result of non-compliance with this Specification. The Project Manager will inform the Contractor of the contravention and the amount of the penalty, and shall be entitled to deduct the amount from monies due under the Contract.

Penalties for the activities detailed below, will be imposed by the Project Manager on the Contractor.

a)	Any employees, vehicles, plant, or thing related to the Contractor's operations operating within the designated boundaries of a "no-go" area.	R 20 000
b)	Any vehicle driving in excess of designated speed limits.	R 2 000
c)	Persistent and unrepaired oil leaks from machinery.	R 3 000
d)	Persistent failure to monitor and empty drip trays timeously.	R 1 000
e)	The use of inappropriate methods for refuelling.	R 1 000
f)	Litter on site associated with construction activities.	R 2 000
g)	Deliberate lighting of illegal fires on site.	R 5 000
h)	Employees not making use of the site ablution facilities.	R 2 000
i)	Failure to implement specified noise controls	R 2 000
j)	Failure to empty waste bins on a regular basis.	R 1 000
k)	Inadequate dust control.	R 5 000
l)	A spillage, pollution, fire or any damage to any watercourse/ wetland resulting from negligence on the part of the Contractor.	R 40 000
m)	Any act, that in the reasonable opinion of the Project Manager, constitutes a deliberate contravention of the requirements of these Specifications	R 10 000

For each subsequent similar offence the penalty shall be doubled in value to a maximum value of R 80 000

The Project Manager will determine what constitutes a transgression in terms of this clause, subject to the provisions of Clause 57(1) of the General Conditions of Contract. In the event that transgressions continue the Contractor's attention is drawn to the provisions of Sub-clause 55(1) of the General Conditions of Contract 2004 under which the Project Manager may cancel the Contract.

1.1.1.6. MEASUREMENT AND PAYMENT

a) Basic principles

i) General

Except as specified below or in the Specifications or as billed, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items in the Bill of Quantities completed by the Contractor when submitting his tender.

ii) All requirements of the environmental management specification

All work not measured elsewhere, associated with complying with any requirement of the environmental management specification shall be measured as a sum. The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Bill of Quantities or shown on the drawing(s).

iii) Work "required by the Specifications"

Where a clause in this Specification includes a requirement as "required by the Specifications", measurement and payment for compliance with that requirement shall be in accordance with the relevant measurement and payment clause of the Specifications.

b) Billed items

i) Method Statements: Additional work

No separate measurement and payment will be made for the provision of Method Statements but, where the Project Manager requires a change on the basis of his opinion that the proposal may result in, or carries a greater than warranted risk of damage to the environment in excess of that warranted by the Specifications, then any additional work required, provided it could not reasonably have been foreseen by an experienced contractor, shall be valued in accordance with the Clause in the General Conditions of Contract dealing with Provisional Sums. A stated sum is provided in the Bill of Quantities to cover payment for such additional work.

ii) All requirements of the environmental management specification

All other work not measured elsewhere, associated with complying with any requirement of the environmental management specification shall be measured as a sum. The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Bill of Quantities or shown on the drawing(s).

3.2 ROLES AND RESPONSIBILITIES

3.2.1 CLIENT

Eskom shall:

- Assume overall responsibility for the administration and implementation of the EMP, through an identified Project Manager;
- Appoint or engage a suitably qualified Project Manager; and

- Appoint or engage a suitably qualified ECO to monitor compliance with the EMP and undertake an audit of compliance with the requirements of the EMP and provide a copy of the audit report to DEA and the Contractor.

3.2.2 PROJECT MANAGER

The Project Manager shall:

- Have overall responsibility for the environment;
- Have the authority to stop works and issue fines, as necessary;
- Receive reports from the ECO and shall report to Eskom; and
- Support the ECO in his/her roles and responsibilities.

3.2.3 ENVIRONMENTAL CONTROL OFFICER

Prior to the commencement of construction a suitably qualified and experienced Environmental Control Officer (ECO) shall be appointed by Eskom to ensure that the mitigation rehabilitation measures and recommendations referred to in the EA are implemented and to ensure compliance with the provisions of the LEMP.

Roles and responsibilities

The role of the ECO is to oversee and monitor compliance with and implementation of the EMP, which includes compliance with the relevant conditions contained in the EA. This includes the following responsibilities:

The duties of the ECO will include:

- Liaison with the Client, Contractor and Environmental Authorities;
- Shall continually review the appropriateness and efficacy of the management of the EMP. Any revisions would however need to occur in consultation with Eskom;
- Monitoring of all of the Contractor's activities for compliance with the various environmental requirements contained in this Specification;
- Monitoring of compliance with the EA issued by DEA as well as other relevant environmental legislation;
- Reviewing and approving of the Contractor's environmental Method Statements;
- Ensuring that the requisite remedial action is implemented in the event of non-compliance;
- Ensuring the proactive and effective implementation and management of environmental protection measures;
- Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately reported and addressed;
- Routine recording and reporting of environmental activities on a bi-weekly and monthly basis;
- Recording and reporting of environmental incidents;
- May, via Eskom, demand corrective actions in case of non-compliance with the EMP.

