9. PLAN OF STUDY FOR EIA

9.1 INTRODUCTION TO THE EIA PHASE

The Scoping Phase of the project focuses on identifying and describing the key issues that require specialist investigations in the EIA (**Chapter 8**). These specialist studies will be undertaken in the EIA Phase of the project. Likely impacts identified will be confirmed and evaluated according to criteria (**Chapter 9.4**) to determine their significance. Mitigation measures to minimize any significant negative impacts and optimized on beneficial opportunities will be proposed.

Alternatives to the proposed project have been fully investigated (**Chapter 4**) and confirm that the proposed project is the preferred option. The specialist studies will therefore only focus on the proposed project and not investigate the alternatives any further.

The Public Participation Process that commenced with the Announcement and Scoping Phase will continue in the EIA Phase (**Chapter 9.5**).

This project is being subject to an internal peer review to be undertaken by Sean O Beirne. Sean has an MSc in Geography and 16 years experience in leading and managing environmental assessments in South Africa, Mozambique and the Russian Federation, the design and implementation of Environmental Management Systems (EMS) for ISO 14001 Certification and post EIA Environmental Management Programmes (EMPs), and applications of Strategic Environmental Assessment (SEA). He has been involved in the peer and external review of major projects in South Africa. Sean is responsible for the peer review of the project.

9.2 SPECIALIST STUDIES

The following specialist studies will be undertaken in the EIA Phase:

- Aquatic Ecology;
- Water Quality;

- Terrestrial Ecology;
- Heritage Resources;
- Social and Landuse Processes;
- Health Impacts;
- Economic Processes;
- Traffic Impacts;
- Visual Impacts;
- Noise Impacts; and
- Air quality.

All specialist studies will be undertaken in compliance with regulation 33(2) of GN 385, and will include:

'(a) details of –

(i) the person who prepared the report; and

(ii) the expertise of that person to carry out the specialist study or specialised process;

(b) a declaration that the person is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(e) a description of any assumptions made and any uncertainties or gaps in knowledge;

(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;

(h) a description of any consultation process that was undertaken during the course of carrying out the study;

(i) a summary and copies of any comments that were received during any consultation process; and

(j) any other information requested by the competent authority.'

Any mitigation measures required will be defined for inclusion in the EMP.

9.2.1 Aquatic Ecology

The aquatic ecology specialist study will be undertaken by Veronica Rall from Golder Africa Associates (Pty) Ltd. Veronica Rall is an experienced aquatic scientist with an MSc in Natural Sciences. She has conducted various aquatic ecological studies relating to all the major ecological components associated with fluvial hydro systems (ecological and biotic integrity assessments, species assemblages - fish and invertebrates, population dynamics, Instream Flow Requirement studies, establishment of microhabitat suitability criteria, water quality and quantity assessments, toxicity and ecological risk assessments, pathway assessments, habitat assessments and functional status assessments) in South Africa and neighbouring countries (Lesotho, Swaziland, Botswana, Namibia and Angola) over the past 12 years.

Information gathered for the Letaba Catchment Reserve Determination Study (DWAF, 2006) is adequate to assess the impacts of the proposed dam on the aquatic fauna of the downstream Groot Letaba River. Available baseline data on the aquatic fauna and riparian vegetation is comprehensive. Some additional information will however be

required to assess the impact of the proposed dam on the Nwanedzi River, habitat alteration and destruction within the dam basin and the disruption of longitudinal connectivity. The information provided by the Letaba Catchment Reserve Determination Study (DWAF, 2006) will also be used as basis for the development of a release strategy for the maintenance of the downstream PES for fish, aquatic macro-invertebrates and riparian vegetation components of the concerned aquatic system (as determined during the Reserve Study, DWAF, 2006). This will be conducted with input from the hydrologist in order to ascertain the supply and availability of water for use by the downstream ecosystem.

Table 9.1 Aquatic Ecology Tasks

Timing	Task
July 2007 – August 2007:	Obtain high resolution satellite imagery of the proposed dam's area of impoundment and plan field survey
October 2007:	Conduct a field survey to obtain additional data required Field survey to gather data on the aquatic fauna and riparian vegetation of the Nwanedzi River and the proposed area of inundation, using standard bioassessment protocols Obtain samples for genetic assessments in order to assess the degree of genetic variation in upstream and downstream fish populations
By February 2008:	Liaise with other specialists, especially Hydrologist. Use existing Reserve (DWAF, 2006) as basis for the development of a release strategy for the maintenance of the downstream PES for the fish, aquatic macro-invertebrates and riparian vegetation. Compile and submit draft EIR, pre-construction and construction EMP.
	The Final EIR and EMP will be submitted two weeks after receipt of comments from the client.

9.2.2 Water Quality

Dr Martin van Veelen will undertake the water quality specialist study.

The effect of the proposed dam on water quality will be studied as follows:

- Obtain all available water quality data from the Department of Water Affairs and Forestry's data bank.
- Determine from the data the current water quality as well as an assessment of the natural background conditions.
- Predict the water quality in the dam by means of a mass balance.
- Predict the changes in water quality downstream of the dam by analyzing a future predicted steady-state flow condition.
- Assess the fitness for use of the predicted water quality in terms of the South African Water Quality Guidelines for the uses of the water that have been identified.
- Propose mitigating measures where needed and appropriate.

Previous water quality studies, especially the work that was done to determine the Reserve, will be used to verify the results of the study and to derive the resource quality objectives.

9.2.3 Terrestrial Ecology

The Terrestrial Ecology specialist study will be undertaken by a team from Ecorex lead by Graham Deall. Graham Deall is a terrestrial ecologist and is registered as a botanical scientist with the South African Council of Natural Scientific Professions (SACNASP). He has an MSc in Vegetation Ecology, and has 25 years professional experience in Southern Africa (mostly South Africa, Swaziland and Lesotho). His experience covers vegetation surveys and mapping, conservation evaluation, impact assessment, impact mitigation, vegetation monitoring, range-condition assessment, land-use evaluation and plant-resource assessment. For the past 10 years he has specialised in Terrestrial Ecological studies for Environmental Impact Assessments involving dam-building, radio-tower construction, open-cast mining, township establishment, resort development, irrigation schemes, transmission lines, water supply projects, roads and railways.

