



water & forestry

Department:
Water Affairs and Forestry
REPUBLIC OF SOUTH AFRICA

REPORT NO.: P 02/B810/00/0708/ Volume 2

GROOT LETABA RIVER WATER DEVELOPMENT PROJECT (GLeWaP)

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

SEPTEMBER 2008



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LIST OF STUDY REPORTS IN GROOT LETABA RIVER WATER DEVELOPMENT PROJECT (BRIDGING STUDIES)

This report forms part of the series of reports, done for the bridging studies phase of the GLEWaP. All reports for the GLEWaP are listed below.

Sequential Numbering				Annexure Title
Authors	Volume	Report Title	Annexure	
Project Coordination and Management Team (BKS) P 02/B810/00/0508	Volume 1	Executive Summary Report	n/a	-
	Volume 2	Main Report	n/a	-
	Volume 3	Record of Implementation Decisions	n/a	-
	Volume 4			
	Volume 5			
Technical Study Module (Ninham Shand) P 02/B810/00/0608	Volume 1	Main Report	n/a	-
	Volume 2	Preliminary Design of Nwamitwa Dam	Annexure 1	Nwamitwa Dam: Design Criteria Memorandum
			Annexure 2	Nwamitwa Dam: Dam Type Selection Report
	Volume 3	Preliminary Design of the Raising of Tzaneen Dam	n/a	-
	Volume 4	Bulk Water Distribution Infrastructure	n/a	-
	Volume 5			
	Volume 6			
	Volume 7			
	Volume 8			
	Volume 9			
	Volume 10			
Environmental Management Module (Iliso Consulting) P 02/B810/00/0708	Volume 1	Scoping Report	n/a	-
	Volume 2	Environmental Impact Assessment Report (P 02/B810/00/0708 Volume 2)	Annexure A	Water Quality Specialist Study
			Annexure B	Terrestrial Ecology Specialist Study
			Annexure C	Social Impact Assessment
			Annexure D	Economic Specialist Study
			Annexure E	Public Participation
			Annexure F	Air Quality Specialist Study
			Annexure G	Visual Impact Assessment
			Annexure H	Aquatic Ecology Specialist Study
			Annexure I	Noise Impact Assessment
			Annexure J	Heritage Resource Specialist Study
			Annexure K	Health Impact Assessment
			Annexure L	Traffic Impact Assessment
			Annexure M	Sedimentation Impact Assessment
			Annexure N	Framework Pre-construction
			Annexure O	Construction Environmental Plans
	Volume 3	Environmental Management Programme for Borrow Area 2 on the Farm La Parisa 729 (Gubits Farm)	n/a	-
	Volume 4	Environmental Management Programme for Borrow Area 3 on the Farm Letaba Drift 727	n/a	-
	Volume 5			
	Volume 6			
	Volume 7			
	Volume 8			
	Volume 9			
Public Involvement Programme (Zitholele Consulting) P 02/B810/00/0808	Volume 1	Main Report	n/a	-
	Volume 2			
	Volume 3			
	Volume 4			
	Volume 5			
Socio-Economics Evaluation P 02/B810/00/0908	Volume 1	Main Report	n/a	-
	Volume 2			
	Volume 3			
	Volume 4			
	Volume 5			

REPORT DETAILS PAGE

Project name: **Groot Letaba River Water Development Project**

Report Title: **Environmental Impact Assessment Report**

Author: **Terry Baker, Martin van Veelen, Melissa Naidoo and input from various specialists**

DWAF report reference no.: **P 02/B810/00/0708/ Volume 2**

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First issue: **September 2008**

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ENVIRONMENTAL ASSESSMENT PRACTITIONER

Approved for ILISO Consulting (Pty) Ltd by:

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PREFACE

The Department of Water Affairs and Forestry (DWAF) is currently undertaking an Environmental Impact Assessment (EIA) to investigate the environmental feasibility of raising the Tzaneen Dam, the construction of a storage dam in the Groot Letaba River and associated bulk water infrastructure (water treatment works, pipelines, pump stations, off-takes and reservoirs) in the Limpopo Province. The EIA is being undertaken by ILISO Consulting (technical aspects) with Zitholele Consulting providing the public participation support. The EIA is being undertaken according to the EIA Regulations under Section 24 (5) of the National Environmental Management Act (NEMA), (Act No 107 of 1998) as amended in Government Notice R385, 386, 387 – Government Gazette No. 28753 of 21 April 2006.