- Shall keep a register of incidents and other documentation related to the EMP;
- Provide support to the Project Manager; and
- Shall prepare an EMP Compliance Report, reporting on the level of compliance and the efficacy of the management of the EMP, and listing any systematic breaches and concerns and recommending appropriate actions. This would be a detailed document, which would provide a more comprehensive review of the implementation of the EMP for the previous period and would be reported to DEA.

A final audit of the EMP should be instituted, upon completion of construction, to be carried out by independent consultants. The audit shall be submitted to Eskom as well as DEA.

Site visits and reporting:

The ECO shall visit the site a minimum of once every two weeks. More frequent visits may be required if the situation requires it.

Monthly compliance reports shall be submitted to the Contractor and the Client and Project Manager and distributed as desired. The compliance report shall comply with the requirements of the EMP Specifications as well as other issues of compliance in terms of the EA.

4 OPERATIONAL FRAMEWORK EMP

The potential positive and negative operational phase impacts identified as part of the EIA include.

- Impact on groundwater resources
- Impact on visual aesthetics
- Impact on economy
- Impact on noise

No mitigation measures were recommended for the operation phase of the proposed reject concentration plant. Should there be significant amendments to the currently proposed brine treatment works it may be necessary to reassess the proposal and operation phase mitigation measures may be recommended.

5 DECOMMISSIONING

The decommissioning of the proposed reject concentration plant would be undertaken during the decommissioning of the Tutuka Power Station. The necessary EMP, as required by the relevant EIA Regulations at that time, will address decommissioning impacts of the entire Tutuka Power Station, including the proposed reject concentration plant.

6 CONCLUSION

In conclusion it should be noted that the LEMP should be regarded as a living document and changes should be made to the LEMP as required by project evolution while retaining the underlying principles and objectives on which the document is based.

The compilation of the LEMP has incorporated mitigation measures from the EIAR as well as incorporating principles of best practice in terms of environmental management.

APPENDIX A
Curriculum Vitae of Environmental Assessment Practitioners

CURRICULUM VITAE

Name of Firm	:	Aurecon (Pty) Ltd	**Name of Staff**	:	Louise Corbett
Profession	:	Environmental Practitioner	**Year of Birth**	:	1981
Years with Firm	:	3	**Nationality**	:	South African

Membership in Professional Societies: Member of the South African affiliate of the International Association for Impact Assessment, (IAIAsa)

Key Qualifications:

Ms Corbett, an Environmental Practitioner in the Cape Town office has a Bachelors of Science (Hons) degree in Environmental and Geographical Science, specialising in Environmental Management, from the University of Cape Town. Louise has four years experience in the environmental field and has compiled and managed numerous environmental investigations including Environmental Impact Assessments, Environmental Management Plans and Environmental Management Programmes. Louise is a member of the South African affiliate of the International Association for Impact Assessment.

Experience Record:

1a) Regulatory Processes and Environmental Impact Assessment: *Impact Assessment:*

2010 - present	**Proposed Brine and Groundwater Treatment Works at Tutuka Power Station, Mpumalanga**	Project Staff
2009	**Proposed wind monitoring masts in Middelburg, Eastern Cape**	Project Staff
2009	**Proposed wind monitoring masts in De Aar, Northern Cape**	Project Staff
2009	**Proposed wind monitoring masts in Cookhouse, Eastern Cape Eastern**	Project Staff
2008-present	**Proposed Fisantekraal New Town Development**	Project Staff
2008-present	**Proposed Langefontein Windfarm, West Coast**	Project Staff
2008-present	**Proposed Coal-Fired Power Station in the Waterberg, Limpopo**	Project Staff
2008	**Proposed Subdivision of Farm Palmiet River No. 319, Elgin**	Project Staff
2008	**Proposed Sedgefield Off-Channel Dam, Sedgefield**	Project Staff
2007-2008	**Proposed Plant Extraction Facility in the Paarl Industrial Area, Paarl**	Project Staff
2007	**Proposed upgrade of fuel pipelines at the Cape Town International Airport.**	Project Manager
2006-2007	**Proposed rezoning of public open space (portion of Erf 10565) in Boston.**	Project Manager
2006-2007	**Proposed upgrade of N1 intersections near De Doorns.**	Project Manager