Site-specific ecological field surveys and impact assessments will be undertaken for the areas that will be directly affected by construction activities. On-site surveys of flora and fauna will be undertaken in summer from October to February. It will therefore be possible to screen all of the conservation-important plant and animal species potentially present in the directly affected areas, making an assessment of ecological sensitivity more objective. The potential impacts of the proposed development will be more clearly identified, and mitigation measures to reduce impacts defined.

Crucial aspects to be included in field surveys are outlined for each biotic group as follows:

Plants

The nine most significantly threatened plant species potentially present in the project area and which will be carefully searched for during field surveys are listed in **Table** 9.2 with an indication of the most favourable survey time (to co-incide with the flowering season).

Table 9.2: Plant species to be especially targeted during detailed summer surveys

Species	Family	Form	RD Status	Flowering season	Flower colour
Aloe monotropa	Asphodelaceae	Succulent	VU	Sep-Dec	Red
Borassus aethiopica	Arecaceae	Tree	LC	Not important	Not important
Encephalartos transvenosus	Zamiaceae	Tree	STBA	Not important	Not important
Ensete ventricosum	Musaceae	Tree	LC	Not important	Not important
Melinis tenuissima	Poaceae	Grass	LC	Apr-Jun	Not important
Mondia whitei	Apocynaceae	Climber	LC	Oct-Feb	Green/Purple
Oberonia disticha	Orchidaceae	Epiphyte	NT	Feb-Mar	Straw
Siphonochilus aethiopicus	Zingiberaceae	Geophyte	VU	Nov-Dec	Pink/Mauve

Species	Family	Form	RD Status	Flowering season	Flower colour
Xylopia parviflora	Annonaceae	Shrub	LC	Oct-Dec	Yellow/Green

Mammals

In order to provide mitigation for potential impacts on mammals, an attempt will be made to confirm the presence of Red Data mammals. The following strategy will be adopted in the remaining non-transformed areas of vegetation:

- Rocky outcrops will be searched for bat roosts, elephant shrews;
- Nocturnal surveys will be conducted to search for hedgehogs, rodents, shrews.;
- Drift fence / pitfall traps used in the reptile surveys will be checked for small mammals ; and
- Walk-in traps (e.g. Sherman traps) to be laid in transects through representative habitats; for a minimum of five days.

Birds

In order to provide mitigation for potential impacts on mammals, an attempt will be made to confirm the presence of Red Data bird species. The following strategy will be adopted in the remaining non-transformed areas of vegetation:

- Early morning searches to be conducted along the perennial rivers in order to search for numerous threatened water-associated species;
- As many large trees as possible to be searched for bird of prey nests, particularly along the rivers and in mature woodland; and
- Representative transects will be walked through all relevant habitats and all bird species heard and seen will be recorded.

Reptiles and Amphibians

The presence of threatened, endemic and protected reptiles and amphibians will be confirmed in order for impacts to be mitigated. The following sampling techniques will be used:

- a proportional number of drift fences combined with pit-fall traps will be constructed in each major vegetation type;

- nocturnal searches will be conducted between October and January (calling season of Pyxicephalus adspersus); in order to optimise likelihood of finding the bullfrogs, the searches will be conducted soon after heavy rains; and

- likely reptile habitat, such as large rock slabs, will be surveyed during the day for resting reptiles.

Invertebrates

Field surveys for invertebrates will include night-time searches with ultraviolet light for the protected scorpions, especially the three predicted Hadogenes species, as presence/absence of Hadogenes can only be reliably ascertained by using this technique. Daytime searches for these and all other protected scorpion species will also be carried out.

A combination of pitfall trapping and day-time searches will be used to confirm presence/absence of the protected beetle and spider species and surveys will be carried out during the wet summer months (November-March).

Visual searches and netting will be required to survey dragonfly, damselfly and butterfly populations. However, non-overlap of flight periods of the butterflies (September-November for Wolkberg Widow and Lotana Blue, November-December for Stevenson's Copper, December-January for Wolkberg Zulu and February-March for Swanepoel's Brown) would lead to a requirement for at least three intensive surveys. Since all of the seven predicted Red Data Odonata and Lepidoptera species are only likely to occur well to the west and upstream of the proposed dam, and are therefore not likely to be impacted in any way, surveys will not be carried out for these species.

The EMP will include an appropriate invertebrate biodiversity-monitoring programme, including the description of baseline assessments of selected indicator taxa (e.g. Dromica spp.) that must be undertaken prior to any development of the site.

9.2.4 Heritage Resources

Dr Johhny van Schalkwyk will undertake the heritage resources specialist study. He has been working at the National Cultural History Museum, Pretoria, for the past 29 years. During that time he has actively done research in the fields of anthropology, archaeology, museology, tourism and impact assessment. This work was done in Limpopo Province, Gauteng, Mpumalanga, North West Province, Western and Northern Cape, Botswana, Zimbabwe, Lesotho and Swaziland. Based on this work, he has curated various exhibitions at different museums and has published more than 60 papers. During this period he has done more than 400 impact assessments (archaeological, anthropological and social) for various government departments and developers. Projects include roads, pipelines, dams, mining, water purification works, historical landscapes, refuse dumps and urban developments.

The study will be undertaken in compliance with National Heritage Resources Act (Act No. 25 of 1999), with special reference to Section 3. The heritage resources specialist survey the area to potentially be affected by the proposed development, identify and evaluate any sites, features and objects of cultural significance located in the area.