An EIA must show the authorities and the proponent what the consequences of their decisions will be in environmental, economic and social terms. An EIA is comprised of various phases: Scoping, Impact Assessment and a Decision-making Phase. During the first phase (scoping) potential issues associated with the project are scoped and identified in order that technical specialists can evaluate them during the next phase of the EIA, viz. the Impact Assessment Phase.

In accordance with the Regulations of the NEMA, Interested and Affected Parties (members of the public, the development proponent, technical specialists and the authorities) must have the opportunity to comment on all submissions made to the competent authority. This was the main purpose of the Draft Scoping Report and its Summary Report that was available for comment from Wednesday 3 October 2007 to Wednesday, 31 October 2007. The Final Scoping Report has now been submitted to and approved by the lead environmental authority, the national Department of Environmental Affairs and Tourism (DEAT) who, in close collaboration with the Limpopo Department of Finance and Economic Development¹, considered the scope to be covered by the Specialist Studies, after which these studies have proceeded as part of the Impact Assessment Phase.

The findings of the studies undertaken in the Impact Assessment Phase are captured in the Draft Environmental Impact Assessment Report. Interested and Affected Parties now have the opportunity to verify that all the issues they have raised during Scoping have been considered in the Draft Environmental Impact Assessment Report and the Environmental

¹ Environmental Affairs is housed within these Departments.
Environmental Impact Assessment Report

Management Plans. Stakeholders are invited to comment on the findings, captured in the report, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones. The Draft Environmental Impact Assessment Report and the Environmental Management Plans are available for public comment from 13 October 2008 to 10 November 2008.

YOUR COMMENT ON THE DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PLANS AND ITS SUMMARY

The Draft Environmental Impact Assessment Report, Environmental Management Plans and/or its Summary have been distributed to everyone that requested a copy in response to a letter in September 2008 announcing the availability of the reports for comment. Copies of the full report have also been made available at strategic public places in the project area (see page 12 and 13) and on the web site (www.dwaf.gov.za/Projects/GrootLetaba) of the Department of Water Affairs and Forestry (DWAF).

The following methods of public review of the Draft Environmental Assessment Report, Environmental Management Plans and its Summary are available:

- Completing the comment sheet enclosed with the reports
- Additional written submissions
- Comment by email, fax or telephone
- Comment during two public meetings to discuss the contents of the Draft Environmental Impact Assessment Report, as follows:

Dates and times	Venues
24 October 2008 from 08:30 – 13:00	Tzaneen Lodge
25 October 2008 from 08:30 –13:00	Nwamitwa village

DUE DATE FOR COMMENT

10 November 2008, to the public participation office at :
Anelle Odendaal / Wilhemina Mosupye, Zitholele Consulting
P O Box 6002, Halfway House, 1685

TEL: (011) 254-4855/4905, FAX: (011) 805-2100
Email: aodendaal@zitholele.co.za or wmosupye@zitholele.co.za

EXECUTIVE SUMMARY

BACKGROUND

In 1998, the DWAF completed an assessment of various options to improve the management of water available for social and economic development in the Groot Letaba River catchment. Since it was recognised that the water resources of the Groot Letaba River were already heavily committed, a wide range of strategic alternatives were considered to improve the water availability situation in the face of growing needs in the domestic water use sector, deterioration in the conservation status of the river ecology and increasing shortages in the irrigation sector.