2006-2007	**Proposed development of the Ibhubesi Gas Field and associated infrastructure, West Coast, South Africa.**	Project Staff
2006-2007	**Proposed new regional landfill to service the City of Cape Town.**	Project Staff
2006-2007	**Proposed subdivision and rezoning of Erf 1366, Eerste River.**	Project Manager
2006-2007	**Proposed subdivision and rezoning of Erf 23300, Maitland (Royal Maitland Phase 3).**	Project Manager
2006-2007	**Proposed subdivision and rezoning of Erf 3410, Simon's Town.**	Project Manager
2006-2007	**Proposed subdivision and rezoning of Erf 1, Simon's Town.**	Project Manager
2006-2007	**Proposed Rocklands Eco Estate.**	Project Manager
2006-2007	**Proposed upgrade of facilities at the River Club, Observatory.**	Project Manager

1b) Regulatory Processes and Environmental Impact Assessment: *Mining and Oil and Gas Prospecting Applications:*

2007	**Proposed deepwater geophysical survey of the South African Continental Margin.**	Project Manager
2007	**Proposed 2D seismic survey in the Northern Block, offshore Namibia.**	Project Manager
2007	**Proposed borrow pits for the upgrade of road sections in the Central Karoo District.**	Project Manager
2006-2007	**Proposed borrow pits for the upgrade of road sections in the Overberg District.**	Project Staff
2006	**Proposed geotechnical survey in the Southern and Northern Blocks offshore Namibia.**	Project Manager
2006	**Proposed reseal of Trunk road 44/1, Main roads 401, 404, 368 and the upgrade of Divisional road 1834 and the development of an associated borrow pit near Uniondale.**	Project Manager

2) Environmental Management Plans:

2006	**Construction Environmental Management Plan for Sitari Fields Golf Estate, Firgrove/ Macassar.**	Project Staff

3) Institutional and Policy Development and Professional Review Services:

2007-2008	**Department of Economic Affairs Environment and Tourism Decision-making Support.**	Project Staff

4) Other:

2008	**Environmental Input to Sites for a Solar Cell Factory**	Project Staff
2008	**Environmental Sensitivity Study for the Proposed Fisantekraal New Town Development**	Project Staff
2006	**Exemption application for tow surfing in the Table Mountain Marine Protected Area.**	Project Staff

Countries of Work Experience: South Africa, United Kingdom, Canada

Education:
-BSc (Hons) Environmental Management, University of Cape Town, 2004.
-BSc Environmental & Geographical Science, University of Cape Town, 2003.

Employment Record:

2009 - present	Senior Environmental Practitioner, Aurecon (Pty) Ltd
2007- 2009	Environmental Practitioner, Ninham Shand (Pty) Ltd
2006-2007	Environmental Consultant, CCA Environmental (Pty) Ltd
2005- 2005	Systems Administrator, Morrison's Plc, London UK
2004- 2005	Customer Services Advisor, Barclays Bank Plc, London UK
2003-2004	Fairmont Gold Attendant, Fairmont Chateau Whistler, Whistler Canada
2003-2003	Practical Demonstrator to undergraduate Environmental and Geographical Science students, University of Cape Town

Languages: English (first), Afrikaans

CURRICULUM VITAE

Name of Firm	**:**	Aurecon (Pty) Ltd
Name of Staff	**:**	Allan Brett Lawson
Profession	**:**	Environmental Practitioner (Associate)
Year of Birth	**:**	1954
Years with Firm	**:**	7
Nationality	**:**	South African

MEMBERSHIP OF PROFESSIONAL SOCIETIES:

- Registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg No 400106/04).
- Certified as an Environmental Assessment Practitioner with Environmental Assessment Practitioners of South Africa (EAPSA).
- Member of the International Association for Impact Assessment South African Affiliate (IAIAsa). (Past President 2006/2007)
- Member of the Game Rangers Association of Africa (GRAA).

KEY QUALIFICATIONS:

Brett Lawson has a Masters degree in Environmental and Geographical Science, as well as diplomas in wildlife management, business management, environmental management and environmental auditing. He spent 12 years in wildlife management and research with conservation agencies in southern and South Africa, and nine years in the more holistic field of environmental management in the National Lake Areas and with Eskom. He was one of the founders in 1995 of Bohlweki Environmental, the first emergent environmental consultancy established in South Africa, and later started The Environmental Partnership which he relinquished in 2004 as a fully empowered environmental consultancy. He thus has considerable multi-disciplinary experience across the range of environmental sciences.