The impact of the proposed development on the sites or cultural material will be considered, and recommendations on steps to be taken prior to development will be made. These range from:

- High, where it would have a "no-go" implication on the project regardless of any mitigation;
- Moderate, where the impact could have an influence which will require modification of the project design or alternative mitigation;
- Low, where the impact will not have an influence on or require to be significantly accommodated in the project design, i.e. where no mitigation is required.

The significance of the sites, features and objects are determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind

that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

The methodology includes:

- Survey of the literature

  A survey of the available literature would be done in order to review previous research and to determine the potential of the area.

- Data bases

  Various databases would be consulted. Locally, these would include the Archaeological Data Recording Centre (ADRC), housed at the National Cultural History Museum, Pretoria and the Environmental Potential Atlas.

- Other sources

  The topocadastral and other maps would be studied. Similarly, aerial photographs, if available, would be studied. Local knowledge, e.g. people working in museums or at universities would also be accessed.

The total area would be inspected. Normally, a number of parallel transects would be walked over the site and all sites, features and object identified would be recorded. Special attention would be given to archaeological sensitive areas, e.g. outcrops (for stone walled sites and rock engravings), hills (for settlements and rock shelters), river banks (for Iron Age settlements), etc.

All sites, objects and structures that are identified are documented according to the general minimum standards accepted by the archaeological profession. Coordinates of individual localities are determined by means of the Global Positioning System (GPS) and plotted on a map. Map datum used (locally): Hartebeeshoek 94 (WGS84).

Mitigation of heritage sites that will be destroyed or damaged during development generally involve documentation (photographing and mapping) and, or excavation. An important part of mitigation of sites in the development area that will not to be damaged or destroyed during development is preparation of a heritage resources

management plan. The plan will contain recommendations on the management of the objects, sites or features, and will also provide guidelines on procedures to be implemented if previously unidentified cultural resources are uncovered during later developments in the area. The EIA will only include the specification of mitigation measures for sites found during the survey, but no application of this mitigation.

9.2.5 Social and Landuse Processes

Anita Bron of MasterQ research will undertake the social and Landuse impact assessment. She has a Masters degree in Research Psychology focussing on Environmental Psychology. She specialises in Social Impact Assessments, Social Marketing Research and Monitoring and Evaluation. She has completed Social Impact Assessments for developments such as transmission power lines, distribution lines, pipelines, mines, and substations. As part of her Social Impact Assessments, she also addresses impacts on health and safety, tourism and socio-economy. She reviewed a SIA for a multi products pipeline. She is a guest lecturer at the University of Johannesburg and lectures post graduate classes on information gathering and focus groups. She is currently completing a Masters degree in Social Impact Assessment at the University of Johannesburg. She is a member of SAMEA, the South African Monitoring and Evaluation Association.

The recommended studies in order to assess the impacts on the social processes are:

- Assess the relative socio-economic impacts of three possible Purchase Lines based on three possible Full Supply levels (0.5 MAR, 1 MAR and 1,5 MAR) in order to inform the decision of the size of the dam (this part of the investigation will be undertaken during the Scoping Phase in order to inform the decision on the size of the dam);
- assess the impacts on the demographics of the directly affected communities;
- assess the potential impact of displacement and resettlement;
- assess information on the construction, maintenance and decommissioning activities, timeframes, workforce, and potential to employ and train local people;

- assess the service delivery capacity of municipalities during construction and operation;
- propose a process of implementing local employment mitigation measures;
- compare the potential impacts of housing workers in the communities vs. a construction village;
- assess how the project might impact on spatial development plans;
- asses the loss of agricultural land and changes in agricultural activities during construction and operation;
- assess potential safety and health impacts;
- assess community attitudes towards as well as understanding of and expectations from the project;
- assess the impacts of the proposed land acquisition process; and
- assess impacts on cultural landscape, sense of place, movement patterns.

Data collection methods will include:

- Participant Rural Appraisal which will include focus groups, interviews, and observation;
- Interviews with municipal and the DWAF officials, as well as project managers;
- Case studies of dams in a similar context; and
- Desktop research, including assessment of the Issues and Response Register, and other specialist reports.

9.2.6 Public Health Impacts

Dr Peet Rautenbach will undertake the public health impact assessment. Peet is a Medical Doctor and an Advocate with vast experience including being a medical

officer, medical superintendent and specialist in community health. He is registered as a specialist in Public Health Medicine and as a sub-specialist in Occupational Health. He has been an Assistant Health Adviser at the Chamber of Mines of South Africa. He is presently the Acting Head of the Department of Community Health, School of Medicine, University of Limpopo. He has worked on the implementation of a water and sanitation project in the Limpopo Province, performed a retrospective health impact mitigation feasibility study for the Lake Matsamo development and the implementation of a health monitoring system for the community in the Maguga Dam reservoir area and relocation area in Swaziland. Peet will undertake the Health Impact Assessment.

The Public Health Impact Assessment Specialist will focus on possible public health impacts that may be caused, aggravated or improved by the project and its operation. These could be direct effects associated with water supply and quality, or indirect effects such as those of immigration and employment, in the context of the existing human population, its health problems, and health services. The geographical area that will be considered in this specialist study will be limited to the Groot Letaba River catchment.

Baseline characterisation

The Public Health Impact Assessment specialist will provide a brief overview of the common health problems in the project area and the current capacity of existing health facilities and services in the area. The focus of the Specialist study will be:

- To determine the approximate number and general state of health of the construction and maintenance workers;
- To determine the approximate number and general state of health of the surrounding community.;
- To determine possible health effects of being on site for the construction and maintenance workers;
- To determine possible health effects due to the presence of the construction and maintenance workers on the community;

- To determine how sanitation, housing, the provision of safe drinking water, bulk infrastructure and unauthorised connections will be managed for the construction workers;

- To determine how construction activities will cause changes to the environment and the indirect impact can be expected on the health of construction and maintenance workers and the community, including dust and litter;

- To determine possible health impacts as a result of water pollution caused by agriculture and other industrial activities; and

- To determine possible health impacts and issues surrounding water-related diseases that may be influenced by the project, including malaria, bilharzia and sanitation related diseases.

