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CLOVER SA (PTY) LTD
PROPOSED ABSTRACTION OF WATER FROM THE
UMHLATUZANA RIVER
ENVIRONMENTAL MANAGEMENT PROGRAMME
(EMPr)



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1. INTRODUCTION

Metamorphosis Environmental has been appointed by Clover SA Pty Ltd (Clover) to prepare an environmental management programme (EMPr) for the proposed abstraction of water from the uMhlathuzana River for use in their processing plant.

Clover S.A. (Pty) Ltd (Clover) is undertaking a Water Use License Application (WULA) process to secure approval from the Department of Water and Sanitation, KwaZulu-Natal office, for the abstraction of water from the uMhlathuzana River to supply the Queensburgh facility located at 100 Richmond Road, Northdene (Queensburgh facility). The Queensburgh facility, processes approximately 63% of Clover's raw milk.

This EMPr has been requested by the Department of Water and Sanitation as part of the Water Use Licence Application (WU39285).

The Clover Queensburgh facility currently sources its water from the eThekweni Metropolitan Municipality, averaging approximately 100 000 m³ per month. This water plays an essential role in the production processes, particularly in the manufacturing and packaging of dairy products, beverages, and other consumables that Clover supplies to the market. However, Clover recognizes the importance of managing this water efficiently to support sustainable resource use and maintain compliance with environmental regulations.

Clover is committed to ensuring that water usage is both efficient and beneficial at every stage of its operations. Approximately 80% of the water used during production is recovered in the form of effluent, which undergoes treatment before being discharged into the uMhlathuzana Wastewater Treatment Works (WWTW), as per the current agreement with the municipality regarding effluent discharge. During this process, fats, oils, and grease (FOG) are removed to reduce the burden on downstream infrastructure, preventing unnecessary pollution of water bodies and optimising the performance of the WWTW.

Clover's water management efforts are further embedded within the Clover Green Initiative, which reflects the company's commitment to sustainability across all operations. Key components of this initiative include:

- Monitoring water usage across facilities to identify inefficiencies and areas for improvement.
- Setting targets for water consumption reduction through optimized processes and technology upgrades.
- Minimising water wastage through staff training and continuous evaluation of operational processes.
- Engaging with supply chain partners to promote sustainable practices and reduce environmental impacts across the value chain.

Clover's efforts contribute directly to national goals on efficient water usage and environmental protection, reducing unnecessary pressure on water resources. The company aims to achieve long-term improvements in water conservation and has embedded these principles within its corporate strategies and day-to-day operations.

However, there is currently significant pressure on the Municipal supply in the area and in order to reduce pressure on the Municipal Services and also ensure sustainable supply of water to the plant, Clover is applying for a licence to abstract water from the uMhlathuzana River to use in the processing plant.

2. PROJECT DESCRIPTION

The project involves the proposed abstraction of 1 500 000m³ per annum of water from the uMhlathuzana River in Queensburgh, KZN. As part of this work Clover will be installing a Concrete Mass Gravity Abstraction Weir to facilitate abstraction of water from the uMhlathuzana River.

Abstraction will be via direct pumping which will take place in the pool created upstream of the weir (as per the engineers' recommendations and designs) to draw water from the river and transfer it via pipeline (above ground) into the treatment works for use in the plant.

Clover will also be installing a water treatment plant to treat the water to an appropriate standard for use in their processes. After use, about 70 to 80% of this water will go through a further treatment process to remove fats, oil and grease (FOG) before discharge to the uMhlathuzana WWTW.

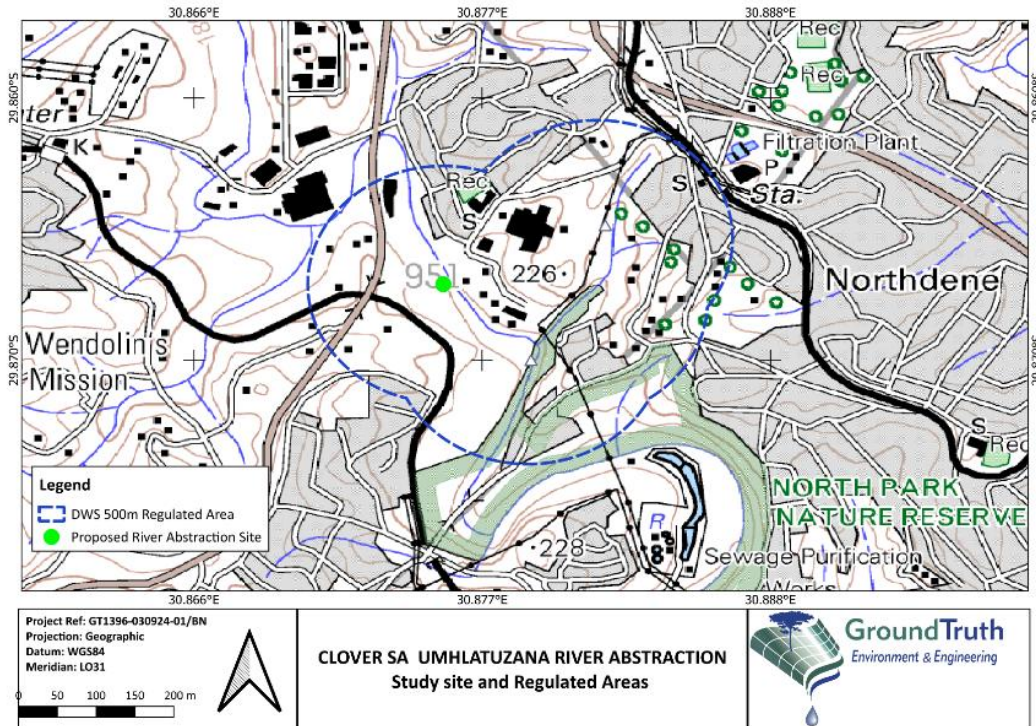


Figure 1 Location Map of the site.



Figure 2 Proposed Developments associated with the abstraction of the water on the Clover Site.

Treatment Plant Process

The feed water from the river will be pumped through basket strainers, which will remove larger suspended solids from the feed and filter the water. From the strainers, the feed will be dosed with a suitable oxidant and proceed to the settling tank, which allows for settling of heavy suspended solids such as sand. This is especially important during flooding conditions in the river when suspended solids loads will be high.

The settling tank overflow will be dosed with coagulant to destabilize and neutralize the charged particles in the water, allowing for floc formation, which will aid in achieving more effective settling. The coagulated feed will then proceed to the rapid mixing tank, to ensure adequate chemical mixing. The overflow from the rapid mixing tank will be dosed with flocculant which will ensure that the flocs formed by coagulation, will agglomerate. This further enhances the settling efficiency of the suspended solids. The coagulated and flocculated feed will then proceed to the slow mixing tank, which will allow enough retention time to ensure proper floc formation and distribution. From the mixing tanks the feed will proceed to the dissolved air flotation (DAF) for the removal of mainly algae, and some particulate COD and suspended solids.

The DAF overflow will be sent to the clarified water tank, from where the water will be pumped to the media filters, for final removal of residual suspended solids. At this point the water will be close to potable standard, but due to the detectable amounts of untreated sewage in the water, there is a risk of micro pollutants in the water that can have adverse effects on human health. These micro pollutants (also known as Compounds of Emerging Concern, CECs) include hormones, pharmaceuticals, pesticides, herbicides, etc. and are notoriously difficult to remove from water. A UV-Hypochlorite Advanced Oxidation Reactor (AOR) will be specifically designed for this application.

Following the AOR, the clean water will be stored in the product tank and be continuously disinfected by the in-tank UV, for further distribution and use.

Chemicals to be used in the process will be a flocculant, coagulant and oxidant for clarification and AOR feed.

All plant waste, including backwash, DAF Sludge and DAF scum will be sent to Clover's effluent treatment plant for disposal.

2.1 Site Description

A vegetation study undertaken by P LeRoux in 2020 states that the abstraction point will be located in KZN Coastal Belt Thornveld - (SANBI BGIS (2014) – this is classified as Vulnerable – nominally protected. The area is designated as CBA Irreplaceable. The sensitivity screening tool indicates that the area has a very high sensitivity (terrestrial biodiversity combined) and Medium sensitivity for plant species (11 sensitive species potentially occurring in the area). However, the site visit identified the northern banks of the Mhlatuzana River as dominated by large alien tree species with indigenous woody species being sparse. The river bank and floodplains were dominated by alien species. The site was therefore found not to be representative of KZN Coastal Belt Thornveld. However, the river is an important wetland system and has value as a DMOSS corridor and ecological support area.

There are considerable opportunities for improvement of the environment as a result of this project, including management of aliens and rehabilitation with indigenous species.

According to the faunal report by Harvey Ecological undertaken in January 2021, the abstraction point is located in an area considered to be a Threatened ecosystem – KwaZulu Natal Coastal Belt (CB3), in an

area designated as D'MOSS. The remainder of the infrastructure falls within the existing parking area on the site, with no habitat impacts envisaged.

Care will need to be taken when constructing the abstraction infrastructure and associated pipelines in the sensitive habitats on the site. Threatened species such as the Kwazulu Dwarf chameleon, spotted Shovel nosed frog, several smaller mammals and a number of bird species may occur in this area.

A riverine and wetland assessment was undertaken for a proposed expansion in 2020, and the uMhlatuzana River, on which the abstraction point will be situated, was noted to be an alluvial perennial River, comprising a macro channel with an active channel, isolated bars and an alluvial flood bench. The macro channel is confined by steep sided banks and valley slopes. The riverine ecosystems were found to be seriously modified (PES). However, the river does offer some ecosystem services due to the vegetated flood benches offering some sediment trapping and attenuation benefits. Ecological Importance and Sensitivity (EIS) of the river was deemed to be moderate, due to the moderately important ecological corridor and refuge for freshwater biota and provision of flood attenuation. It was recommended that a 50m buffer should be kept around the river. Care will have to be taken in this buffer area.

An updated aquatic assessment at the proposed abstraction point was undertaken for the purposes of the WUL application, in 2024. The instream habitat was found to be fair – to borderline poor, with impacts of sedimentation due to erosion and deposition and sand mining activities upstream of the site. Water quality was compromised by sewage inputs and solid waste in the river. Riparian habitat was also found to be fair to poor due to erosion and alien vegetation infestation. Water quality was noted to be significantly impacted by sewage with high levels of ammonia and *eColi*. Benthic diatoms and aquatic macroinvertebrates were both found to be in a seriously modified state. '

The report summarises that *'Given the current largely to severely modified state of the uMhlatuzana River, the unlikely presence of pollution sensitive aquatic species, and the value of the river system to the DMOSS, the uMhlatuzana River is considered a moderately sensitive ecosystem. Any additional disturbances could result in critical degradation of the system, which should otherwise be managed to an improved ecological state.'*

The wetland verification study undertaken by GroundTruth in 2024 verified that there are no wetlands hydrologically linked to the proposed abstraction site.