The feasibility study indicated that additional storage facilities would provide for a more sustainable solution to the water supply problems. To this end, various alternative storage sites were examined. The outcome of these investigations led to the recommendations that the construction of a new major dam at the site known as Nwamitwa be considered together with improved water management interventions. The raising of the Tzaneen Dam, with the objective of minimising the intensity and consequences of shortages in the irrigation sector, was found to deserve sympathetic consideration. The DWAF is currently reviewing and updating information in this regard and conducting post-feasibility bridging studies to determine whether the recommendations made previously are still relevant and how they should be taken forward.

ENVIRONMENTAL AUTHORISATION PROCESS

Environmental authorisation in terms of Section 24 (5) of the NEMA and other legislation is required before the infrastructure components of the project can be implemented. An EIA process commenced in June 2007 and is expected to be completed in the last quarter of 2008.

The DEAT is the lead authority for the EIA, and will make the final decision on whether the proposed project may go ahead or not, and under what conditions. DEAT will use the inputs from other relevant government departments and agencies, for example, the Limpopo Department of Finance and Economic Development, Department of Minerals and Energy (DME), the Department of Land Affairs (DLA), the Roads Agency Limpopo (RAL), the South African Heritage Resources Agency (SAHRA), and district and local municipalities before making a final decision.

The EIA is currently in the Impact Assessment phase, designed to address all issues raised in the Scoping phase, investigate project level alternatives, assess identified impacts and determine the significance of each impact and formulate mitigation measures that will minimise the negative or maximise the positive impacts. These investigations are compiled in a set of draft reports that are made available for public comment. Comments received are considered and incorporated into the final reports for submission to DEAT.

MOTIVATION FOR THE PROJECT

The Groot Letaba Valley falls within the Luvuvhu-Letaba Water Management Area (WMA), one of the 19 WMAs into which South Africa is divided. Faced with water shortages of increasing severity and frequency, the main consumptive users of water (irrigation, forestry, domestic and industrial) have from time to time had to compete for limited supplies by taking extraordinary measures to survive. This has resulted in serious degradation of the riverine ecosystems. Historically the environment was not considered a water user and was not allocated any water from available resources. However, in the Letaba River catchment 14.8 million m³/annum was allocated, on an ad hoc basis, for release from Tzaneen Dam to the Kruger National Park, but little if any of these releases reached the Park with real beneficial effect.

With the advent of the National Water Act (Act 36 of 1998 NWA), a water allocation or Reserve for basic human needs and for sustaining ecological functioning, has placed a new perspective on water resource management in the Groot Letaba River. It now has to be complemented by a strategy for managing the water resources in a sustainable manner. Proposals for augmenting reliable water supplies from the Groot Letaba River include the construction of a dam on the Groot Letaba River at the site known as Nwamitwa just downstream of the Nwanedzi River confluence as well as the possibility of raising the Tzaneen Dam. Bulk infrastructure for the treatment, conveyance and storage of potable water for primary use forms an integral part of the development proposals. Attention is focused on water needs for the increasing human population, for downstream riverine ecosystems (including those in the Kruger National Park) as well as for stabilising commercial irrigation, including the settlement of resource-poor farmers.

The Groot Letaba River Water Development Project (GLWaP) is a major initiative by the DWAF in support of the Limpopo Provincial Government's economic development strategy for the province. The project will have a positive impact on the regional economics and on alleviating poverty. This will mainly be achieved through:

- *Increasing the safe, reliable water supplies for domestic and industrial use;*
- *Minimizing the frequency, intensity and duration of restrictions on the use of water allocated for irrigation of high value crops;*
- *An increase in total household income through stabilising the job market; and*
- *Providing leverage for the equitable distribution of resources.*

The proposed infrastructure will make it possible to improve the management of water resources so as to stop degradation of the conservation status of the riverine ecosystem.