Impact Assessment

The major issues to be considered in the impact assessment are:

Construction Phase

The will examine the specific health risks associated with construction, such as:

- Transmittable diseases from construction and maintenance workers to the community;

- Transmittable diseases from the community to the construction and maintenance workers;

- Impacts of construction activities on workers. These include, dust, noise, operation of heavy machinery and traffic, including accidents at the sites or on the roads;

- Impacts of construction activities on the community. These include, dust, noise, effects of operation of heavy machinery and traffic, including accidents at the sites or on the roads; and

- How safety issues will be communicated to communities.

Operational Phase

The study will examine the following specific health risks associated with the operational phase:

- Changing water levels in operational phase. The shoreline will be exposed as water levels drop. The effect of the substrate, clay or sand has the potential to affect community health;
- The change from a flowing river to a large body of water will affect the community in terms of water-borne diseases, such as bilharzia and malaria; and
- The positive effects of a supply of clean high-quality water on the health of the community should also be investigated.

Health Management Plan

The feasibility of a HIV/AIDS and screening programme for construction and maintenance workers will be investigated.

Conclusion

The specialist recognises that it is primarily the responsibility of the Department of Health to investigate and mitigate public health issues. However, as this project may, in specific areas, increase or otherwise accentuate specific health related problems, the specialist needs to briefly highlight these areas and recommend mitigation measures. Responsibility for implementation may be vested with the project proponent or another organ of State in the spirit and practice of co-operative governance.

9.2.7 Economic Processes

Kayamandi (Pty) Ltd will undertake the economic processes specialist study.

Russell Aird is the Managing Director of Kayamandi Development Services (Pty) Ltd. He has 20 years experience in the fields of urban economics, economic development, rural development, housing development, industrial sector expansion, and socio-economic development and water transfer schemes. Russell has been involved in numerous water related projects, especially water augmentation schemes, where his speciality has been determining the social and economic impacts of dams and

pipelines as well as the impact on the donor and receiving populations and economy. Projects he has been involved in include the Orange Vaal Augmentation Planning Study (VAPS), Vaal River Eastern Sub-System Augmentation, Orange River Re-planning, Olifants River Water Resources Development Project and Hartebeestpoort Industrial Water Pipeline. Russell is also the project manager for a multi year project, to provide Business Support to DWAF for the Development of Management Interfacing and Socio-Economic Systems. Due to the multi dimensional nature of development projects Russell has evolved into a competent project manager and has successfully undertaken numerous studies and coordinated various projects of a multi-sectoral nature.

Nanja Churr has a degree in Town and Regional Planning and has done training in Canada in the fields of Regional Planning and Economic Investment Analysis, the theory of economic development, and the practice of Economic Development. She has extensive experience in the field of socio-economic development of communities, inclusive of the dynamic impacts associated with urban frameworks and infrastructure development/upgrading, as well as in conducting economic profiles and complimentary analysis and interpretation. Nanja has been involved with numerous economic frameworks, development plans, urban revitalisation studies, integrated development planning, local economic development plans, socio-economic research, macro-economic analysis, feasibility studies and business plan development and economic impact studies. Her experience in socio-economic impact studies includes impact studies for mines, pipelines, dams, roads and other infrastructures.

The purpose of the economic impact assessment study is to:

- define and describe the receiving environment (local, regional, broader, etc) from an economic perspective, and to identify, analyse and in detail to assess the opportunities and constraints arising from or potentially limiting the proposed project;

- assess the development impact of the proposed project on the economy of the region (including the improvement of the tax base), which will form an important component for establishing the overall feasibility of the Project; and

- quantify the impact of the proposed project on GGP, new business sales, employment, income generation; loss of resources, and personal income.

The various measures of direct economic impacts include:

- Total employment which reflects the number of additional jobs created by economic growth. This is the most popular measure of economic impact because it is easier to comprehend than large, abstract Rand figures. The total employment can be interpreted in terms of generally accepted definitions of job creation.

- Aggregate personal income rises as pay levels rise and/or additional workers are hired. Either or both of these conditions can occur as a result of business revenue growth. As long as nearly all of the affected workers live in the study area, this is a reasonable measure of the personal income benefit of a project or program.

- Value Added (which is normally equivalent to Gross Domestic Product or Gross Regional Product) is a broader measure of the full income effect. This measure essentially reflects the sum of wage income and corporate profit generated in the study area. However, in today's increasingly global economy, value added can be an overestimate of the true income impact on a local area, insofar as it includes all business profit generated there.

- Business Output (also referred to as revenue or sales volume) is the broadest measure of economic activity, as it generates the largest numbers. It includes the full (gross) level of business revenue, which pays for costs of materials and costs of labour, as well as generating net business income (profits).

- Property Values are also a reflection of generated income and wealth. When property values rise in a community as a result of increasing demand for property that may be a direct consequence of increasing aggregate personal income or investment of business profits.

Information required will largely be accessed from site inspections, interrogation of maps and aerial photographs, technical discussions and meetings with local role

players and stakeholders. Use will be made of existing databases and results from existing studies wherever possible.

Inception and delineation of study area

An assessment needs to be made on the current state of the economy in the project area. In order to undertake this study it would be essential to undertake a site visit in order to obtain key primary data and to delineate the study area.

For the purpose of economic analysis, a delineation of the study area is required. The study area and areas of impact need to be delineated into primary (local), secondary (surrounding area of impact) and tertiary area of investigation (broader area and International such as Mozambique). The primary area refers to farm areas and settlements directly affected by the dam and the length of area on which the proposed pipeline and related dam infrastructure will be located. The surrounding areas and communities/villages refer to the secondary area of investigation and the tertiary area of investigation refers to the broader area, major towns, municipal areas and District that will be economically impacted.