EXPERIENCE RECORD

1) Regulatory Processes and Environmental Impact Assessment:

2008	Project Director	**Environmental & Socio-Economic Impact Assessment for proposed NamPower coal-fired power station at Walvis Bay, Namibia** Appointed by NamPower to manage an Environmental & Socio-Economic Impact Assessment for a proposed coal-fired power station at Walvis Bay that includes a site screening and selection process, scoping study and ESEIA, supported by an EMP.

2008	Project Director	**Paratus Emergency Generation Facility in Walvis Bay, Namibia** Appointed as lead consultant to manage the environmental process in relation to a proposed 50MW Heavy Fuel Oil emergency electricity generation facility located in the industrial port area.
2008	Project Director	**Rössing Uranium Mine expansion project, Erongo Region, Namibia** Appointed by Rössing Uranium Limited to manage a comprehensive and multi-disciplinary EIA process for their Phase 1 mine expansion project.
2006	Project Manager	**Additional Units at the Open Cycle Gas Turbine Plant at Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to manage a comprehensive and multi-disciplinary EIA process for three additional gas turbine units at the peaking generation power plant at Mossel Bay.
2006	Consulting team member	**Melkhoutfontein Landfill Site, Stilbaai, Western Cape, South Africa:** Appointed by Hessequa Municipality to manage an EIA process for a new landfill site, in collaboration with GeoStatus Engineering Geologists.
2006	Project Manager	**Emergency electricity generation at PetroSA Refinery, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to undertake a Scoping Checklist submission for the temporary installation of three 22 MW portable open cycle gas turbine electricity generating plants within the PetroSA Refinery site at Mossel Bay. The objective of the installation was to augment electricity generation in the Western Cape until permanent open cycle gas turbine plants are brought on line at Mossel Bay and Atlantis.
2006	Project Manager	**Coal-fired Power Station and Associated Infrastructure in the Witbank Area, Mpumalanga, South Africa:** Appointed by Eskom to manage a comprehensive and multi-disciplinary EIA process for a new 5 400 MW base-load power plant and associated infra-structure.
2005	Project Manager	**Baden Powell Drive realignment project, Cape Town, Western Cape, South Africa:** Appointed by the City of Cape Town to undertake a Scoping Checklist submission, which includes an Environmental Opportunities and Constraints Report and comprehensive public participation, for the realignment of a Class 1 Expressway. The realignment is one of the City of Cape Town's Urban Renewal Programme projects.
2005	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to manage a comprehensive and multi-disciplinary EIA process for a new peaking generation power plant and associated infrastructure.
2004	Project Manager	**Helderstroom Prison upgrade, Caledon, Western Cape, South Africa:** Appointed by Dept of Public Works to undertake a Scoping-level EIA for new and replacement housing, recreational facilities and fuel station.
2004	Project Manager	**Kraaifontein residential development, Western Cape, South Africa:** Appointed by EGT Developers to undertake a Scoping Checklist submission for rezoned agricultural land.
2002	Project Manager	**Liesbeek River canal rehabilitation, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake an EIA for rehabilitation of Liesbeek River canal.

2002	Project Manager	**Blue Downs Police Station, Western Cape, South Africa:** Appointed by Dept of Public Works to undertake an EIA for a new police station.
2001-2003	Project Manager	**Table Mountain National Park's Glen, Boulders and Constantia Nek facilities, Cape Town, Western Cape, South Africa:** Appointed by SANParks to undertake IEM processes for redevelopment of tourist amenities.
2001	Project Manager	**Helderberg 132/11 kV substation, Western Cape, South Africa:** Appointed by Helderberg Municipality to undertake EIA for new substation.
2001	Project Manager	**Kuilsrivier housing development, Western Cape, South Africa:** Appointed by private developer to undertake EIA for Bardale Village economic housing project.
2000	Project Manager	**Hazeldean Housing Development, Western Cape, South Africa:** Provided pro bono service in undertaking EIA for community-based housing project.
2000	Project Manager	**Cape Town International Convention Centre, Cape Town, Western Cape, South Africa:** Appointed in association by private/provincial partnership to undertake EIA for new world-standard convention centre.
2000	Project Manager	**Saldanha - Vredenberg 66 kV powerline, Western Cape, South Africa:** Appointed by local authority to undertake EIA for new electricity distribution powerline.
2000	Project Manager	**Siemens cellphone mast sites, Western Cape, South Africa:** Appointed by service provider to undertake EIAs for third cellphone licence at seven mast sites.
2000	Project Manager	**Gordons Sports Institute, Western Cape, South Africa:** Appointed by private developer to undertake EIA for redevelopment of sports complex.
1999	Specialist on consulting team	**Gurue – Lichinga 110 kV powerline, Mozambique:** Appointed by Scandinavian development agency to apply specialist EIA methodology in undertaking of EIA for new electricity distribution network in northern Mozambique.
1999	Project Manager	**Cape Town International Airport Precinct 2, Cape Town, Western Cape, South Africa:** Appointed by Airports Company of South Africa to undertake EIA for industrial development on their landholdings
1999	Project Manager	**Kraaifontein urban development, Western Cape, South Africa:** Appointed by private developer to undertake EIA for mixed urban development in greenfield area.
1999	Project Manager	**Rooiels residential development, Western Cape, South Africa:** Appointed by private landowner to undertake EIA for new residence in coastal settlement.
1999	Project Manager	**Suikerbossie development, Hout Bay, Western Cape, South Africa:** Appointed by private developer to undertake EIA for redevelopment of restaurant and conference facility.