DESCRIPTION OF THE PROJECT

The Groot Letaba River Water Development Project is aimed at improving the management of the water resources in the catchment and consists of non-infrastructure options to manage the available water as well as the construction of infrastructure components. Although only the construction of the infrastructure components require authorisation from the DEAT and are subject to this EIA, they must be seen as being complemented by the non-infrastructure components.

Non-infrastructure options

Non-infrastructure options to make more water available, which do not form part of the project for environmental authorisation, include:

- *Water conservation and demand management, as well as water recycling and re-use: The aim is to ensure that increased efficiency and effectiveness of water use will decrease the growth in the need for new water supply augmentation*
- *Local groundwater resources: The conjunctive use of ground and surface water is promoted. Groundwater resources should be developed incrementally to supply growing needs, supported by ongoing monitoring to ensure sustainable yields and good water quality. The Department will make recommendations to local authorities in this regard.*
- *Removal of invasive alien vegetation: DWAF's Working for Water Programme is actively removing invasive alien vegetation in the Groot Letaba Valley as a means of improving runoff in the river system.*

Infrastructure components of the project

The infrastructure components of the project that the EIA is based on include:

- *Raising of the Tzaneen Dam would result in increasing the storage from 157.5 million m³ up to approximately 203 million m³.*
- *The general locality of new infrastructure is indicated on **Figure 3.8**.*
- *Construction of a dam at the site known as Nwamitwa on the Groot Letaba River, downstream of the confluence of the Nwanedzi River. The Environmental Impact Assessment was based on a dam wall could be up to 36 m high and have a gross storage capacity of 144 million m³. The catchment area of the proposed dam at the site known as Nwamitwa is up to 1 400 km² and the Mean Annual Runoff (MAR) is approximately 122,6 million m³ under natural undeveloped conditions. The estimated increase in system yield available for domestic use is up to 18 million m³/a after providing for the Reserve.*
- *The R529, D1292 and P43/3 roads will have to be re-aligned to accommodate the dam.*
- *Upgrading of the water treatment works at Nkambako, and construction of bulk water pipelines and pump stations for water supply for domestic use to communities in the area. Pump stations and reservoirs could each occupy an area of about half a football field.*
- *Construction activities will take approximately 5 years with several construction teams working concurrently in different areas at the proposed dam site and along the pipeline routes.*
- *Residential accommodation for construction staff will be established in the vicinity of the proposed dam or in established towns. Housing, internal roads, water and electricity supply, water treatment, solid waste disposal, emergency facilities and recreational amenities will be provided.*
- *The construction cost of the infrastructure components of the project is estimated in excess of R1 200 million at 2007 prices.*
- *Construction sites will include offices, internal roads, water and electricity supply, waste water treatment, solid waste disposal, emergency facilities, areas for the handling of*

hazardous substances, workshops, washbays, areas for the safe storage of explosives and communication infrastructure.

- *Supply of water from the proposed Nwamitwa Dam is expected by 2013 with full yield available around 2014. Implementation activities such as detailed design and land acquisition could commence late in 2009, and construction could start in 2011.*

The borrow areas from which material is required will be sourced and assessed in separate reports.

ALTERNATIVES

The following alternatives to the project were considered during the Scoping Phase and presented in the Scoping Report:

- *The “Do Nothing” approach*
- *Replacing commercial afforestation with natural vegetation*
- *Ceasing export of water to the Sand River*
- *Improve utilization efficiency of irrigation water*
- *Decrease irrigation allocations*
- *Water Conservation and Demand Management*
- *Alternative water storage facilities*

PROJECT SPECIFIC ALTERNATIVES CONSIDERED IN THE EIA PHASE

The following project specific alternatives were investigated in the Impact Assessment Phase (Figure 3.12):

Raising of the Tzaneen Dam

The raising of the Tzaneen dam is now being considered as a viable option. The raised dam could have a capacity of 203 million m³. This would improve the assurance of supply for irrigation purposes, and decrease water restrictions. The dam would be raised by a maximum of 3.5 m and would take place simultaneously with the construction of the proposed dam at the site known as Nwamitwa.