3. SCOPE AND OBJECTIVES OF THE EMPr

The objective of the EMPr is to provide practical, economically viable and sustainable environmental management measures for those aspects of the project that have the potential to impact negatively on the receiving environment. The implementation of the recommendations within the EMPr will minimise the overall negative impacts and assist in improving the operation of the site. Also, it will ensure compliance with the applicable legislation and guidelines.

This EMPr provides a detailed plan specifying actions to be performed in specific areas, as well as general principles that should be implemented by the operator to adequately address the environmental management of this site.

Documents consulted for the purposes of compiling this EMPr included:

- Harvey Ecological, January 2021, Fauna Biodiversity Assessment for the Proposed Clover Queensburgh Expansion Development.

- P LeRoux, December 2020, Vegetation Assessment, Phase 1 Investigation, Application for Expansion of Infrastructure into DMOSS Designated Areas, Clover Dairies.
- R Edwards, February 2021, Proposed Clover Facility Expansion: River and Wetland Baseline Assessment
- GroundTruth, September 2024, Clover SA (Pty) Ltd WULA Aquatic Assessment (Amended 2025).
- GroundTruth, December 2024, S27 Motivation WU39285 GroundTruth.
- GroundTruth Risk Assessment Matrix v2 updated July 2025.
- GroundTruth, April 2024, Clover SA Borehole and uMhlatuzana River abstraction – Wetland Verification (Draft Report).
- SRK Consulting, August 2021, Hydrogeological Assessment for Clover SA, Queensburgh.

4. RESPONSIBILITIES OF THE TEAM

4.1 The Site Manager

Responsibilities of the site manager are as follows:

- To ensure that all staff on site are aware of the EMPr requirements and therefore know their responsibilities;
- To monitor that the activities undertaken on site comply with the environmental requirements;
- To ensure that there is an emergency procedure in place and that staff are aware of the assembly points etc;
- Be familiar with the recommendations and mitigation measures of this EMPr,
- Implement these measures; and
- Monitor site activities for compliance.

4.2 Responsibilities of Contractor

Responsibilities of the contractor are as follows:

- Familiarize themselves with and understand the content of the EMPr;
- Ensure that their employees understand what is expected during the undertaking of activities on site;
- Ensure compliance with applicable Occupational, Health and Safety Act (Act 85 of 1993) and Hazardous Substances Act (Act 15 of 1973);
- Notify the Site Manager of any activities undertaken which may have a negative impact on the environment;
- Ensure that the EMPr is available on site at all times;
- First aid box, emergency procedure and numbers to be contacted in case of urgency must be made known to all people working on site; and
- Ensure that each activity has a method statement, which provides detail on how the works will be conducted on site.

4.3 Responsibilities of CLOVER

Responsibilities of Clover are as follows:

- Ensure that employees and contractors are fully aware of, and understand the environmental management measures and why it is necessary to comply with them;
- Ensure compliance with the conditions of the EMPr;
- Ensure that monitoring is undertaken; and

- Notify the competent authority and other stakeholders in the event of any accidental infringements of the EMPs and to take appropriate remedial action as required by the competent environmental authority.

5. DETAILS OF THE EAP WHO COMPILED THE REPORT

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Years' experience	35 years
Professional Affiliation	International Association for Impact Assessment (SA), EAPASA Certified, IWM, PrSciNat.
Areas of expertise	EMPs, Auditing, Legal Advisory, EIA, environmental awareness training, facilitation, waste management licence applications etc.

6. IDENTIFICATION OF ENVIRONMENTAL IMPACTS

The following environmental impacts could potentially result from the proposed development:

6.1 **Key Negative Impacts (without Mitigation)**

Construction impacts

- Pollution of water resources and loss of biodiversity and habitat;
- Siltation of the instream and/or riparian zones, and related water pollution and loss of biodiversity and habitat; and
- Modification of the river bed and banks and related loss of biodiversity and habitat.

Construction will entail the operation of machinery within the instream and riparian zones to undertake earthworks, construction of a weir and pumphouse and laying of the pipeline.

- Operation of machinery may result in some degree of water pollution from hydrocarbons and greases, whilst movement within the river bed and corridor will result in habitat disturbance, and exposure of soils on the riverbank to erosion.
- Earthworks, construction of the weir and pumphouse, and laying of the pipeline will result in localised disturbance in the riparian zone, further siltation of the instream habitat and altered water quality through increased turbidity and suspended solids, thereby affecting habitat characteristics and aquatic biota utilising the river.
- Notwithstanding, the construction period is likely to be of short duration (< 12 months) and will be confined to small working area within the river bed, and a defined route between the river and the Clover facility.

Operational Impacts

- Alteration of hydrological regime of the river
- Alteration of habitat characteristics of the river

The primary activity of the operation phase is the abstraction of water from the uMhlatuzana River for utilisation at the Clover facility.

- Given the present-day flow in the system (710 l/s and 135 l/s in summer and winter, respectively), and assuming a worse-case scenario of maximum abstraction (47.5 l/s), this is unlikely to result in over-abstraction of the current available flow.
- According to the hydrological assessment (GroundTruth, 2025b), the presence of the instream weir will not result in modification of 2-, 5-, 10-, 20-, 50-, 100-year flood peak events. In addition, the presence of the abstraction weir does not result in significant backflooding and will not lead to flood inundation of existing property boundaries (GroundTruth, 2025b). Notwithstanding, changes to the habitat characteristics, and related aquatic biota, and overall integrity of the river at this site may still occur due to inundation at the weir itself and backflooding of the macro channel.
- To address base flow concerns, a spillway height of 1 m above the active channel was selected through an iterative design process to act as a low-head weir providing enough head for the abstraction requirements, whilst still allowing base flows to pass the structure (GroundTruth, 2025a). The weir was specifically designed such that flows exceeding the 1 m overflow depth of the weir will behave closer to natural flow conditions, with sedimentation, erosion, etc occurring uninfluenced by the weir (GroundTruth, 2025a). Normal flow conditions of the river are unlikely to have a significant impact on the integrity of the river and the downstream environment. Ecological changes may still manifest potentially during the winter months during very dry cycles (e.g. drought periods).
- The ecological water requirements (EWR) (or ecological reserve) for this river system have not been determined, thus the impact of direct abstraction is given at low confidence.

6.2 Positive Impacts

- Security of employment and dairy product supplies due to reduced risk of water supply interruptions
- More Municipal water available for other users;
- Temporary employment opportunities;

6.3 Risk Assessment

The Table below is taken from the GroundTruth Aquatic Assessment Report undertaken for the WULA in 2024 (updated 2025). It relates to the abstraction of the water, which is the predominant risk from a pollution perspective during construction and Water Use perspective during operation.

Information gaps identified are as follows:

- The exact location of the proposed abstraction weir is yet to be confirmed based on suitable founding bedrock, to be determined through a geotechnical survey.
- The abstraction volume has not been approved at the time of conceptual design of the weir. Therefore, the design of the abstraction works is undefined. It is assumed that abstraction will be via direct pumping which will take place in the pool created upstream of the weir.

Due to several uncertainties, the following assumptions were made during the assessment of risks:

- A Concrete Mass Gravity Abstraction Weir is the selected infrastructure option to facilitate abstraction of water from the uMhlatuzana River.

- Abstraction will be via direct pumping which will take place in the pool created upstream of the weir. Should alternative designs and methods of abstraction be pursued, this aquatic assessment may need to be revised.
- Construction would entail an above ground pipeline, following the most direct route between the indicated abstraction point and the Clover SA boundary fence, and a pumphouse close to the river margin.
- The worst-case scenario was assessed, i.e. the maximum amount of water (1 500 ML/a) will be abstracted solely from the uMhlatuzana River. This equates to an abstraction rate of 4.1 ML/d, or 47.5 l/s.
- Water will be abstracted on a daily basis and throughout the year. There is no foreseen end-date for this activity.
- There will be no return or discharge of water (used, treated or untreated) from the Clover facility back into the uMhlatuzana River.
- The bioregion is considered to be the Indian Ocean Coastal Belt, with the reference benchmark vegetation being the KwaZulu-Natal Coastal Belt. This region has been classified as 'Endangered', due to the lack of protection it receives (SANBI, 2018). Riverine ecosystems are nested within these terrestrial ecosystems.
- The aquatic ecoregion encompassing the study area is considered to be the North Eastern Coastal Belt (17.01) (Kleynhans *et al.*, 2005).
- The terrestrial area surrounding the study site, as well as the south-eastern tributary of the uMhlatuzana River, are considered to be of low sensitivity, as indicated in the national screening tool¹ created by the Department of Forestry, Fisheries and Environment (DFFE) under the Aquatic Biodiversity theme. Conversely, the main uMhlatuzana river system itself is considered highly sensitive.

The following limitations apply to the assessments undertaken for the WULA aquatic assessment report:

- Only freshwater ecosystems within 500 m of the riverine abstraction point were considered in this study.
- Only freshwater ecosystems that would be primarily impacted upon by the riverine abstraction were sampled and investigated in detail, i.e. the uMhlatuzana River
- Although the desktop study was conducted using the latest available datasets, these sources do not always provide an accurate account of the site conditions at the exact moment the desktop study is conducted.
- All assessments undertaken were based on the impacts that were noted during the time of the site visit. Should onsite conditions change, these assessments may not necessarily reflect such changes.
- Information presented in this report is based on a single site visit undertaken on the 4th of April 2024 (i.e. during Autumn). The natural long-term seasonal variations of the water quality determinants and associated biota are therefore limited.
- Rivers are naturally dynamic systems that respond to disturbances caused by floods, thus the instream and riparian conditions can vary over time, however, these variances are also skewed by land transformation in catchment areas upstream.
- A full riparian delineation exercise was not undertaken during this study, given the exploratory nature of the work. A detailed delineation and risk assessment will likely be required for the license application process once more information is available.
- Due to the paucity of information regarding the proposed development activity, the risk assessment is based largely on assumptions of what can be expected for a development of this nature, and correspondence with the Clover SA representative.