Base profile

To determine the potential economic impact that the proposed project will have on the region, it is necessary to compile a base profile of the study area. The data attained here will need to form the baseline data to be utilised in a input/output model. The profile will include economic structure, identification of sectoral development opportunities according to the SIC, sectoral production, economic base, employment, growth, potential, trends per sector (especially agriculture and tourism), specialisation, linkages and comparative advantages.

Impact Modelling and assessment

During scoping the following economic impacts, which need to be considered and quantified in this study, were identified:

- Economic effect
- Employment
- Business output and sales

- Government income and expenditure
- Standards of living
- Agriculture production and loss of agricultural land
- Ownership and land use patterns
- Stimulation of income generating activities
- Property values

The input-output model will be utilised to quantify the impact. The model will take cognisance of all the economic gains and losses. An assessment (quantitative and qualitative) is therefore required of the economic impacts.

The potential impact that will be incurred should there be some undue delay in the implementation of the proposed project should also be included. This implies the opportunity costs need to be determined.

The identified impacts need to be assessed in terms of nature, extent, duration, intensity, frequency of occurrence, probability, and will include reference to both positive and negative impacts during both operation and construction.

The current values of the impacts need to be calculated as well as the exact location and timing of the impacts. The techniques to be used to calculate the current value will depend on the nature of the particular element (e.g. gross margin per hectare in the case of irrigation land). Depending on the nature of the particular element, this current value should be discounted over a certain period at a certain rate to arrive at the relocation or compensation costs.

Cognisance should also be taken of direct growth expectations and indirect growth expectations.

Impact and management measures reporting

Management and mitigation options that identify alternative ways of meeting needs, bringing about changes in plans, improving monitoring and management, and improving negative perceptions will be defined.

The specialist study will include:

- Economic baseline data (qualitative and quantitative);
- Positive and negative quantification of economic impacts, issues and aspects covering nature, extent, duration, intensity, frequency of occurrence, probability, and legal requirements (where applicable);
- Management plan to guide the development and maximize positive economic impacts and minimize negative economic impacts; and
- Recommendations: key interventions required to address risks and meet economic needs.

9.2.8 Traffic Impacts

Bert de Vries of ILISO Consulting will undertake the traffic specialist study. Bert is a registered professional engineer and specialises in traffic and transportation planning. He has been involved in a variety of Traffic Impact Assessments for major developments and environmental impact assessments. He has 30 years of traffic and transportation experience on projects in the Western and Eastern Cape, Gauteng and Swaziland.

The TIA will address the impact during construction and after completion of the dam. The TIA will investigate the effects of the relocation of roads on local travel around the dam.

Data Collection

Existing traffic information will be collected on the road network surrounding the dam, R71, P433 and the district roads which form part of the road network affecting the Nwamitwa Dam.

The traffic surveys will be undertaken to compliment the existing traffic data. Classified traffic counts will be undertaken from 06:00 – 18:00. In addition to traffic counts, vehicle occupancy counts will be undertaken to establish the number of person trips affected by the relocation of the roads.

Pedestrian and other non-motorised traffic will be surveyed. Limited origin and destination surveys might be undertaken for pedestrian and other non-motorised travel to determine the in- or decrease of travel distance between their origins and destinations.

Construction information will be collected to determine the flow of persons, goods and materials during construction. Furthermore the use of the dam for other than for bulk water uses will be ascertained, which might generate traffic after completion of the dam.

Road network information, road width and surface conditions as well as pavement management information will be collected to establish whether construction traffic could damage roads to be used for construction purposes.

Traffic Generation

Traffic generated by the dam will be determined from construction information. Traffic generated by the dam after construction might be minimal depending on activities, other than water storage, that will be allowed.

Traffic Impact

The traffic impact will be assessed during construction and after completion of construction for the normal daily traffic conditions.

The impact on travel of people in the area surrounding the dam will be assessed in relation with the road relocation programme.

The impact of increased heavy vehicular traffic on the road pavement and road structure will be assessed.

Mitigation

Mitigating measures will be proposed to minimise the impact of the dam if require.

9.2.9 Visual Impacts;

Karen James from Insite will undertake the visual impact assessment. Karen has a Bachelor's degree in Architectural Studies and an Honours degree in Landscape Architecture. She has been involved in governmental, commercial, retail and industrial development, master planning, environmental impact assessments (EIAs) and planning, as well as residential estate design projects. She works for Insite Landscape and Environmental Consultants and has compiled a number of Individual Visual Impact Assessments for previous Gautrain EIAs. These assessments were conducted over the proposed Northern and Southern Variants of the Gautrain Rapid Rail Link and included full Visual Analyses, with substantial visual graphics, Study Reports, as well as summaries for Proposed Mitigation techniques.

Basic Premises

There is a strong correlation between ecologically healthy landscapes and scenically intact landscapes and it is for this reason that the importance of the quality of our visual environment is of significant concern. At times when a 'visual resource' has to compete with the exploitation of the other resources of our country or region, or when infrastructure or development is imposed on the existing landscape, it is very often the scenic quality and character of that landscape that is diminished. It is the therefore the objective of a Visual Impact Assessment (VIA) to investigate and recommend a visual resource management system (VRM) that will identify the significance of and furthermore protect the quality of a visually positive environment.

The visual impact study is to be included to some extent in the Environmental Impact Assessment (EIA) that will focus on the proposed construction of a major dam on the farm Janetsi, an area which lies within the Groot Letaba River at the confluence of the Nwanedzi River.

A Visual Impact Assessment (VIA) will provide the project with a system of applying management policies to scenically important areas. These areas will be identified

and geographically delineated according to their assessed qualitative attributes and sensitivity to viewing. Such a system will serve then as a management and decision-making tool for land managers, developers, engineers and decision-makers.