*The **design alternatives** considered with regards to the spillway were a labyrinth, fuse gate and side channel spillway.*

None of the specialist studies found any of these alternatives to be environmentally favourable or not preferred as opposed to any of the others. The main factors influencing the preference are therefore technical and cost, and a final recommendation has not been made.

A new Dam at the site known as Nwamitwa

The sizing of the proposed dam at the site known as Nwamitwa was not final at the time that the EIA commenced. The EAP was therefore able to contribute to this process from an environmental perspective. Comparative impacts of a 0.5 MAR, 1 MAR and 1.5 MAR dams were considered, specifically from social landuse and terrestrial perspectives.

No relocation of rural village houses or infrastructure will be required for any of the three size dams.

When considering the houses, irrigation dams, and packing facilities of commercial farmers affected, the difference in loss between the 1 and 1.5 MAR dams are minimal compared to the difference between these two levels and the 0.5 MAR dam. The differences are as follows:

- For the 1.5 MAR dam, 12 houses, 26 irrigation dams and two packing facilities will be affected.*
- For the 1.0 MAR dam, 10 houses and 13-16 irrigation dams and two packing facilities will be affected.*
- For the 0.5 MAR dam, 6 houses and 12 irrigation dams and only one packing facility will be affected.*

The number of houses affected is not considered a significant factor in this decision, as the majority of land owners are willing to be compensated for their houses to secure the benefits of the dam. The preferred dam capacity is mainly based on the number of irrigation dams and packing facilities that will be lost. The difference between the number of dams that will be lost for the 1.5 MAR dam and 1 MAR seems significant. There is hardly a difference between the 0.5 MAR and 1 MAR in terms of loss of dams. The 1 MAR is therefore preferable to ensure that local communities benefit optimally. The loss of established irrigated lands was also a key factor influencing the decision on the size of the dam.

Impacts of a larger dam could be minimized or offset by:

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- *Farmers not forfeiting water rights and allocations, and that water allocations lost will be replaced;*
 - *Job losses be mitigated;*
 - *Surrounding communities benefit (more people getting access to water).*

Impacts on the aquatic and terrestrial ecology and the heritage resources in the dam basin are directly related to the size of the area to be inundated. The smaller the dam the less the impact on the natural environment.

Road re- alignment

The construction of the proposed new dam will inundate sections of Road R529, Road D1292 and Road P43/3 that will require re-alignment. There are four alternative alignments that were considered for Road R529:

- *Alternative 1: The new road will deviate westwards from the existing R529 alignment approximately 5 km north of the intersection with Route R71 up to Road D1292, where it turns eastward to follow the alignment of the latter for 1 km where it deviates northwards again to link with the existing Road R529 alignment 1 km south of Ka-Malubana Village.*
- *Alternative 2: The new road will deviate westwards from the existing R529 alignment approximately 5 km north of the intersection with Route R71 up to Road D1292 (same as Alternative 1), where it turns directly northwards for approximately 3 km, it then turns eastwards to link with the existing alignment of Road R529 just south of Ka-Malubana Village.*
- *Alternative 3: The new road will deviate westwards from the existing R529 alignment approximately 5 km north of the intersection with Route R71 and will be aligned in a westerly direction up to Road D1292.*
- *Alternative 4: The new road will deviate northwards from the R529 approximately 8.5 km north of the intersection with Route 71; it will cross over the D1292 until it links with the existing R529 1km south of Ka-Malubane.*

There is no additional distance for the R529 after the dam has been constructed if Alternative 4 is used for the re-alignment. Alternative 1 has an additional 780 m, Alternative 2 has an additional 1.6 km and Alternative 3 7.07 km in comparison to the existing alignments if travelling from Letsitele to Nwamitwa. Alternative 3 is the least preferred from the noise perspective due to the close proximity of some noise sensitive receptors along that route. The preferred re-alignment in terms of social, cost, noise, and traffic impact is Alternative 4.