¹ <https://screening.environment.gov.za/screeningtool/#/pages/process>

- This study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of survey undertaken. This study is, however, considered to be the most accurate and up to date assessment of the riverine and associated habitat present within the study area, and should be used to inform the decision-making processes of the relevant authorities.

Summary of Risk Assessment Ratings for the Construction and operational phases, with and without mitigation intervention.

Phase	Activity	Impact	Risk Ratings
CONSTRUCTION (unmitigated)	Operation of machinery	Pollution of water resources and loss of biodiversity and habitat	L
	Earthworks, construction of weir, pumphouse and laying of pipeline	Siltation of instream and riparian zones, and related water pollution and loss of biodiversity and habitat	M
		Modification of main channel of flow, altering flow dynamics and habitat characteristics at the site	L
CONSTRUCTION (mitigated)	Operation of machinery	Pollution of water resources and loss of biodiversity and habitat	L
	Earthworks, construction of weir, pumphouse and laying of pipeline	Siltation of instream and riparian zones, and related water pollution and loss of biodiversity and habitat	L
		Modification of main channel of flow, altering flow dynamics and habitat characteristics at the site	L
OPERATIONAL (unmitigated)	Abstraction of water	Alteration of hydrological regime and habitat characteristics	M
OPERATIONAL (mitigated)	Abstraction of water	Alteration of hydrological regime and habitat characteristics	L

The aim of this EMPr is to reduce the likelihood and significance of these risks.

7. ENVIRONMENTAL GUIDELINES AND OBJECTIVES

In order to meet the commitments detailed within the environmental specifications of this EMPr, objectives and targets must be set and conform to, and comply with, the following criteria:

- The objectives and targets must constitute the overall goals for environmental performance identified in the environmental policy and strategy;
- When establishing objectives and targets, the contractor must take into account the identified environmental aspects and associated environmental impacts, as well as the relevant findings from environmental reviews and/audits; and
- Objectives must be reviewed from time to time in view of changed operational circumstances and/or changes in environmental legal requirements, and shall also take into consideration the views of interested and affected parties (I&APs).

The objectives of this EMPr are to minimize the impacts of construction and operation of the water abstraction and treatment activities on the receiving environment and to maximise any potential opportunities associated with the project.

7.1 Legislative Framework

This EMPr informs the contractor of his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by the activity.

The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project.

7.2 Applicable Legislation and Standards

The Contractor must comply with all South African national and provincial environmental legislation, and associated regulations applicable to the project. The list of applicable legislation provided below is intended to serve as a guideline only:

- The Constitution of the Republic of South Africa Act 108 of 1996;
- National Environmental Management Act 107 of 1998;
- National Environmental Management: Protected Areas Act 57 of 2003;
- National Environmental Management: Air Quality Act 39 of 2004;
- National Environmental Management: Waste Management Act 59 of 2008;
- Health Act 63 of 1977;
- Occupational Health and Safety Act 85 of 1993;
- Conservation of Agricultural Resources Act No. 43 of 1983;
- National Environmental Management: Biodiversity Act 10 of 2004;
- National Water Act 36 of 1998; and
- Hazardous Substances Act 15 of 1973.
- eThekweni Bylaws.

The Contractor must establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

8. GUIDELINES FOR ENVIRONMENTAL MANAGEMENT

8.1 PLANNING PHASE

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
On-site Documentation	The Project Applicant must ensure that a copy of this EMPr is available on site at all times.	Project Applicant	At all times	Duration of the project	ECO
Authority consultation	Consultation must take place with KZNW, DAFF and BMD prior to any disturbance of natural vegetation/streambanks to determine whether there are any sensitive/protected species to be affected. This will include protected fauna. Liaison with EKZNW must be undertaken during project planning due to proximity to the North Park Nature reserve. Irene Hatton – ihatton@kznwildlife.com	Project Applicant	Once off	As soon as the location of the pipeline, abstraction point and pumphouse are decided.	ECO
Appointment and Duties of Environmental Control Officer	An Environmental Control Officer (ECO) must be appointed 1 week prior to the commencement of the construction activities. The ECO must monitor the site, preferably twice monthly, for the duration of the construction period. A monthly audit report should be prepared for the Project Applicant, by the ECO. The ECO must keep records relating to the compliance/ non-compliance with the conditions of the WUL and EMPr. ECO has the responsibility to conduct environmental training to contractors and site managers to ensure that they understand their role in environmental management.	Project Applicant	Once off Twice monthly Monthly	1 week prior to commencement of construction	ECO
Public Liaison	Not required unless specified in the WUL.	Project Applicant	Once off	Prior to commencement of construction	ECO
Location of site camp/offices	The site manager and the ECO must decide on the appropriate location of the construction camp/site office prior to moving on to the site. This must be located in a previously developed area of the site.	Site Manager/ECO	Prior to commencement of construction	Prior to commencement of construction	ECO
Ablutions	Potable water must be available at all times at various points within the site. Where waterborne sewerage is not available (ie at the abstraction point/pipeline area) a reputable company, approved by the Site Manager, must provide portable chemical toilets. Such toilets must be available for all staff. Toilets must be no closer than 50m from any natural water body watercourses (Section 1 (24 and 29) National Water Act (36 of 1998)) and must be serviced regularly. The chemical toilet must be situated out of the 1:100 year flood line of any watercourse.	Site Manager	At all times	Prior to commencement of construction/ongoing	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	The construction of long drop toilets is forbidden. Staff must be instructed not to use any other areas within the site for ablutions. A maintenance plan must be created for the servicing of the toilets.				
Solid Waste Management	Appropriate waste disposal receptacles must be placed within the construction areas, camps/site offices. All contractors must be made aware that they will be required to remove all their waste from site and dispose of it legally and that the site manager or the ECO may request to view the safe disposal certificates. Recycling and the provision of separate waste bins for different types of waste should be encouraged. Hazardous and general waste will be stored separately in appropriately marked containers, and hazardous waste in bunded areas.	Site Manager	At all times	Prior to commencement of construction/ongoing	ECO
Pollution	Any sources or potential sources of pollution must be identified by the Site Manager and appropriate measures must be taken to prevent any pollution of the environment. A stormwater management plan must be drawn up prior to commencement of the project.	Site Manager	As required	Prior to commencement of construction/ongoing	ECO
Hazardous Materials	Potentially hazardous materials (if any) must be identified before being brought to the site. Safety Data Sheets must be available on site for all hazardous substances. Hazardous substance storage and refueling areas must be bunded and lined (impermeable). These storage areas must be clearly sign posted as such and access must be strictly controlled. Emergency procedures for the handling of such substances during incidents must be available on site. Staff working with such substances must be trained and be competent to deal to emergency situations A spill kit must be available on site prior to construction taking place.	Site Manager	As required	Prior to commencement of construction/ongoing	ECO
Worker Conduct	The site manager and any contractors must understand the contents of this EMPr and be proved competent in implementing its requirements. Construction workers must be made aware of their specific responsibilities in terms of environmental impacts i.e. controlling noise levels, reducing dust. Construction workers must be made aware that : - no alcohol or drugs will be allowed on site and no workers under the influence will be permitted on site. - no firearms or traditional weapons will not be allowed on site. - no fires will be permitted on site.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	All construction vehicles must be fitted with standard silencers and must be inspected and be found to be at an acceptable standard of maintenance before accessing site.				
Pipeline Routing	The location of the abstraction point and choice of pipe route should take into account minimum disturbances to the environment (vegetation, soils etc). The appropriate buffers must be demarcated around the sensitive riverine and vegetation areas.	Site Manager	As required	Prior to commencement of construction/ongoing	ECO
Access Roads	All temporary access roads must be planned and approved by the Site Manager and ECO ahead of construction activities and must not be created on an ad hoc basis. Roads must have as little disturbance as possible – the access to the river must be carefully located and designed to minimize disruption of the natural environment. No trees/shrubs/groundcover may be removed or vegetation stripped without the prior permission of the ECO. Contractors must construct formal drains on all temporary roads in the form of side drains and mitre drains to prevent erosion and point source discharge of run-off. All roads must allow for the natural movement of water where required.	Site Manager	As required	Prior to commencement of construction	ECO
Survey points	Roads or trails that are cut to provide temporary access for survey work must be minimized. Marking of survey points must have the Site Manager's approval. Vegetation clearing must be kept to a minimum during survey operations.	Site Manager	As required	Prior to commencement of construction	ECO
Contractor camp site selection	The Contractor is to adhere to the following when selecting a site for storage of equipment and materials: - Choose as level an area as possible (gradients must not exceed 1:3); - Avoid locating the site within 50m of a hydrological feature (Section 1 (24 and 29) National Water Act (36 of 1998)); - Locate the storage site within an already disturbed area; The site selected must be approved by the ECO. If the ECO is not satisfied with the proposed site, alternative sites must be proposed and discussed with the ECO until a compromise is reached that is mutually acceptable. The extent of the storage site must be defined and fenced off and all activities must be confined within this area. The ECO must agree to any extension or change in location of the storage site. The storage site is to be maintained in a neat and orderly state at all times. Provision must be made for adequate cooking and ablution facilities at the site. Gas or electricity must be used for cooking purposes to avoid the use of fires and potential stripping of the surrounding vegetation for fuel.	Site Manager/ECO	As required	Prior to commencement of construction	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
Materials Management	Contractors must prepare a source statement indicating the sources of all materials (including topsoil, sands, natural gravels, crushed stone etc.) and submit these to the Site Manager for approval prior to the commencement of any work. A signed document from the supplier of natural materials must be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation.	Site Manager/ECO	As required	Prior to commencement of construction	ECO
Flora and Fauna	A detailed flora/fauna assessment of the pipeline route and pump house location must be undertaken prior to finalization. A rehabilitation plan must be developed – this must include the assessment of the presence of sensitive/vulnerable species of animals and plants which require specific management (relocation etc) prior to commencement of construction. This must include inter alia the Kwazulu Dwarf chameleon, spotted Shovel nosed frog. Relocation of smaller protected and conservation important plants and animals must be undertaken prior to commencement of any earthworks. Sufficient budget must be allowed by the contractor for plant rescue prior to vegetation clearance, alien plant control and rehabilitation post construction. The contractor must undertake environmental awareness training for all employees. This should include basic environmental training based on the requirements of the EMP, including training on avoiding and conserving local wildlife. All permissions and permits for the removal of vegetation must be in place before commencement of construction activities. Protected tree species to be removed or cut must be approved through the DAFF permitting process. Vegetation not to be removed must be clearly marked beforehand with chevron tape. The vegetation specialist must be given time to identify vegetation that is not to be removed before the contractor begins clearing the site. Communication and approvals from eThekweni Municipality's environmental division and KZNW must be undertaken prior to construction.	Site Manager/ecological specialist	As required	Prior to commencement of construction	ECO
Aquatic Environment	Best practice methods in favour of minimal environmental disturbance in terms of the design of instream infrastructure, as per the conceptual weir design proposed GroundTruth (20205b) and related infrastructure (e.g. buried pipeline crossings vs elevated pipeline crossings) must be adopted The location of the weir, pipeline and pumphouse, materials storage, ablutions. Site camp etc must be decided in conjunction with the ECO and riverine specialists in order to reduce impacts on aquatic and terrestrial environments. Where possible no activities other than abstraction point, pipeline and pumphouse must be located within 100m of the river.	Site Manager/ECO	As required	Prior to commencement of construction/ongoing	ECO
Social Impacts	Construction activities must be limited Mondays to Fridays 07h00 to 18h00 on weekdays only unless otherwise approved in writing by the ECO in consultation with adjacent landowners.	Site Manager/ECO	As required	Prior to commencement of construction/ongoing	ECO