1999	Project Manager	**Milnerton Racecourse redevelopment, Cape Town, Western Cape, South Africa:** Appointed by private developer to undertake EIA for redevelopment of racecourse for mixed urban use.
1998	Project Manager	**Somerset Square development, Somerset West, Western Cape, South Africa:** Appointed by private developer to undertake EIA for development of new residential precinct.
1998	Project Manager	**Longbeach Mall, Noordhoek, Western Cape, South Africa:** Appointed by private developer to undertake EIA for development of new commercial complex.
1998	Project Manager	**Noree 66/11 kV substation, Western Cape, South Africa:** Appointed by local authority to undertake EIA for new substation in rural area.
1998	Project Manager	**Wynberg traffic alleviation study, Western Cape, South Africa:** Appointed by South Peninsula Municipality/Cape Metro Council to undertake EIA for proposed arterial bypass through heavily urbanised area.
1997	Project Manager	**Myrtle Grove Wine Estate, Western Cape, South Africa:** Appointed by private developer to undertake EIA for residential component and expanded processing facilities on wine farm.
1997	Project Manager	**Ottery/South/Constantia Road, Cape Town, Western Cape, South Africa:** Appointed by South Peninsula Municipality/Cape Metro Council to undertake EIA for proposed arterial route through heavily urbanised area.
1997	Consulting team member	**Vanguard Drive, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake IEM process for preliminary design of arterial road upgrading project
1997	Consulting team member	**Sheffield – Symphony Road, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake IEM process for new arterial road alignment.
1996	Consulting team member	**Blackheath transport interchange, Western Cape, South Africa:** Appointed by City of Cape Town to undertake IEM process for transport modal interchange at railway station and taxi rank.
1996	Consulting team member	**Kaalfontein residential development, Gauteng, South Africa:** Appointed by private developer to undertake EIA for new residential precinct in greenfield area.
1993	Environmental advisor	**Waenhuiskrans electricification, Southern Cape, South Africa:** Provided environmental sensitivity report for electrification of underdeveloped fishing village.
1992	Environmental advisor	**Knysna – Robberg 66 kV powerline, Southern Cape, South Africa:** Undertook EIA for new powerline through rural area.
1992	Environmental advisor	**Rietvlei – Plattekloof 132 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline in peri-urban area.
1992	Environmental advisor	**Kraaifontein – Scottsdene 66 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline peri-urban area.
1992	Environmental advisor	**Caledon – Jagersbos 66 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline through rural area.

1991	Environmental advisor	**Woodville – Wilderness 66 kV powerline, Southern Cape, South Africa:** Undertook EIA for new powerline through rural area.
1991	Environmental advisor	**Blue Downs – Firgrove 132 kV powerline, Western Cape, South Africa:** Undertook EIA for new powerline through peri-urban area.

2) Environmental Management Plans:

2006	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to compile an EMP for the construction of a new peaking generation power plant and associated infrastructure.
2005	Environmental Monitor	**Berg River Dam Project, Western Cape, South Africa:** Appointed by Berg River Consultants to stand in for the Environmental Monitor responsible for performance monitoring of the application of the EMP for a significant dam construction project.
2002-2004	Project Manager	**Chapmans Peak Drive road rehabilitation, Western Cape, South Africa:** Appointed by Provincial Government to apply EMP and manage environmental monitoring committee.
2003	Project Manager	**Cape Town International Convention Centre, Cape Town, Western Cape, South Africa:** Appointed in association by private/provincial partnership to compile and apply EMP for construction of new world-standard convention centre.
2001	Project Manager	**Saldanha Port service corridor bridge, Saldanha, Western Cape, South Africa:** Appointed by Provincial Government to compile and apply EMP for construction of new bridge.
2001	Project Manager	**Vredenberg - Saldahna Road, Western Cape, South Africa:** Appointed by Provincial Government to compile and apply EMP for construction of new dual-carriageway.
2001	Project Manager	**Stellenbosch Arterial Road, Western Cape, South Africa:** Appointed by Provincial Government to compile and apply EMP for construction of upgraded dual-carriageway.
1998	Project Manager	**Arabella Golf Course, Hermanus, Western Cape, South Africa:** Appointed by private developer to compile and apply EMP for construction of new golf course.
1996	Project Manager	**Vredenberg - Paternoster Road, Western Cape, South Africa:** Appointed by Provincial Government to compile EMP for resurfacing of road.