Pipelines and reservoirs

The GLeWaP includes the construction of bulk water supply infrastructure to various communities in the area. The potential impacts on the environment of proposed pipeline routes and alternatives were investigated.

Although no fatal flaws were found with any of the pipeline routes or alternatives were found, all pipeline routes through untransformed vegetation should be regarded as least favourable options and routes should whenever possible traverse transformed habitats in order to minimise impacts on terrestrial ecology and heritage resources.

Four reservoirs are proposed (A,B,C and D). Reservoirs C and D have alternative sites that were considered. No fatal flaws at any of the alternative reservoir sites were found, however in terms of impacts on terrestrial ecology, C1 and D3 are the most attractive. However, C4 is preferred to C1 because it is closest to the existing Rampepe Reservoir and will enable the Rampepe Reservoir to be served by two sources of supply (the existing source from the Modjadji Dam as a backup and the proposed Nwamitwa Dam), which will increase the flexibility of supply to this sub-system.

Booster Pump- Stations

No fatal flaws were identified for any of the sites identified for the location of booster pumps Pump- stations should however be located at least 250 m from residences, school or public facilities in order to maintain acceptable noise levels.

DESCRIPTION OF THE RECEIVING ENVIRONMENT

The Tzaneen Dam, proposed new dam at the site known as Nwamitwa and associated bulk water supply infrastructure are located in the Groot Letaba River catchment, in the Mopani District Municipality (MDM), Limpopo Province. The two affected local municipalities are the Greater Tzaneen and the Greater Letaba Local Municipalities.

The catchment is mountaneous in the west where the rainfall, which occurs mostly in summer, is high and decreasing rapidly in the plains areas to the east. The Groot Letaba River is part of the Letaba River Catchment within the Luvuvhu-Letaba Water Management Area (WMA). The catchment is drained by the Groot Letaba River and its major tributaries. From the confluence of the Klein and Groot Letaba Rivers, the Letaba River flows through

the Kruger National Park (KNP) until it joins with the Olifants River near the Mozambique border. The proposed dam site falls within the lower Groot Letaba River sub-catchment. The Nwanedzi River is a non-perennial tributary of the Groot Letaba River which confluences with the Groot Letaba River just upstream of the proposed dam wall site.

The geology at the proposed Nwamitwa dam site consists of Goudplaats Gneiss from the Swazian age. Underlying this is granite gneiss and diabase dykes. The rest of the Groot Letaba catchment is made up of granites that result in shallow weathering (less than 10 m) and the soils formed are sandy.

*Thirty four fish species would historically have occurred within the river reach at the site of the proposed new dam, of these 13 species are widespread and abundant, one of the species (*Oreochromis mossambicus*) is listed as Near Threatened and the remaining 20 are unlisted.*

The project area covers two different vegetation types, Granite Lowveld and Tsende Mopaneveld with a wide range in ecosystem status. The main factors of disturbance in the project area are human settlements, agriculture and forestry. Nearly 60 % of the project area is transformed or degraded by such developments.

Applying the precautionary principle, a total of 91 species of Red Data flora and fauna could potentially occur in the project area (18 plant, 36 mammal, 34 bird, 3 reptile & amphibian, and 0 invertebrate). Moreover, at least 21 species could be endemic or near-endemic (locally or regionally), and 115 are likely to be protected.

The Greater Tzaneen Local Municipality (GTLM) and the Greater Letaba Local Municipality (GLLM) have approximately 190 settlements in total, with an average of 2 700 to 3 700 people per village. Approximately 33 settlements have more than 5 000 people. Villages develop outwards, resulting in rural sprawl.

The population profile of the people living in the study area is described as:

- *Females are in the majority;*
- *Up to half of the population falls in the age bracket 0 -19 year olds;*
- *Educational levels are low;*
- *The population growth rate can be estimated at 1% per annum;*
- *Majority Black African; and*
- *HIV / Aids might impact significantly on population numbers.*

The population within close proximity to the construction sites and migratory as well as locally sourced labour are all likely to have a high prevalence of HIV infection and Tuberculosis.