8.2 CONSTRUCTION PHASE

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
Site Access	The Contractor is to ensure that all access roads are maintained in good working condition by attending to potholes, corrugations and storm water damage as soon as these develop. No vehicles will use routes other than approved access. If necessary staff must be employed to clean surfaced roads adjacent to construction sites where materials have been spilt. Adequate management of stormwater will be undertaken on all access routes to ensure that no wash-off or erosion occurs. Existing roads, servitudes and access routes must be used as far as possible to gain access to the river site. The creation of ad hoc access routes must be kept to a minimum, e.g. a single route to and from the development point. Traversing the riparian margin up or downstream, and new river crossings, except within the footprint of the proposed weir, must not be permitted. Access to the river will be restricted – only critical vehicles will be permitted to access the riverine area.	Site Manager/contractor	At all times	During construction	Site Manager/ECO
Defining and Management of No-Go Areas	The edges of the construction servitude / development zone within the vicinity of the stream / riparian habitat (to include a buffer area) must be clearly staked-out by a surveyor and demarcated using highly visible material (e.g. danger tape) prior to construction commencing. The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences. Demarcations must remain until construction and rehabilitation is complete. All areas outside of this demarcated working servitude must be considered no-go areas for the entire construction phase and no equipment laydown or storage areas may be located outside the delineated riparian areas. Access to and from the development area should be either via existing roads or within the construction servitude. Any contractor found working within No-Go areas must be fined as per fining schedule/system setup for the project. All disturbed areas beyond the construction site that are intentionally or accidentally disturbed during the construction phase must be rehabilitated immediately to the satisfaction of the ECO. All disturbed areas must be prepared and then re-vegetated to the satisfaction of the ECO as per the relevant rehabilitation plan.	Site Manager/contractor	At all times	During construction	Site Manager/ECO
Maintenance of contractors camp	The Contractor must monitor and manage site drainage to avoid standing water, runoff from the area and soil erosion. The site must be kept neat and tidy, it must be fenced, have adequate security and waste management facilities, ablutions etc all of which must be well managed and monitored.	Site Manager/contractor	At all times	During construction	Site Manager/ECO
Waste Management	A dedicated waste storage area must be identified and clearly labelled. This area must not be within 100m of the river.	Site Manager/contractor	At all times	During construction	Site Manager/ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	The Contractor must identify disposal sites for the various categories of waste likely to be generated on site and must provide the ECO with documented proof of the type and volume of waste disposed of at these sites. Certificates of safe disposal of all wastes must be available on site at all times. Where possible, waste must be collected for recycling programmes. Water containing waste must not be discharged into the natural environment. All working areas will be cleared of litter on a daily basis. Domestic Waste Domestic waste is to be stored in watertight, scavenger-proof and wind proof waste receptacles at the camp. It must be cleared on a regular basis and transferred to a permitted domestic disposal site. No domestic waste is to be buried or burned on site. Scrap Metal Scrap metal must be stored in a designated scrap metal container (e.g. a skip) located at the storage site and collected by a licenced recycler as needed. Hazardous waste Hazardous waste must be stored in a designated, impermeable containers (e.g. a skip) located at the camp/storage site if it is not possible to remove immediately from site. They must be stored in clearly marked containers in banded areas. Construction Debris On completion of construction, all leftover construction materials are to be removed from the working areas and storage site. Construction debris is not to be buried on site.				
Ablution Facilities	An adequate number of self-contained chemical toilets must be established at the site and active working area. These may not be located closer than 100m from the river. The ablution facilities should conform to any requirements stipulated by the Department of Health and the Local Authorities. Contractors must supply toilet paper at all toilets, and will be responsible for their maintenance and servicing. The ablution facilities must be maintained in a clean and orderly state and are to be regularly cleared to prevent odour and pest problems. Contractors must ensure that no spillage occurs when chemical toilets are cleaned and cleared and that the contents is carefully stored and transported when removing off-site. All spills must be recorded in the Environmental Incident Record Book. No pit latrines are to be used. Performing ablutions outside toilet facilities or in rivers / drainage lines will be strictly prohibited. Only the designated ablution facilities must be used by the personnel on site.	Site Manager/contractor	At all times	During construction	Site Manager/ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
Water Supply and usage	Potable water is to be sourced from an existing supply, and made available at various localities around the site. No water is to be abstracted from the river on the site or downstream for use in construction activities. Employees are not to make use of any natural water sources (e.g. wetlands or rivers) for the purposes of swimming, bathing or washing of equipment, machinery or clothes. A dedicated source of water for dust suppression purposes must be determined during site establishment and be approved by the ECO if required.	Site Manager/contractor	At all times	During construction	Site Manager/ECO
Concrete Mixing	If small volumes of concrete are to be mixed (manually), mixing is to be undertaken on a hard surface covered in plastic sheeting so that concrete waste and runoff can be contained. If large volumes are generated, the following requirements must be met: - The mixing area must be underlain by an impermeable surface that is sufficient to trap spills; - Runoff from the concrete mixing area is to be contained and channelled into a sump. All concrete waste is to be collected and removed from the site for disposal at an appropriate disposal site. Cement mixers and other equipment may not be washed on site.	Site Manager/contractor	At all times	During construction	Site Manager/ECO
Natural Vegetation	Prior to commencement of construction: - Where construction may impact on plants designated as 'specially protected' under the Natal Nature Conservation Ordinance (Act No. 15 of 1974), an application must be submitted to EKZNW to clear or translocate these plants as part of the plant rescue operation. - Where construction may impact on natural forests or individual trees protected in terms of the National Forests Act, 1998, an application must be submitted to the Department of Agriculture, Forestry and Fisheries (DAFF). - Where construction may impact on plants listed as Threatened or Protected species (TOPS) under the National Environmental Management Act: Biodiversity Act, 2004 (10 of 2004), an application must be submitted to EKZNW to translocate these plants as part of the plant rescue operation. - A plant 'rescue' operation must be undertaken under the direction of an ecologist/botanist prior to construction, where plants of high conservation value will be impacted by any part of the development. Where construction occurs close to any sensitive areas of natural vegetation or any plants of high conservation value, these must be suitably and visibly demarcated and cordoned off by the ECO prior to and during the construction phase. Appropriate buffer zones must be applied around sensitive vegetation and clearing and cutting back of vegetation must be kept to a minimum. Site clearing activities should be phased and only conducted immediately prior to construction, to reduce the amount of time topsoil is exposed, and thus the potential for erosion and the construction footprint must be kept to a minimum. No disturbance must take place outside the demarcated working area. No clearing of indigenous vegetation outside of the defined working servitudes is permitted for any reason (i.e. for fire wood or medicinal use). An alien plant management programme must be developed, alien plants must be removed in the working areas and recolonisation must be prevented.	Site Manager/contractor/ appointed specialist	At all times	During construction	Site Manager/ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	Communication must be maintained with eThekweni Municipality's environmental division and KZNW throughout construction and monitoring of impacts on flora must be included in environmental compliance monitoring.				
Working within or Directly Upslope of River	Construction activities, specifically of the weir and pumphouse, laying of the pipeline network and the related earthworks in the river bed and the riparian zone, must be undertaken during the dry, winter months to limit instream disturbance. Best practice methods for construction and working in sensitive riverine environments in favour of minimal environmental disturbance must be implemented (e.g. sensitive/minimised flow diversion, instream sediment control measures). The construction zone should be demarcated and kept as narrow as practically possible, and the activities should be implemented to minimise the area of soil disturbance and the potential for mobilising sediment from bare areas include: • Earth dikes and diversions to direct all stormwater flows from disturbed areas into silt traps; • Soil stabilisation practices, such as grass log rolls, sediment blankets and mulching, introduced onsite; • Vegetation should remain intact as far as possible during the construction phase to limit high surface flows and mobilisation of sediment; • Stockpiles of soil and building materials must be stored outside of the floodplain (i.e. beyond the riparian zone); • Stockpiles of soil must be protected with suitable covering to prevent erosion and mobilisation of sediment. Heavy machinery and major earthwork in riparian and instream areas must be limited as far as possible. The minimum number of machines must be deployed to do the work as quickly and effectively as possible. Any direct modification of river habitat for the installation of the abstraction point, pumphouse and pipeline must be limited to the construction servitude. Before any work commences, sediment control/silt capture measures (e.g. bidim/silt curtains) must be installed downstream/downslope of the active working areas. Quantities of silt fences/curtains shall be decided on site with the engineer, contractor and ECO. The ECO should be present during the location and installation of the silt curtains. Silt fences/curtains must be regularly checked and maintained (de-silted to ensure continued capacity to trap silt), and repaired where necessary. When de-silting takes place silt must not be returned to the watercourse. Any topsoil removed from watercourses must be stockpiled separately from subsoil material and be stored appropriately for use in rehabilitation activities. The ECO will need to mark any indigenous riparian trees or sensitive plant species adjacent to the construction servitude that are not to be damaged during construction. If necessary, indigenous riparian vegetation must be carefully removed and stored in an appropriate facility for rehabilitation purposes.	Site Manager/contractor	At all times	During construction	Site Manager/ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	Where possible, vegetation should be cut to ground level rather than removing completely so as to assist with binding/stabilising the soil during land-clearing operations. Movement of construction vehicles in the river must be minimised as much as possible. Excavated rock and sediments from the construction zone, and including any foreign materials, should not be placed within the delineated rivers and riparian areas in order to reduce the possibility of material being washed downstream. No physical damage should be done to any aspects of the channel and banks of watercourses other than those necessary to complete the works as specified. Channel bed and bank materials are not to be removed from the watercourse or used for construction purposes. All cleared and trimmed vegetation shall be removed from the watercourse upon completion of clearing in order to prevent the risk of flooding/snagging.				
Fauna	Sensitive species must be identified prior to commencement of construction and an appropriate management plan developed and implemented (Kwazulu Dwarf chameleon, spotted Shovel nosed frog, etc). Where possible, exposed vulnerable animals should be removed from the work area along with some of the soil/substrate they were found in (if applicable) and placed carefully in similar but safe habitat adjacent to/up or downstream of the works. The ECO must be notified and consulted in this regard. Protection of the fauna must be undertaken throughout the development. However, mortalities of various types of animals are inevitable due to the earthworks and movement of heavy machinery. This should be minimised by keeping the construction footprint to a minimum and by using existing access roads and disturbed areas for vehicle access and for stockpiling. If snakes are encountered, they are not to be killed. There are several snake experts who can be contacted to remove and relocate snakes (e.g. the Fitzimons Snakepark in Durban. Tel: 031 337 6456). Fishing must be strictly prohibited in and around the working areas and no project workers are permitted to catch, trap, poison, kill or disturb any animals present in the project areas. No disturbance of nesting or feeding sites and fauna habitat is allowed. Advice from the ECO should be sought if such sites are encountered in the work areas. All vehicles accessing the site should adhere to a low speed limit to avoid running over susceptible species such as reptiles (snakes, frogs and lizards). Communication must be maintained with eThekweni Municipality's environmental division and KZNW throughout construction and monitoring of impacts on fauna must be included in environmental compliance monitoring.	Site Manager/contractor	At all times	During construction	Site Manager/ECO
Soil management	Topsoil (top 500mm) is to be removed separately to subsoil and be safely stockpiled for use in rehabilitation. Where possible soil must not be handled when it is wet as this will result in unnecessary compaction and repeated handling of soil must be avoided as this results in compaction and the loss of soil structure Exposed soils, and cut and filled surfaces are to be adequately safeguarded as per recommendations of the geotechnical report and other applicable mitigation measures and large sediment loads must be	Site Manager/contractor	At all times	During construction	Site Manager/ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	prevented from entering drains and watercourses. The impacts on soils and substrates must be monitored during the construction phase as part of environmental management of the contract Soil that is to be stockpiled for an extended period must be stored: • At sheltered site where it will not be exposed to the effects of wind erosion; • Outside the working area where it will not be disturbed or contaminated; • Away from drainage lines so as to avoid the risk of erosion; Soil is not to be stockpiled against tree trunks as this will encourage ant infestations. The colonisation of stockpiles by invasive plants must be controlled by removing the plants when they germinate. The purpose of this is to reduce the risk of developing a seedbank of invasive species within the stockpiled soil. Topsoil is not to be used as a bedding material.				
Soil erosion	Site clearing activities should be phased and only conducted immediately prior to construction, to reduce the amount of time topsoil is exposed, and thus the potential for erosion. Erosion control measures must be implemented in areas sensitive to erosion such as near water supply points, edges of slopes, etc. These measures could include the use of sand bags, retention or replacement of vegetation. Disturbed areas must be rehabilitated and monitored as soon as possible after disturbance. Riparian areas On steep slopes draining towards the identified freshwater ecosystems, small-scale diversion berms should be constructed, to reduce the risk of the earthworks becoming a preferred surface flow path leading to erosion. The construction footprint within the riparian systems must be as narrow as practically possible, i.e. machinery must utilise the same route through the systems at all times so as to avoid unnecessary disturbance. Site Clearance Vegetation should not be stripped over the entire site at commencement, if the construction programme could accommodate phased clearance. Stripping of topsoil Topsoil stripping activities should be carried out over limited areas on extensive sites and only commence as work progresses to new areas. Consideration should be given to using cleared vegetation as a temporary brush mattress for erosion control or chipping it for use in mulching or being wrapped in shade-cloth to form "roll" berms.	Site Manager/contractor	At all times	During construction	Site Manager/ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	Reinstatement of Vegetation Areas of site that are to be permanently landscaped and receive vegetal covering, should be reinstated as soon as possible, wherever practical and be protected during the balance of the construction period.				
Surface water Contamination	Where construction activity takes place within floodlines of watercourses, temporary berms need to be formed to ensure the construction site and disturbed soils are protected from flooding, storm flows and erosion. This is particularly important when construction activities are taking place outside of the dry season. Erosion that takes place during rainfall events must be rehabilitated immediately. Pollution on site must be prevented and all spills immediately cleaned up. Bidim curtains and other activities described in the Section "Working within or Directly Upslope of River" above.	Site Manager/contractor	At all times	Construction	ECO and site manager
Stormwater management	A stormwater management plan will be developed for the site prior to construction. Installation of the stormwater management system will commence immediately on completion of clearing and commencement of earthworks. Drainage must be controlled to ensure that runoff from the site does not culminate in off site pollution or cause water damage to properties downstream of the site. Runoff should be released outside the watercourses and wetlands wherever possible. Only clean stormwater runoff must be allowed to enter the environment.	Site Manager/contractor	At all times	Construction	ECO and site manager
Pollution risks/hazardous substances	If pollution of any surface or groundwater occurs, it must be immediately reported to the relevant Departments and the appropriate mitigation measures must be employed. Fuel and hazardous material storage, handling and refuelling must not take place within the 1:100 year flood line of riparian habitat and buffer zones. Such storage areas must be located at least 100m from riparian zones and any other sensitive environments. All spills of foreign or hazardous materials or fluids must be cleaned up immediately, with all spills larger than 20 litres being reported to the ECO immediately. No washing of vehicles must take place within or close to the watercourse – no concrete mixing machinery should be washed on site. A record must be kept of all spills and the corrective action taken. Drip trays are to be provided under all standing vehicles to minimise hydrocarbon spills. A hard-standing, impermeable area and and/or drip trays must be used for refueling. The handling and storage of hazardous materials must be in accordance with the MSDS and must be restricted to the storage site as the appropriate pollution control measures will need to be in place.	Site Manager/contractor	At all times	Construction	ECO and site manager