Terms of Reference

The terms of reference for this study are the following:

- Sketches and plans will be used in describing the components of the intended development as well as the study area.
- The landscape setting in which the dam development is proposed to lie will be described.
- The boundaries of the viewshed will be illustrated on a plan. This will also identify the critical surrounding land uses and view lines exposed to the view of the various structural and mechanical components.
- The change in the visual setting for each identified land use zone shall be analyzed and appropriately illustrated.
- The significance of the visual impact for each land use zone will be assessed according to a set of defined criteria.
- The impact significance for each land use zone or view line will be presented in the form of a table summary for ease of reference.
- Specific mitigation measures for each identified zone will be recommended, and their effectiveness in reducing a negative visual impact established.
- The assessment will investigate and address the visual impacts of the new dam in its various phases of construction and after its completion.

9.2.10 Noise Impacts

Derek Cosijn will undertake the noise specialist study. Derek is a professional engineer registered with the Engineering Council of South Africa (ECSA), a fellow of SAICE, a member of the Southern African Acoustics Institute (SAAI) and is a certified Environmental Assessment Practitioner (EAP). He is a partner with Jongens Keet

Associates and Calyx Environmental cc. He has had 39 years of professional experience over a wide range of civil engineering, transportation planning, environmental and acoustic engineering projects. His area of special expertise is environmental noise (acoustical engineering). The environmental projects have ranged through EIAs and noise impact assessments, policy formulation and procedural guideline development. He has worked with a wide client base, ranging from the National Department of Transport, Provincial transportation/road authorities, Provincial environmental authorities, the metropolitan authorities and many local councils, to private organizations, and has also worked in Canada.

Noise Impact Assessment

i) A sufficiently detailed quantitative (by measurement) and qualitative assessment is to be undertaken within the area of influence of the planned Groot Letaba River Water Development Project (GLeWAP) in order to enable a full appreciation of the nature, magnitude, extent and implications of the potential noise impact.
ii) The noise impact assessment is to focus on the construction and operational noise impacts of proposed dams, the planned pipelines and related pump stations, and required appurtenant works.
iii) The level of investigation is to that of an environmental impact assessment (EIA).
iv) All aspects of the investigation are to conform to the requirements of relevant environmental legislation and noise standards.
v) The potential impacts of the pre-construction, construction and operational phases of the project are to be assessed.
vi) Where relevant, appropriate noise mitigating measures are to be identified. These need only be conceptual at this stage.
vii) There will be no direct involvement by the noise specialist in the public involvement programme.

9.2.11 Air quality

The air quality specialist study will be undertaken by Airshed. Reneé Thomas is an air quality consultant and has six years of experience in the field of air pollution impact assessment and air quality management. She was part of the Highveld Boundary

Layer Wind Research Group based at the University of Pretoria. At Airshed Planning Professionals (previously Environmental Management Services) she has undertaken numerous air pollution impact studies and has provided extensive guidance to both industry and government on air quality management practices. She is currently completing her masters in micrometeorology. She has six years experience in conducting air quality impact assessments for a wide range of industries including: pulp and paper industries, pelletizer operations, refineries, cement operations, incinerators, chromium chemical operations, power stations, iron and steel industries, platinum industry, mining, cement industries, chlorine industries, ferro-silicon industries and fertilizer plants.

The following tasks will be undertaken:

Baseline Characterisation

Determine the regional climate and site-specific atmospheric dispersion potential, including:

- Analysis of meteorological data (from the nearest weather station to the site); and,
- Characterisation of ambient air quality and dustfall levels in the region based on available data recorded to date in the region (if available).
- Identification of the potential sensitive receptors within the vicinity of the proposed site.
- Identification of existing sources of dust emissions in area.
- The legislative and regulatory context for South Africa (also likely to include reference to the World Bank guidelines, the World Health Organisation and the European Community).

Impacts Assessment

The impacts assessment will include:

Construction Phase:

- Compilation of an emissions inventory, comprising the identification and quantification of sources of emission.
- Dispersion simulations of ambient respirable particulate concentrations and dust fallout from the construction activities for the proposed dam.

- Analysis of dispersion modelling results from both construction phases of the proposed dam, will include:
- Determine zones of maximum incremental ground level impacts (concentrations and dust fallout); and,
- Evaluation of potential for human health and environmental impacts.

Operational Phase:

A qualitative assessment of the proposed air quality due to the operation of the proposed dam.

Dust Management Plan

Development of a dust management planning component for the construction phase comprising of the following:

- Source prioritisation based on source contributions to total emissions and air quality related impact potentials;
- Identification of cost-optimised mitigation and management measures for priority sources;
- Determination of suitable timeframes, responsibilities, performance indicators and targets for selected mitigation and management measures;
- Development of a suitable ambient monitoring network, to fulfil the following functions:
- On-going characterisation of ambient air quality levels;
- Demonstrate the level of compliance with relevant air quality guidelines and standards, and deposition levels;
- Track progress of emission reductions measures being implemented; and,
- Provide early warning of adverse external impacts.
- Recommendation of emission controls and management measures to be taken into account in the project design phase in order to minimise the potential for air quality impacts.

9.3 ENVIRONMENTAL IMPACT REPORT

Once the specialist investigations have been completed and the findings and recommendations integrated by the team, an Environmental Impact Report will be

prepared according to Government Notice R385, Section 32 (2) and will include the following:

- A description of the EAP who prepared the report;
- A detailed description of the proposed activity and route;
- A description of the environment that may be affected;
- A description of the PPP that was undertaken;
- A description of the need and desirability of the project and details of the alternatives that were investigated;
- Findings and recommendations of specialist studies;
- An indication of the method used to identify significance;
- A comparative assessment of all alternatives;
- An assessment of each potentially significant impact;
- An opinion of whether the activity should be authorised or not, and if is should be authorised, and conditions that should be made in respect of the authorisation;
- An Environmental Impact Statement; and
- A draft Environmental Management Plan.

9.4 ENVIRONMENTAL MANAGEMENT PLANS

Environmental Management Plans

A draft pre-construction Environmental Management Plan (EMP) and a generic construction EMP will be compiled and included in the Environmental Impact Assessment Report. The overall objective of these EMPs will be to present a workable document that explains how to operate and implement environmental protection requirements for construction. An EMP for the operational phase will be compiled during the detailed design phase when the information is available.