3) Institutional and Policy Development and Professional Review Services:

2006	Project Manager	**Independent review of EIA for golf course development, Plettenberg Bay, Western Cape, South Africa:** Appointed by Department of Environmental Affairs and Development Planning to undertake independent review of EIA documentation and process for Roodefontein golf course/ residential development.

2005	Project Manager	**Independent review of EIA for golf course development, Malmesbury, Western Cape, South Africa:** Appointed by Department of Environmental Affairs and Development Planning to undertake independent review of EIA submission for Mount Royal golf course/ residential development.
2002-2004	Consulting team member	**Independent review of EIA/EMP for Chapmans Peak Drive road rehabilitation, Cape Town, Western Cape, South Africa:** Appointed by Provincial Government to provide independent review and advisory service for planning, approval and construction of road rehabilitation.
2002	Project Manager	**Independent review of powerline EIA, Northern Cape, South Africa:** Appointed by Eskom to undertake independent review of Oasis - Kanoneiland 66 kV powerline EIA process and documentation.
1999	Project Manager	**Independent review of landfill EIA, Hermanus, Western Cape, South Africa:** Appointed by Arcus Gibb to undertake independent review of EIA for new regional landfill site.
1998 – 2000	Project Manager	**Independent review of electricity distribution EIAs, Western Cape, South Africa:** Appointed by Eskom to undertake independent reviews of EIAs for 10 electricity distribution powerlines.
1996	Project Manager	**Strategic review of Eskom's Annual Report, South Africa:** Appointed by Eskom's Distribution Group to review environmental component of annual report from a strategic point of view.

4) Assessment of Water Resource Developments and Catchment Management:

2002	Specialist on consulting team	**Port of Durban Master Plan, Durban, KwaZulu Natal, South Africa:** Appointed by National Ports Authority to undertake environmental component of Master Plan formulation for Port of Durban.
2002	Project Manager	**Liesbeek River canal rehabilitation, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake an EIA for rehabilitation of Liesbeek River canal.
2000	Specialist on consulting team	**Faunal study for Zoarvlei management plan, Cape Town, Western Cape, South Africa:** Appointed by Blaauwberg Municipality to undertake specialist faunal study for Zoarvlei management plan formulation.
1988	Warden/ Ecologist	**Wilderness National Park Management Plan, Southern Cape, South Africa:** Developed *Procedure for Dealing with Beached or Stranded Marine Mammals* as component of Wilderness National Park Management Plan.

5) Specialist Facilitation, Public Processes, Training and Social Surveys:

2005	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to undertake the public participation process for a comprehensive and multi-disciplinary EIA process for new peaking generation power plant and associated infrastructure.
2002	Project Manager	**Kalk Bay heritage assessment, Kalk Bay, Western Cape, South Africa:** Appointed by private developer to undertake the public participation process for redevelopment of New Kings and Majestic historic sites.

1998	Project Manager	**Krantzkop SEA, Wellington, Western Cape, South Africa:** Appointed by Somchem to undertake the public participation process for SEA of possible redevelopment of explosives manufacturing plant.
1997	Project Manager	**Wildevoelvlei waste water treatment plant, Western Cape, South Africa:** Appointed by City of Cape Town to undertake the public participation component of EIA for expansion of Wildevoelvlei treatment plant.
1996	Project Manager	**Bellville – Cape Town cycle path, Western Cape, South Africa:** Appointed by Cape Metropolitan Council to undertake the public participation process for proposed cycle path.