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	Inventory of Substances The Contractor must compile an inventory of all hazardous substances to be used and stored on the site and must ensure that they know the effects of these substances on their staff and the environment. A copy of this inventory must be supplied to the ECO. Handling and Storage The Contractor must ensure that the quantities of chemicals stored on site are appropriate for his / her requirements, and must ensure that they are appropriately stored and handled so as to minimise the risk of spills. Chemicals must be stored in a bunded area with an impermeable base (e.g. concrete or plastic lining). Spills of Hazardous Substances The accidental or negligent spillage of any potentially hazardous substances must be cleaned up immediately using the most appropriate methodologies, equipment and materials. The Contractor must ensure that the necessary materials, equipment and chemicals are available on the site to deal with spills of any hazardous materials. The Contractor must devise a procedure for dealing with spills, which has to be approved by the ECO. The procedure must distinguish between those spills that can be cleaned up by the Contractor and those that will require specialist input. The name and contact numbers of various clean up companies must be posted and visible at the camp office. This procedure must also include a provision to notify the RE and ECO of any spills. Any contaminated soil or water must be removed and stored in a skip until it can be disposed of at an appropriate disposal site. Recording of Incidents The Contractor must provide an Environmental Incident Record Book on site to record the details of any environmental incidents (date, time, cause, action taken). This book will be regularly checked by the ECO who will also cross reference the entries with observations made during site visits.				
Emergency Preparedness	Emergency Response Plans for all possible potential incidents during construction must be developed.	Site Manager/contractor	As required	Construction	ECO and site manager
Dust Management	Dust producing delivery loads should be covered with tarpaulins. Vehicles travelling around the construction site must adhere to speed limits so as to avoid generating excessive dust. No refuse may be burnt on the premises or on surrounding premises.	Site Manager/contractor	As required	Construction	ECO and site manager
Visual Impact	No refuse or builders' rubble generated on the premises may be placed, dumped or deposited on adjacent/surrounding properties including road verges, roads or public places and open spaces during or after the construction period.	Site Manager/contractor	At all times	Construction	ECO and site manager

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
Noise Pollution	Institute noise control measures throughout the construction phase for all applicable activities, including the construction times. Limit the working hours during the construction phase between 07:00 and 18:00 during weekdays. No construction work should occur during weekends. Ensure compliance with the noise/nuisance bylaws at all times. All vehicles and equipment must be properly maintained to reduce unnecessary noise.	Site Manager/contractor	As required	Construction	ECO and site manager
Safety and Security	Ensure that the handling of equipment and materials is supervised and staff are adequately trained. Contractor to ensure that job seekers are discouraged and that staff are not permitted to leave the working areas during working hours. Site camps will be fenced and security provided to ensure that criminals are not attracted to the area. The contractor will provide his own security arrangements while on site. Erect barriers around the construction areas where excavations and localised machinery movements will be considered a danger to the public. Urban reserves are conduits for crime and contractors will need to be mindful of security on site at all times.	Site Manager/contractor	As required	Construction	ECO and site manager
Heritage Resources	If any archaeological material, palaeontological material (concentrations of bones or shells), or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist or palaeontologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Site Manager/contractor	At all times	Construction	ECO and site manager
Worker Conduct	The Project Applicant and any site foreman must understand the contents of the EMPr and be competent in implementing and monitoring the requirements. No alcohol/drugs are allowed on site and no workers under the influence will be permitted on site. No firearms or traditional weapons allowed on site. Fires/open flames will not be allowed on site. No hunting or trapping of any animals or collection of plants will be allowed. Staff on site may not use any area for ablutions apart from the designated ablutions facilities. All other instructions as defined in the sections above must be explained to staff in environmental training sessions.	Site manager/contractor All staff	At all times	Construction	ECO and site manager
Social Impact	A detailed complaints register must be maintained by the Construction Site Manager and all complaints should be documented. Local contractors' personnel and residents must be given preference with regards to jobs created during the construction phase.	Project Manager/Site Manager/contractor	As required	Construction	ECO and site manager