The EMP will contain and address the following aspects:

- Roles and responsibilities will be defined.
- Environmental specifications that are applicable to the project and its associated activities will be set out and will provide guidance in order to achieve these environmental specifications.
- Defining corrective actions which must be taken in the event of non-compliance with these environmental specifications.
- Specifying requirements and procedures for monitoring, auditing and reporting.
- Specifying requirements and procedures for record keeping.
- Acting as a monitoring and auditing reference tool for ensuring compliance with the provisions of the EMP.
- Making provision for review of the EMP.
- Defining how the management of the environment is reported and performance is evaluated.
- Specifying compliance with all applicable laws, regulations, standards and guidelines for the protection of the environment.
- Adopting the best practicable means available to prevent or minimise adverse environmental impacts.
- Describing all monitoring procedures required to identify impacts on the environment.
- Encouraging continual improvement of environmental performance.
- Facilitating the training of employees and contractors with regard to environmental obligations.

9.5 IMPACT ASSESSMENT METHODOLOGY

The key issues identified during the Scoping Phase informed the terms of references of the specialist studies summarised above. Each issue consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative and from the project onto the environment or from the environment onto the project. In the EIA the significance of the potential impacts will be considered before and after identified mitigation is implemented.

A description of the nature of the impact, any specific legal requirements and the stage (construction/decommissioning or operation) will be given. Impacts are considered to be the same during construction and decommissioning.

The following criteria will be used to evaluate significance:

Nature

The nature of the impact will be classified as positive or negative, and direct or indirect.

Extent and location

Magnitude of the impact and is classified as:

- **Local**: the impacted area is only at the site – the actual extent of the activity
- **Regional**: the impacted area extends to the surrounding, the immediate and the neighbouring properties.
- **National**: the impact can be considered to be of national importance.

Duration

This measures the lifetime of the impact, and is classified as:

- **Short term**: the impact will be for 0 – 3 years, or only last for the period of construction.
- **Medium term**: three to ten years.

- **Long term**: longer than 10 years or the impact will continue for the entire operational lifetime of the project.
- **Permanent**: this applies to the impact that will remain after the operational lifetime of the project.

Intensity

This is the degree to which the project affects or changes the environment, and is classified as:

- **Low**: the change is slight and often not noticeable, and the natural functioning of the environment is not affected.
- **Medium**: The environment is remarkably altered, but still functions in a modified way.
- **High**: Functioning of the affected environment is disturbed and can cease.

Probability

This is the likelihood or the chances that the impact will occur, and is classified as:

- **Low**: during the normal operation of the project, no impacts are expected.
- **Medium**: the impact is likely to occur if extra care is not taken to mitigate them.
- **High**: the environment will be affected irrespectively; in some cases such impact can be reduced.

Confidence

This is the level knowledge/information, the environmental impact practitioner or a specialist had in his/her judgement, and is rated as:

- **Low**: the judgement is based on intuition and not on knowledge or information.
- **Medium**: common sense and general knowledge informs the decision.

- **High**: Scientific and or proven information has been used to give such a judgement.

Significance

Based on the above criteria the significance of issues will be determined. This is the importance of the impact in terms of physical extent and time scale, and is rated as:

- **Low**: the impacts are less important, but may require some mitigation action.
- **Medium**: the impacts are important and require attention; mitigation is required to reduce the negative impacts
- **High**: the impacts are of great importance. Mitigation is therefore crucial.

Cumulative Impacts

The possible cumulative impacts will also be considered.

Mitigation

Mitigation for significant issues will be incorporated into the EMP for construction.

Table 9.3: Example of Impact Assessment Table

Description of potential impact		
Nature of impact		
Legal requirements		
Stage	Construction and decommissioning	Operation
Nature of Impact		
Extent of impact		
Duration of impact		
Intensity		

Probability of occurrence		
Confidence of assessment		
Level of significance before mitigation		
Mitigation measures (EMP requirements)		N/A
Level of significance after mitigation		N/A
Cumulative Impacts		
Comments or Discussion		

9.6 PUBLIC PARTICIPATION IN THE IMPACT ASSESSMENT PHASE

After the Scoping Phase, a detailed Environmental Impact Assessment will be carried out and an Environmental Impact Report (EIR) prepared.

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Environmental Impact Report (EIR) is made available to the public for comments. I&APs will comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones. Once the review is completed, the authority may decide to request additional information on matters that may not be clear from the report, authorise the application with certain conditions to be complied with by the applicant or reject the application. An Environmental Authorisation reflecting the decision of the authority as well as any conditions that may apply will be issued to the applicant.

I&APs will be advised in good time of the availability of these reports, how to obtain them, and the dates and venues of public and other meetings where the contents of the reports will be presented for comment.

Public participation activities during the impact assessment phase of the EIA will revolve mainly around a review of the findings of the EIA, presented in the Draft

Environmental Impact Report (EIR), a Summary Report of the Draft EIR, and the volume of Specialist Studies.

NB: The public participation process and scheduling suggested for the Impact Assessment Phase are provisional, since the Scoping Phase often points the way to the process that should be followed during the Impact Assessment Phase.

9.6.1 Progress Feedback

At the beginning of the Impact Assessment Phase (January 2008), all stakeholders on the database will receive a personalised letter to report on progress to date, to thank those who commented to date, and to outline the next steps in the process. They will again be offered the proceedings of the public meetings (held in October 2007) for their information, and will be advised that the Final Scoping Report had been handed to the authorities for approval that the Specialist Studies may proceed.

As part of the on-going communication process, every comment received from an I&AP will be responded to by way of a personalised letter of appreciation, indicating what will happen to the comment, e.g. will be taken up in the Specialist Investigations, etc. The broader body of stakeholders will continue to be informed of progress with the Specialist Studies and the EIA and asked for their inputs on an ongoing basis up to the record of decision by the authorities.