6) Environmental Planning:

2006	Consulting team member	**Alien Vegetation Eradication and Rehabilitation, Fancourt Estate, George, Western Cape, South Africa:** Appointed by Fancourt Golf and Country Estate to formulate an alien vegetation eradication and rehabilitation plan for their landholding on the Malgas River.
2005	Project Manager	**Taal Monument Security Fence, Paarl Mountain, Western Cape, South Africa:** Appointed by Dept of Public Works to formulate a Conservation Management Plan and construction guidelines for the erection of a new security fence around a cultural precinct.
2002	Specialist on consulting team	**Port of Durban Master Plan, Durban, KwaZulu Natal, South Africa:** Appointed by National Ports Authority to undertake environmental component of Master Plan formulation for Port of Durban.
2002	Specialist on consulting team	**Paarl Farms planning study, Western Cape, South Africa:** Appointed by Drakenstein Municipality to undertake biophysical component of forward planning study of farmland within Paarl urban area.
2002	Project Manager	**SEA for Lansdowne Road corridor, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake SEA for Lansdowne Road development corridor
2001	Specialist on consulting team	**Scenic Drive Network management plan, Cape Town, Western Cape, South Africa:** Appointed by City of Cape Town to undertake environmental component of Cape Town's Scenic Drive management plan formulation.
2001	Specialist on consulting team	**Avifaunal study for Paradyskloof powerline EIA, Western Cape, South Africa:** Appointed by Stellenbosch Municipality to undertake specialist avifaunal study for EIA process for Paradyskloof powerline project.
2000	Specialist on consulting team	**Faunal study for Zoarvlei management plan, Cape Town, Western Cape, South Africa:** Appointed by Blaauwberg Municipality to undertake specialist faunal study for Zoarvlei management plan formulation.

1998	Consulting team member	**Krantzkop SEA, Wellington, Western Cape, South Africa:** Appointed by Somchem as consulting team member for SEA of possible redevelopment of explosives manufacturing plant.
1998	Specialist on consulting team	**Conservation Management Plan for Krantzkop nature reserve, Wellington, Western Cape, South Africa:** Appointed by Somchem to formulate conservation management plan for landholdings surrounding explosives manufacturing plant, as component of SEA.
1995	Environmental advisor	**Salt River Powerstation decommissioning, Cape Town, Western Cape, South Africa:** Managed study of biological component for EIA of decommissioning of Salt River Powerstation.
1992-1994	Environmental advisor	**Fixed-point photographic monitoring, Western Cape, South Africa:** Undertook fixed-point photographic monitoring of revegetation of Gydo - Ceres 66kV powerline servitude.
1988	Warden/ Ecologist	**Wilderness National Park Management Plan, Southern Cape, South Africa:** Developed *Procedure for Dealing with Beached or Stranded Marine Mammals* as component of Wilderness National Park Management Plan.
1986	Ranger/ Ecologist	**Avifaunal monitoring, Southern Cape, South Africa:** Maintained individual locus lists for *A Checklist of the Birds of the Southern Cape.*
1982-1985	Ranger/ Ecologist	**Golden Gate Highlands National Park Management Plan, Free State, South Africa:** Undertook long-term ungulate population monitoring and maintained census records.
1981	Research technician	**Research methodology, Jonkershoek Research Station, Western Cape, South Africa:** Developed photomicrographic technique for carnivore scat analysis.
1980	Research technician	**Research methodology, Jonkershoek Research Station, Western Cape, South Africa:** Designed and applied collapsible fall-cage for carnivore capture.

7) Business/Corporate Environmental Services:

2003-2004	Consulting team member	**Environmental management system for toll road, Cape Town, Western Cape, South Africa:** Appointed by toll road operator to participate in design of EMS for Chapmans Peak Drive and implemented by means of Isometrix software application.
1997	Project Manager	**Environmental audits of landfill sites, Gauteng and Western Cape, South Africa:** Appointed by Waste-Tech to undertake audits of their landfill sites in Gauteng and Western Cape, South Africa.
1996	Consulting team member	**Environmental audit of Johannesburg International Airport, Gauteng, South Africa:** Appointed by Airports Company of South Africa to undertake an audit of land issues relevant to their international airport in Johannesburg.
1993-1995	Environmental advisor (team member)	**Environmental management system for electricity utility, Western Cape, South Africa:** Developed and initiated an EMS for Eskom's Cape Distributor, based on BS7750, ISO9000 and ISO14001.

1993-1995	Environmental advisor (team member)	**Environmental audits of electricity powerlines, Limpopo, Mpumalanga, Western Cape:** Undertook environmental audits of Eskom's Pietersburg - Phalaborwa and Palmiet - Mossel Bay transmission lines, as well as distribution lines in the Cape Distributor.
1993-1994	Environmental advisor (team member)	**Environmental audits of electricity substations, KwaZulu/Natal, Mpumalanga and Gauteng, South Africa:** Undertook audits of Eskom's Marathon, Venus, Foskor and Newcastle main transmission system substations.
1993	Environmental advisor (team member)	**Environmental audits of power stations, Gauteng, South Africa:** Undertook environmental audits of land issues relevant to Eskom's Arnot and Wilge powerstations.