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
Training	The workers on site must be trained on safety, health and environment aspects before the start of construction activities. First Aid and Firefighting training must also be given to specific individuals on site so that emergency situations are properly handled. All workers and visitors to the site must receive induction training prior to working on the site.	Site Manager/contractor	Ongoing	Prior to and during Construction	ECO and site manager
Post construction activities	Disassemble all infrastructure from the working areas and Contractors Camp. This will include temporary office and storage structures and containers, water supply pipelines, water storage containers, power supply, etc. Drain all wastewater and sewage associated with the temporary ablution facilities and transfer the waste to an appropriate disposal site. Disassemble all fencing around the camp and either sell, auction or donate the components to the local community or transfer the waste components to the Contractors base. Excavate all areas of contaminated substrate, transfer the contaminated substrate to an appropriate disposal site and treat the affected areas with appropriate ameliorants. Remove all plastic linings used for pollution control and transfer to an appropriate disposal site. Remove all foreign material from the river and dispose appropriately. Break up all concrete structures that have been created (e.g. working and parking surfaces) and remove concrete waste to an appropriate disposal site. Remove all leftover construction materials from the camp and working areas and either sell, auction, donate to the local community or transfer to the Contractor's base. There must be no pollution or waste material left on the site. Remove all construction debris, litter and domestic waste from the camp and working areas and transfer to an appropriate disposal site. Remove all waste receptacles from the camp and working area either donate to the local community, auction, or transfer to Contractor's base. Do not burn or bury any waste at the storage site or in the working area – all waste is to be transferred to a permitted disposal site.	Site Manager Project Manager	As required	Post-construction	ECO and site manager
Rehabilitation	A rehabilitation plan must be developed and implemented for the areas regarded as impacted by the activities on site. Re-vegetation and rehabilitation must take place at worked sections immediately following completion so that vegetation can re-establish as quickly as possible. In riparian areas, backfilling should occur as soon as possible, with soil compaction undertaken and shaping to original levels. All disturbed areas are to be rehabilitated, with the riparian habitat and areas where disturbance has	Site Manager Project Manager/appointed specialist	As required	Post-construction	ECO and site manager

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	resulted from excavation being restored to near-natural conditions. In many areas the removal of alien vegetation and rehabilitation with indigenous species will result in a significant environmental improvement. The river should be rehabilitated to ensure that no barriers exist within the riverbed and that in-stream habitat is comparable to the natural or, at a minimum, preconstruction state. Within, and in proximity to riparian areas, successful re-vegetation is crucial to stabilise soils and limit infestation by invasive alien plant species and dominance by ruderal species. Correct species for riparian and wetland habitats of the region must be re-established in consultation with an appropriately qualified specialist (e.g. botanist/vegetation ecologist). Vehicle access tracks, footpaths and other areas of soil compaction and vegetation denudation as a result of the construction activities must be appropriately contoured, scarified and re-vegetated where required. Fill areas must be stabilised and appropriately re-vegetated to ensure that erosion does not occur – these areas must be regularly monitored. Construction areas must be rehabilitated to a land surface which integrates with the surrounding slope morphology and river channel form so as not to create areas of soil instability, or flow paths which incorrectly direct stormflows and floods, thereby causing scour, erosion and damage to adjacent habitats and infrastructure. Areas subject to concentrated water flows during rainfall or high flow events must receive particular attention during rehabilitation and re-vegetation. Where possible, these must be identified prior to commencement of construction activities. Where required, erosion protection structures may need to be designed and installed. Artificial embankments, depressions and holes created by the construction activity must be contoured/rehabilitated to minimise risk to, and death of, all fauna types, from large mammals to small invertebrates. Upon site closure, all infrastructure, foreign materials, waste, litter and contaminated water, rock or soil must be removed from site and disposed of in accordance with best environmental practice.				
Revegetation	A detailed revegetation plan must be developed prior to completion of construction and implemented on completion of construction. All Invasive Alien Plants (IAPs) and weeds must be removed from target sites, preferably by uprooting. Topsoil must be placed in the same area from where it was originally stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas. Where topsoil is lost during construction as a result of erosion, topsoil will need to be imported to the site and re-established. Such topsoil must be sourced commercially and legally.	Applicant/site manager/appointed specialist	As required	Post-construction	ECO and site manager

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	The topsoil must be compacted to similar compaction levels as natural soils in the area. The engineer will provide detailed advice on this. No exotic/alien plants are to be used in re-vegetation.				
Post-revegetation	Revegetation must be monitored and alien vegetation must continue to be managed and monitored.	Applicant/contractor	As required	Post-construction	ECO and site manager

8.3 OPERATIONAL PHASE

Aspect	Description of Action	Person responsible for implementing action	Frequency	Period of implementation	Monitor
Authority liaison	DWS to be kept informed by way of monitoring reports etc as required in terms of the WUL.	Applicant/Site manager	As required	Operational	Applicant/site manager
Water Resource protection	To verify that abstraction from the uMhlathuzana River will not negatively impact on the ecological health and functioning of the system, the EWR should be determined to quantify the abstraction thresholds, particularly during dry months to preserve winter base flows. Abstraction volumes must be monitored and compared to the flows in the river system. A water depth logger must be installed upstream of the abstraction point for this purpose.	Applicant/DWS	As required	Operational	Applicant/site manager
Water Treatment Facility Operation and Maintenance	Daily, weekly and monthly maintenance checklists will be drawn up and completed for the abstraction point, pump and treatment plant operation. Leaking or damaged components must be timeously repaired to prevent unnecessary runoff and erosion.	Applicant/site manager	As required	Operational	Applicant/site manager
Hazardous Substances	All hazardous substances will be appropriately labelled and stored on the site Spill kits of spill control products, e.g. Drizit / Zorbit, should be kept on the site and be easily accessible. These spill kits should be used by suitably qualified persons. Staff must be trained on all hazardous substances on site.	Applicant/site manager	At all times	Operational	Site manager/ applicant
Waste management	General and hazardous wastes must be stored separately in appropriate and labelled containers in line with the Norms and Standards for waste storage. Hazardous waste must be disposed at a suitably licenced landfill. General waste must be removed for disposal by eThekweni Municipality. Staff training should be undertaken - staff must be educated in terms of waste minimisation, waste disposal, recycling and other waste issues. Any waste 'sludges' from the treatment plant must be disposed of according to the prevailing legislation. A Service Level Agreement (SLA) between the Applicant and a registered/licensed disposal facility must be kept on record. No littering will be permitted on the property.	Applicant/site manager	At all times	Operational	Site manager/
Stormwater management/ erosion	Stormwater runoff on site must be controlled in such a manner that it does not lead to erosion and the removal of soil off the site or have a detrimental impact on the downstream infrastructure. The abstraction point will be protected from erosion with rocks and monitored weekly to check for erosion.	Applicant/site manager	At all times	Operational	Site manager/ Applicant
Visual Impacts	Outside lighting should be directed away from sensitive areas and sodium vapour lights should be used wherever possible.	Applicant/site manager	As required	Operational	Site manager/ applicant
Infrastructure and Services	Services such as electricity, water supply, sewage and refuse disposal systems will require ongoing monitoring and maintenance for the duration of operation.	Applicant/site manager	As required	Operational	Applicant/site manager

Fire/Emergency Management	Fire prevention equipment (fire extinguishers, hydrants) will be required on site for use in the event of a fire. The Emergency Preparedness Plan must be kept up to date and emergency drills undertaken regularly. An incident register will be kept on site. All significant environmental incidents will be reported to the relevant Authorities.	Applicant/site manager	As required	Operational	Applicant/site manager
Flora and Fauna	Ongoing removal of alien vegetation and replacement with indigenous plants will continue in accordance with the Alien Plant Management Plan. Disturbance to or removal of wildlife on adjacent properties and damage to their breeding and foraging sites must be prevented at all times. No poaching and / or unauthorised shooting or hunting will be permitted on adjacent properties. No collection of or damage to protected plant species will be permitted.	Applicant/site manager	At all times	Operational	Applicant/site manager
Noise, Motorised Vehicles and Equipment	No unnecessary noise such as hooting or shouting will be permitted. Activities on the site should be undertaken responsibly and should take into account neighbouring landowners. Noisy activities should be restricted to daylight hours.	Applicant/site manager	At all times	Operational	Applicant/site manager
Access control	No trespassing on neighbouring properties.	Site manager/applicant	At all times	Operational	Applicant/site manager
Monitoring	Monitoring will be undertaken in accordance with the provisions of the WUL.	Specialist	Monthly	Operational	Applicant/site manager
Contingency	The Spill Management and Contingency Plan should be followed in the event of any spill incident on the site (Appendix 2).	Site manager/applicant	At all times	Operational	Applicant/site manager

9. DECOMMISSIONING

Once the plant and pipeline are no longer required, all infrastructure will be removed and the area will be rehabilitated to the required status.

Rehabilitation will be monitored until complete.

10. ENVIRONMENTAL AWARENESS

The material/source of information will be the EMPr and WUL, as well as other relevant specialist reports. The environmental awareness plan is detailed in the sections below:

10.1 Content and Delivery of Environmental Training Session

The environmental training session will be carried out on site with all labourers and Contractors present. The session will be delivered in languages familiar to the workforce in order to ensure that full understanding the contents of the session is achieved.

The session will cover the following topics:

- The EMPr;
- What is the environment?
- What makes up the environment?
- Why is it so important to protect the environment?
- How can the environment be damaged?
- How can you protect the environment?

The training session will comprise a presentation with colourful diagrams describing the above-mentioned issues. The information in the presentation will be presented in the languages familiar to the workforce. The information on presentation will be duplicated in hard copy hand-outs/ brochures which are given to each member of the workforce to keep.

The session will be interactive and questions and discussion from the workforce must be encouraged.

10.2 Induction

All full time staff and contractors are required to attend an induction session. Any contractor who performs work at the site is also required to undergo the respective induction training. Environmental issues and aspects related to the operation of the site are addressed in induction sessions.

All environmental impacts and aspects and their mitigating measures will be discussed, explained and communicated to employees. The induction sessions will be modified according to the level of employee attending the induction session, so that all employees gain a suitable understanding of environmental issues and pollution.

10.3 Environmental Meetings

Environmental meetings should be held with management, and supervisors and/or employee representatives. This will take the form of an open discussion between the site manager and these individuals. The meetings will aid in environmental awareness being generated at all levels, as well as assist in defining all and identifying new environmental issues, concerns and possible pollution sources.

10.4 On the Job Training

On the job training is an essential tool in environmental and safety awareness. Employees will be trained on how to respond if an environmental problem or source of environmental pollution arises.