9.6.2 Draft EIR and Summary Report

Findings of the environmental investigations will be integrated by the environmental consultants and captured in a Draft Environmental Impact Report (EIR). The report will include the Issues/Response Report, which will list every issue raised with an indication of where the issue was dealt with in the technical evaluations, and the relevant findings. It will also include a full description of the EIA process, including the necessary appendices.

A summary of the Draft EIR (probably around 25 pages) will be prepared for those I&APs that have neither the time nor the inclination to review the full EIR and the Specialist Studies. It will contain an abridged version of the full EIR, with emphasis on the findings, conclusions and recommendations. It must be noted that it is never

possible in such a summary to provide the full reasoning behind all statements, findings, conclusions and recommendations. I&APs will be referred back to the full EIR report, which will be available in public places, for further information.

Announcement of opportunity to comment on findings

The availability of the Draft EIR and the Summary Report, as well as the comment period and the deadline for comment, will be announced by the following methods:

- Personalised letters to all individuals and organisations on the mailing list
- Posters at selected public places to announce the opportunity to comment
- Paid advertisements in the local and regional media
- Radio announcements on local radio stations (three languages).

Distribution

The full Draft EIR, including its Summary, the Issues and Response Report and the volume of Specialist Studies, will be left in public places (see Table 9 – same as the public places used for the Draft and Final Scoping Reports) in the study areas where the broader public can have access to it, and will be on display at meetings with stakeholders.

Only in special cases, such as the decision-making and commenting authorities, will the full sets of reports be distributed. The Draft EIR alone, and individual Specialist Studies will, however, be distributed to stakeholders that specifically request them.

However, the Summary of the Draft EIR will be widely distributed, as follows:

- Mailed to those that request it, in the language of their choice
- Mailed to everyone registered to attend public meetings
- Be available for further distribution at the public meetings
- Personally handed to stakeholder leaders during meetings

- Be placed on the Web site.

Methods of public review

Public review of the Draft EIR will be by the following methods:

- Written comment, including email – a comment sheet asking I&APs to respond to particular questions will accompany the report; further written submissions will be encouraged
- Verbal comment during public meetings – see below
- One-on-one discussions with the EIA team members subsequent to the public meetings.

I&APs will be asked to keep the following in mind when reviewing the findings of the EIA:

- Verify that the issue(s) they have raised during the Scoping Phase have been considered in the report
- If the issue is not specifically considered in the report, verify that an indication has been provided of where and when it will be addressed
- Indicate which of the findings they agree with, and which not
- For those of the findings that they do not agree with, they will be asked to provide reasons and supporting information, or at least the sources where such information can be obtained. They are also welcome not to agree because of personal preference.

Public meetings

Similar to the scoping phase, two public meetings (table 6) will be convened to assist stakeholders to comment on the findings of the investigations.

Final EIR and its supporting reports

The Final EIR and its supporting reports will incorporate public comment received on the Draft EIR, and will be distributed mainly to the authorities and key I&APs. No summary of the Final EIR is foreseen.

Progress feedback

After the last round of public meetings, stakeholders will be informed by way of personalized letter that the Final EIR has been submitted to the authorities for decision-making, and approximately when the decisions can be expected.

9.6.3 Notification of the Environmental Authorisation

Once the authority's environmental authorisation has been issued, all stakeholders will receive a letter (within 7 days) and be advised of the appeals period, and thanked for their contributions during the environmental authorisation process.

After the Scoping Phase, a detailed Environmental Impact Assessment will be carried out and an Environmental Impact Report (EIR) prepared. This report will contain descriptions of each feasible alternative to the process under consideration, an assessment of the environmental impacts of these alternatives, determination of the significance of the impacts, mitigation measures proposed to lessen the impacts. There will also be a section addressing the issues raised during scoping and a comparative assessment of the feasible alternatives.

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Environmental Impact Report (EIR) is made available to the public for comments. I&APs will be afforded an opportunity to verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere. Also, I&APs will comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones. Once the review is completed, the authority may decide to request additional information on matters that may not be clear from the report, authorise the application with certain conditions to be complied with by the applicant or reject the application. An Environmental Authorisation reflecting the decision of the authority as well as any conditions that may apply will be issued to the applicant.

I&APs will be advised in good time of the availability of these reports, how to obtain them, and the dates and venues of public and other meetings where the contents of the reports will be presented for comment.

9.7 PROGRAMME

The EIA process commenced with a pre-application consultation with DEAT in March 2007. This was followed by a technical site visit, after which the application form was completed and submitted. The project announcement and public participation for the scoping phase took place during August 2007. The Draft Scoping Report has now been compiled and will be available for public comment from 3 October 2007 to 31 October 2007.

All the comments on the Draft Scoping Report will be considered and incorporated to produce a final Scoping Report for submission to DEAT in November 2007. Once the DEAT has reviewed and responded to this report, the specialist studies can be concluded and the Draft Environmental Impact Assessment Report compiled.

The draft Environmental Impact Assessment Report will present the findings of the specialist studies and recommendation on how the project should be implemented to ensure environmental sustainability. This draft report will scheduled to be available for public comment in April 2008.

All the comments on the Draft Environmental Impact Assessment Report will be considered and incorporated to produce a Final Environmental Impact Assessment Report for submission to DEAT in July 2008. The DEAT will review and respond to this report by deciding whether the project can go ahead or not, and if it can, then under what conditions. This response is expected in October 2008. An appeal period follow the authorisation.

Table 9.4: Summary of the EIA programme

Date	Activity
8 March 2007	Pre-application consultation
19 – 21 March 2007	Site Visit
22 June 2007	Application form submitted
August 2007	Scoping public participation
September/October 2007	Draft Scoping Report public comment period
November 2007	Submit Final Scoping Report
January 2008	Specialist studies and impact assessment
April – May 2008	Draft EIR and EMP public comment period
July 2008	Submit final EIR and EMP
August - October 2008	Authority Review