8) Project Management:

2005	Project Manager	**Open Cycle Gas Turbine power plant, fuel supply pipeline, substation and transmission lines, Mossel Bay, Western Cape, South Africa:** Appointed by Eskom to project manage a comprehensive and multi-disciplinary EIA process for new peaking generation power plant and associated infrastructure.

COUNTRIES OF WORK EXPERIENCE:

Botswana, Mozambique, Namibia, South Africa.

EDUCATION:

TERTIARY

- MA in Environmental and Geographical Science, University of Cape Town, 1996.
- Diploma in Small Business Management, Potchefstroom University, 1989.
- BA in Geography, University of South Africa, 1985.
- Diploma in Nature Conservation and Wildlife Management, Pretoria Technikon, 1976.

IN-SERVICE TRAINING/ CONTINUING PROFESSIONAL DEVELOPMENT (* certificated)

Conservation management:

- Taxidermy
- Chemical immobilisation
- Skiboat Skippers licence *
- Restricted Marine Radio Operators licence *
- Herbicide application *

Business management:

- Personal computers *
- Management skills *
- Performance appraisal *
- Conflict management and mediation skills *

Environmental management:

- Negotiation skills *
- Integrated Environmental Management (UCT) *

- Study tour to Florida, USA (presented paper at EPRI conference & undertook research at electricity utilities)
- ISO 9000 Quality Management: Environmental Auditing*
- Architectural and Urban Conservation *

EMPLOYMENT RECORD:

2009 to date	Associate, Aurecon (Pty) Ltd, Cape Town, South Africa
2004 - 2009	Associate, Ninham Shand Consulting Services, Cape Town/George, South Africa
1998-2004	Director, The Environmental Partnership, Cape Town, South Africa
1995-1998	Chief Consultant, Bohlweki Environmental (Pty) Ltd, Cape Town, South Africa
1990-1995	Environmental Advisor, Eskom, Western Cape, South Africa
1985-1990	Senior Ranger/Warden, National Parks Board, Western Cape, South Africa
1982-1985	Ranger, National Parks Board, Free State, South Africa
1980-1982	Research Technician, Department of Nature and Environmental Conservation, Western Cape, South Africa
1975-1980	Conservator, Department of Nature and Environmental Conservation, Western Cape, South Africa
1974-1975	Game Ranger, Limshapo Game Conservation Syndicate, Botswana
1973	Field Technician, Mineral Services (Pty) Ltd, Namibia

LANGUAGES:

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

PAPERS AND PUBLICATIONS:

Lawson, A B 1997. Applying Sector-specific EIA Methods*: Lessons Learnt from Large Linear Developments*. Proceedings of the annual conference of the South African chapter of the International Association for Impact Assessment, Kwamaritane, September, 1997.

Lawson, A B 1996. *Environmental Impact Assessment in the Routing of High Voltage Overhead Transmission Lines: Theory and Practice in South Africa*. Unpublished MA Dissertation. University of Cape Town, 1996.

Lawson, A B 1995. *Environmental Impact Assessment within the Power Utility Industry in South Africa: the Distribution Group Perspective*. Proceedings of the 15th annual International Association for Impact Assessment conference, Durban, June 1995.

Lawson, A B 1993. *Monitoring Wildlife and Powerline Interactions in the Fynbos Biome*. In *Monitoring Requirements for Fynbos Management*, Marais, C & Richardson, D M (eds), Programme Report Series No. 11, FRD. (Short communication)

Lawson, A B & Wyndham, M J 1992. *A System of Monitoring Wildlife Interactions with Electricity Distribution Installations in a Supply Region of the Cape Province in Southern Africa*. Proceedings of the EPRI International Workshop on Avian Interactions with Utility Structures, Miami, Sept. 1992.

Earle, R A & Lawson, A B 1988. *An Annotated Check List of the Birds of the Golden Gate Highlands National Park*. Koedoe 31: 227-243.

Norton, P M, Lawson, A B, Henley, S R & Avery, G 1986. *Prey of leopards in four mountain areas of the south-western Cape Province*. S Afr J Wildl Res 16: 47-52.

Norton, P M & Lawson, A B 1985. *Radio tracking of leopards and caracals in the Stellenbosch area, Cape Province*. S Afr J Wildl Res 15: 17-24.

Lawson, A B 1982. *Notes on the mammals of the Gamka Mountain Reserve, Cape Province*. Bontebok 2: 1-8.