10.5 Complaints Register and Environmental Incident Book

Any complaints received from the community must be registered and recorded by the contractor on site. The complaint must be brought to the attention of the site manager and ECO, who will respond accordingly. The following information will be recorded:

- Time, date and nature of the complaint;
- Response and investigation undertaken; and
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) is to be given to the complainant within 7 days.

All environmental incidents occurring on the site will be recorded. The following information must be provided:

- Time, date, location and nature of the incident; as well as,
- Actions taken and by whom.

11. ENVIRONMENTAL MONITORING

Environmental monitoring of the operation (after completion of construction) will be undertaken by the Clover SHEQ staff on a regular basis. Monitoring will be undertaken to ensure compliance with all aspects of the WUL and EMPr.

A monitoring plan will need to be compiled once the WUL has been issued – to ensure compliance with the provisions of the WUL.

Water Quality monitoring will be undertaken in accordance with the WUL requirements.

Monitoring will be undertaken using a checklist which consolidates all the requirements of the WUL and EMPr.

11.1 Non-Compliance with the EMPr

Difficulties may be encountered with carrying out mitigation measures that could result in future non-compliance. The Contractor shall put in place procedures to motivate staff members to comply with the EMPr/WUL and to deal with acts of non-compliance, or damage to the environment. Penalties for non-compliance need to be discussed with the Contractor at the earliest stage.

It should be noted that compliance with the EMPr will become legally binding once the EMPr is approved DWS and the WUL issued.

12. CONCLUSION

In terms of NEMA everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the

environmental risks of their work and training them to operate in an environmentally responsible manner. Furthermore, in terms of NEMA, the cost to repair any environmental damage shall be borne by the person responsible for the damage.

Should any amendments or additions to this EMPr be required, Metamorphosis will need to be contacted for discussion of such. Motivation for such amendments will then be forwarded to DWS by Metamorphosis on behalf of the client. DWS will then be in a position to make a decision regarding the proposed amendments or additions.

If the above-mentioned management recommendations are adopted, it is anticipated that any possible negative environmental impacts of the project can be prevented.

Prepared by



V King PrSciNat, Reg EAP (EAPASA)

Metamorphosis Environmental Consultants

References:

GroundTruth, September 2024, Clover SA (Pty) Ltd WULA Aquatic Assessment AMENDED 25072025.

GroundTruth Risk Assessment Matrix v2 updated July 2025.

GroundTruth, December 2024, S27 Motivation WU39285 GroundTruth.

GroundTruth, April 2024, Clover SA Borehole and uMhlatuzana River abstraction – Wetland Verification (Draft Report).

Harvey Ecological, January 2021, Fauna Biodiversity Assessment for the Proposed Clover Queensburgh Expansion Development.

P LeRoux, December 2020, Vegetation Assessment, Phase 1 Investigation, Application for Expansion of Infrastructure into DMOSS Designated Areas, Clover Dairies.

SRK Consulting, August 2021, Hydrogeological Assessment for Clover SA, Queensburgh.

Verdant, February 2021, Proposed Clover Facility Expansion: River and Wetland Baseline Assessment

APPENDIX 1- CV OF EAP

VICKI KING

CURRICULUM VITAE

Professional Qualifications

Masters Degree (LLM) in Environmental Law, University of Natal, Durban 2003.
BSc (Joint Honours) Biological Sciences and Geography, University of Birmingham, England in 1988.

Short Courses

Integrated Environmental Management (IEM) Theory and Practice – University of Cape Town 1992.
Cultivated Pasture Management, Cedara Agricultural College 1996.
Conflict Management, CDR Associates, 1997
Environmental Lead Auditor Course, Wynleigh International / University of Potchefstroom 2000.
Conversational Zulu 2003.
Corporate Governance 2003.
Environmental Law Update, Green Gain Consulting 2009
Hazardous Waste Management, IWM, 2012
Train the Trainer, KZN Training, 2014
UN Globally Harmonised System of Chemical Classification, RiskChem, 2014
Environmental Law Update, Shepstone and Wylie, 2014.
Sharpening the Tool; New Techniques in Environmental Impact Assessment, SE Solutions 2014.
Carbon Footprinting – GCX, February 2017.

Year of Birth

1967

Nationality

British (Permanent Resident RSA)

Languages

English, French (Good), German (basic), Zulu (basic).

Professional Affiliations

Registered Professional Natural Scientist
(1994)
International Association for Impact Assessment
(1999)
MSAIE&ES
(2004)
Institute for Waste Management South Africa
(2004)
EAPSA certified environmental practitioner
(2005/2019)
National Association for Clean Air (2005)
Environmental Law Association of SA
(2012)

Career Profile

Vicki has been working as an independent environmental consultant for over 30 years, during this time, she has undertaken or project managed over 500 environmental projects. She ran the Durban office of WSP Walmsley for 13 years and reviewed every technical document produced in the office during this time. She set up MEC in 2006 and now undertakes predominantly review, management systems, permit applications, training, auditing and advisory work, calling on her many years experience in the field.

She has successfully compiled and carried out training courses in EIA review for the eThekweni Municipality Development and Planning Department, sustainability training for Capcan Africa and runs her own EIA training courses in Durban. She has undertaken 'Train the Trainer' coaching to ensure that her training techniques are robust and up to date.

She has completed her Masters in Environmental Law at the University of Natal, the research for which has provided her with a great insight into the legislative situation within the environmental profession. The title of her dissertation was '*Sustainable Development – Legal Facilitation or Failure*'.

This, together with the practical experience she has gained in 30 years of practice, gives her capability to add value to environmental procedure documentation, through involvement in the drafting, and review process.

Areas of Expertise

Environmental Law, all aspects of Integrated Environmental Management including management systems (ISO 14000), Auditing, Scoping Studies, EIA, Water Use Licensing, EMPs, EMPRs (mining industry) and monitoring. She successfully completed Environmental Lead Auditor course through Potchestroom University in 2000. Her particular interest lies in waste management, review, corporate governance and sustainable development within the industrial sector.

Countries Worked

South Africa, Zimbabwe, Zambia, Mauritius, Seychelles, United Kingdom and Namibia.

Papers

IEM and the Proponent, Young Water, Environmental & Geotechnical Engineers Festival 1996
Environmental Planning and Management of Water Supply Projects, WISA Conference, PMB 1996
Sustainable Development – Legal Facilitation or Failure, Masters Dissertation, 2003.
Environmental Law – The Triple Bottom Line Approach, Legal Congress 2004.

Publications

EIA in the Seychelles - Chapter in SAIES Book on Environmental Assessment in Southern Africa, 2003.

EMPLOYMENT HISTORY

Metamorphosis

February 2006 to present – Member

Wilson and Pass

WSP Environmental, Durban, RSA

April 2001 to February 2006 – Director

Walmsley Environmental Consultants, Durban

July 1995 to April 2001 - Director/Senior Environmental Scientist

Walmsley Environmental Consultants, Durban

August 1993 to July 1995 - Environmental Scientist

Walmsley Environmental Consultants, Johannesburg

January 1991 to August 1993 - Environmental Scientist

Lewis's Retail Ltd, England

1988 to 1990 - Departmental manager/Personnel manager

KEY PROJECT EXPERIENCE

PROJECT	Client	Year	Role
Industry Waste Management Plans			
Everest Flexibles	Everest	2017	Project leader
iThunga Pre-Press	Everest	2019	Project leader
Landfill Auditing			
Landfill permit audits for the Bulbul Drive H:h landfill site	Wasteman	2008 – present.	Lead Auditor
Review of Mariannhill landfill site permit audits	DSW	2009 - present	Review
Internal Auditing for Kwadukuza Landfill Site	DCLM	2010 – 2019.	Lead Auditor
Review of Landfill Audits for Geomeasure Group	Geomeasure Group	2010 to 2018	Review
Landfill Permit Audit for the Roundhill Landfill site	Buffalo City Municipality	2016 and 2017	Lead Auditor
Waste Disposal			
Site Selection Study for a hazardous waste Disposal site in Kwazulu-Natal.	Waste Services	1993	EAP
Independent Environmental Assessment for New England Road Landfill Site, Pietermaritzburg	Pietermaritzburg Municipality	1996	Review
Independent Chair for the Mariannhill landfill Monitoring Committee.	eThekweni Municipality	2009 - present	Chair
Ongoing consultation at the Kwadukuza Landfill site in KZN.	DCLM	2010 - present	EAP
Project management of the Leachate treatment solution project for DCLM	DCLM	2012	Project leader and EAP
Application for the exclusion of Slag from the definition of waste	Assmang	2016, 2018	Project leader
Application for the exclusion of Slag from the definition of waste	African Rainbow Minerals	2020	Project leader
Review of the Chloorkop Waste Licence Application	Lords View	2019	Review
Review of the Somkhele Waste Licence Application	Tendele	2020	Review
Water Use Licence Applications			
Integrated Water Use Licence for the Kwadukuza Landfill and leachate treatment plant	DCLM	2016	Project leader and EAP
Integrated Water Use Licence Application for the Lovu Landfill and leachate treatment plant	DSW	2015-2016	Project leader and EAP
Water Use Licence Application for the Proposed Birdhaven Estate in Salt Rock	DG Investments	2015-2016	Project leader and EAP
Integrated Water Use Licence for the Shongweni Landfill	DSW	Current	Project leader and EAP
Environmental Control Officer			
Environmental monitoring for the NCS Warehouse construction.	NCS Resins	2000	ECO
Environmental monitoring for the construction of the replacement pipe to the SAPREF SBM.	SAPREF	2001	ECO
Environmental monitoring for the Umgeni South Coast Pipeline construction.	Umgeni Water	2011	ECO
Environmental monitoring for the Greenmeadow Lane construction.	M Piggott	2009 - 2016	ECO
Environmental monitoring for the construction of Molasses bladders at Maidstone and Felixton Sugar Mills.	Voermol	2016 and 2018	ECO
Environmental monitoring for Cell 2 and LTP construction at Kwadukuza Landfill.	DCLM	2015	ECO

Alien Plant monitoring for Kwadukuza Landfill site.	DCLM	2013 - 2019	ECO
Environmental Auditing			
Shadow audit for Diverseylever with URS Dames and Moore in Durban.	URS	2003	Auditor
Environmental legal audit for the three NPC sites around KZN.	NCS	2007	Lead Auditor
Environmental Legal Audit for Somkhele Coal Mine.	Tendele Coal	2011	Lead Auditor
Environmental Legal Audit for Zululand Anthracite Colliery.	GCS	2011	Lead Auditor
Legal Audit for the Monoweld Galvanising plant in Johannesburg	Monoweld	2016	Lead Auditor
Environmental health and Safety Audit for the Equal Chance Trading and Discovery Drilling operation in Rustenburg	Equal Chance	2017	Lead Auditor
Environmental Audit of the National Norms and Standards for the Storage of Waste for the DCLM site in Richards Bay	DCLM	2017 and 2019	Lead Auditor
Environmental Audits for 5 AccessWorld Sites throughout South Africa	AccessWorld	2017/18	Lead Auditor
Environmental health and Safety Audit for the ACE Chemical Factory in Johannesburg	Associated Chemical Enterprises	2018	Lead auditor
Audits of 12 BP Fuel Filling stations throughout the Western Cape	BP/GMG	2018	Lead Auditor
Audit of Bulk Fuel Storage facilities at OR Tambo, George, Wonderboom and East London Airports	BP/GMG	2018	Lead Auditor
Audit of the Arsenic disposal operation at Dundee Precious Metals at Tsumeb, Namibia.	DPMT	2019/2020	Lead auditor
Environmental Training			
Environmental Training for Contractors on the Booth Road Development, Durban.	eThekwini	1999	Lead Facilitator
EIA Review training for eThekwini Municipal officials	eThekwini	2000	Lead Facilitator
Environmental Law training for Metro Parks Department	eThekwini	2005	Lead Facilitator
Sustainability Training for Capcan Africa (various clients).	Capcan	2007	Lead Facilitator
Real World EIA training for Consultants and Industry.	Various	2008 - present	Lead Facilitator
Environmental Training for Unitrans Construction Supervisors/Managers.	Unitrans	2012	Lead Facilitator
Environmental Law training for AccessWorld Supervisor and Managers (5 sites)	AccessWorld	2020	Facilitator
Environmental Management Plans			
Closure Plans for Solmar and Burnside Collieries	Grinaker	1999	EAP
Environmental Management Plan for the Zone 3I Reservoir, Kloof.	eThekwini	2000	Project leader and EAP
Environmental Management Plan for the Courtyards Shopping Centre in KwaZulu Natal.	Mark 2 Projects	2001	Project leader and EAP
Environmental Management Plan for the Kloof Sewer Pipeline	eThekwini	2002	Project leader and EAP
Environmental Management Programme	Hulett Aluminium	2003	Project Leader
Review of the SAPREF ISO 14000 system.	SAPREF	2004	EAP
Environmental management plans for the Nutri-Flo Spoornet sites.	NutriFlo	2013-2016	Project leader and EAP

Environmental Impact Assessment			
PEIA for Sengwa Colliery in Zimbabwe.	Rio Tinto Zimbabwe	1991	EAP
EIA for Pegasus Coal mine	Trans-Natal Corp	1991	EAP
EIA for Marble Hall MDL project	Samancor Ltd	1991	EAP
EIA and management plan for housing development in Munster, Natal.	Permprop	1992	Project leader and EAP
EIA for a coal loading siding in Vryheid	Trans Natal Corp	1993	Project leader and EAP
EIA and Management plan for the Northern Feeder Pipeline,	Umgeni Water	1994	Project leader and EAP
Full EIA for the Gokwe North Coal Mine in Zimbabwe for	Rio Tinto Zimbabwe	1993 - 1997	Project leader and EAP
Environmental Study for the upgrading of the Durban Heights Reservoir Overflow System	Umgeni Water	1995	Project leader and EAP
Environmental Scoping Study for an SRU and SCOT at the SAPREF Refinery on the KZN South Coast.	SAPREF	1996	Project leader and EAP
Environmental Application for the Mhlathuze Waste Water Pipeline in Richards Bay.	Mhlathuze Water	1999	Project leader and EAP
Full EIA for the Murowa Diamond mine in Zimbabwe	Rio Tinto Zimbabwe	1999 to 2002	Project leader and EAP
Environmental Scoping study for the Durban Fibres Plant in Prospecton.	Hosaf	2001	Project leader and EAP
Scoping Study for the proposed pilot bitumen plant at Engen Refinery	Engen	2002	Project leader and EAP
Scoping Study for the SAPREF Clean Fuels Project	SAPREF	2003	Project leader and EAP
Extended Scoping Study for the LignoTech Lignosulphonate Plant	Sappi Saiccor	2003	Project leader and EAP
EIA for the Durban Solid Waste CDM project (Landfill gas to Energy)	eThekwini	2004	Project leader and EAP
Scoping study for the Engen Clean Fuels Project	ENGEN	2004	Project leader
Scoping report for the WasteX Autoclave project in Tongaat	WasteX	2004	Project leader and EAP
Environmental impact assessment for the Sappi Saiccor Expansion project	Sappi Saiccor	2005	Project leader and EAP
Environmental Impact Assessment for the Proposed Shongweni Landfill.	DSW	2005	Project leader
Basic Assessment for a proposed styrene tank at NCS Resins, Isipingo.	NCS Resins	2005	Project leader and EAP
Environmental Impact Assessment for the Bulbul Drive Gas recovery project.	Wasteman	2006	Project leader and EAP
Scoping report for the Fordoun Leisure Resort expansion.	Fordoun	2007	Project leader and EAP
Environmental Impact Assessment for the Inkwazi Housing Development in Kwadukuza Municipality	Chapman Enterprises	2008	Project leader and EAP
Assistance to the KZN Provincial Department of Agriculture and Environmental Affairs with the closure of files and issuing of RODs for 34 applications.	DAEA	2009	EAP
Basic Assessment for a proposed dam on the Mhlali River.	A Reynolds	2010	Project leader and EAP
S24G application and EMPr for the eThembeni Cemetery in Pmb.	Mpinvestfor	2011	Project leader and EAP
Environmental Impact Assessment for the Kwadukuza Landfill upgrade project.	DCLM	2012	Project leader and EAP
N3 Upgrade Project	SANRAL	Current	Project leader and EAP

Basic Assessment for the Kingsburgh x 9 Housing Development	Dan Spares	Current	Project leader and EAP
S24G application for the Construction of 3 dams on AC Reynolds Farm	AC Reynolds	2018	Project leader and EAP
S24G application for the formalization of permitting at the Lovu Landfill site	eThekwini Municipality	Current	Project leader and EAP
Environmental Management Programme Reports for Mining			
EMPR for Greenside and New Clydesdale Collieries	Gold Fields of SA	1992	EAP
EMPR for a basalt quarry in Mtubatuba	North Coast Crushers.	1994	EAP
EMPR for a brickworks on the Mzimkulu River	IH Brick & Block.	1996	Project leader and EAP
EMPR for Brockwell Colliery in Vryheid	Trans Natal Colliery	1997	Project leader and EAP
EMPR for Glen Quarry, Dundee	Sunshine Quarries	1998	Project leader and EAP
Environmental Management Programme for Midmar Crushers Dolerite Quarry, Howick	Midmar Crushers	1998	Project leader and EAP
EMPR for Natal Ammonium Colliery Closure in Vryheid	Kangra	1999	Project leader and EAP
EMPr and WUL Compliance assessment for Tendele Mining	Tendele	2019	Lead Auditor
Strategic Environmental Assessments			
Strategic Environmental Assessment for the location of marinas, ski lanes and bathing areas	Government of Mauritius	2003	EAP
SEA for development of a Tourism Strategy for Kwadukuza Local Municipality.	Hayley Sharpe	2008	EAP
Strategic Environmental Assessment to identify Industrial land in Ilembe District.	Urban Econ	2009	EAP
Due Diligence Studies			
Due diligence study for privatization of the oil industry in Zambia.	Zambian Government	2000	EAP
Due Diligence for 'Project Pipe' in Howick KZN.	ERM	2003	EAP
Due diligence for acquisition of various industrial sites in KZN	ERM	2004	EAP
General Environmental Projects			
Production of a brochure on environmental control for the Outer West Local Council.	eThekwini Municipality	1993	EAP
Seychelles Chapter in World Summit Sustainable Development book in order to provide a constructive analysis of the application of Environmental Assessment.	South African Assessment of Impact Assessment	2003	Research and compilation
Strategic planning for the identification of Major Hazardous Installations in eThekwini.	eThekwini Municipality	2004	EAP
Duty of Care study for Sappi Saiccor industrial Modernisation Project	Sappi Saiccor	2005	EAP
Closure Planning			
Closure Plan for Assmang Manganese, Cato Ridge.	Assmang	2005	Project leader and EAP
Pasture Management			
Preparation of a pasture management plan on various equestrian properties in Assagay.	Various	2006 - present	Project leader and EAP
Ongoing management of several equestrian properties in Assagay.	Various	Ongoing	Project leader and EAP
Environmental Review			
Review of the EIA for the proposed Xolobeni Mining Project.	GCS	2007	Review

Review of Various mining applications for GCS Consultants	GCS	2010-2011	Review
Review of Several projects for Acer Africa.	Acer	2011-present	Review
Review of the Keystone Logistics Park Environmental Impact Assessment	Balanced Environment	2015	Review and assistant to EAP
Review of all Environmental Projects for Geomeasure Group	GMG	2012-present	Review
Review of the Chitima Mining EIA in Mozambique	GCS	2018	Review
Review of Somkhele Mining application EMPr	Tendele	2019	Review
Corporate Governance			
Verification audit for McAlpine's Annual Sustainability Report at 4 sites in UK (industrial, retail, infrastructure and mining).	WSP	2005	Lead Auditor
Facilitation at the Real World Learning event for Exel in Hoedspruit.	Exel	2005	Facilitator
Review of Eskom's 2006 Annual Report	Eskom	2006	Review
Legal Register compilation			
Monoweld Galvanisers	Monoweld	2016	Author
Equal Chance	Equal Chance	2017	Author
Or Tambo International Airport Bulk Fuel Storage	BP/GMG	2018	Author
Wonderboom Airport Bulk Fuel Storage	BP/GMG	2018	Author
George Airport Bulk Fuel Storage	BP/GMG	2018	Author
East London Bulk Fuel Storage	BP/GMG	2018	Author
Strategic Assistance			
Environmental Advisory work	DCLM	2010 to present	Advisor
Strategic assistance with regard to Environmental Management Systems	Voermol Feeds	2016 to present	Advisor
Carbon Footprint			
Development of Carbon Footprint Report	Voermol Feeds	2017	Author
Update of Carbon Footprint Report	Voermol Feeds	2018	Author

APPENDIX 2- SPILL CONTINGENCY AND EMERGENCY RESPONSE PLAN