Although the Mopani District Municipality (MDM) is not considered to be an endemic malaria region, the local climate in the MDM can accommodate the insect vectors (Anophele sp. mosquitoes) necessary for the spread of the malaria parasite (P. falciparum).

The incidence of Schistosomiasis (bilharzia) is difficult to estimate as it is not a notifiable disease. It is however recognised that schistosomiasis is second only to malaria in contributing to the disease burden in the developing world. The climate and rainfall characteristics of the MDM make it likely that both S. haematobium and S. mansoni are endemic to the area, provided that suitable intermediate hosts (pulmonate snails sp) are present. Residents of the villages in the area of the proposed GLeWaP bulk water distribution area are at risk of infection as they currently rely heavily on communal taps, boreholes or river water.

The lack of water borne sewage systems in the proposed GLeWaP bulk water distribution area increases the risk of spread of diarrhoeal diseases as untreated sewage may enter rivers, streams and underground water resources. Latest available information shows that the status of healthcare services within the GTLM and GLLM is inadequate to effectively respond to the community health needs.

The majority of communities within the GTLM and the TLLM are impoverished with generally poor levels of nutrition, especially amongst children. Poor nutritional standards impact adversely on the health status of populations and significantly increase the risk of disease.

For the Greater Letaba Local Municipality (GLLM) and Greater Tzaneen Local Municipality (GTLM), the agriculture sector (fruit orchards dependant on irrigation) and the associated agro-industries provide the majority of employment opportunities in the area. This is followed by the government and community services sector and the retail and trade sectors. The study area (represented by the four affected municipalities) provides for approximately 17% of the employment within the Limpopo Province. Commercial farms are mainly owned by white farmers, and emerging black farmers are challenged in terms of lack of training, finances, and access to water (amongst others).

The landowners who have land in the proposed dam basin are all commercial fruit farmers with a few who also grow vegetables on a commercial basis. Some also farm with cattle.

12 farmhouses and two packing facilities and approximately 26 small irrigation dams will be affected by the proposed new dam (at 1.5 MAR capacity). No re-location of rural village homesteads or facilities will be required.

KEY ISSUES IDENTIFIED DURING THE SCOPING PHASE

Key issues identified in the Scoping phase and discussed in the Scoping Report and its Summary are:

- *River flow (water quantity and quality)*
- *Terrestrial ecology*
- *Social processes*
- *Economy*
- *Physical infrastructure*
- *Public health*
- *Heritage resources*
- *Relocation of main roads*
- *Water rights*
- *Land acquisition.*

SPECIALIST STUDIES

During the Scoping Phase the EIA study team, with input from the public participation process, identified key issues that required further in-depth investigation by specialists. Twelve specialist studies were conducted during the EIA phase and are summarised as follows:

Water quality

The water quality situation in the catchment of the proposed new dam is such that no water quality problems are expected to occur. The dam will be able to provide water of an acceptable quality to communities that are at present in part reliant on water from boreholes. Some of the water obtained from boreholes is not fit for human consumption.

The only possible effect of such a dam on water quality could be the release of cold and anaerobic bottom water during periods when the dam becomes stratified. This can effectively be mitigated by the installation and correct operation of multiple level outlets.

There is some risk of contamination from construction material and waste discharge during construction. This can be mitigated by the implementation of proper construction methods and effective waste management.

In terms of water quality there is therefore expected to be no significant negative effect on the environment from either the construction of the proposed new dam, or the raising of the Tzaneen Dam wall.

Sedimentation Specialist Study

This study investigated the impacts of the proposed Nwamitwa Dam on the sediment transport balance in the Groot Letaba River. The upstream impacts were analysed by analytical and empirical methods while the downstream impacts were assessed by mathematical hydrodynamic modelling. Other aspects of the development such as access roads and raising of Tzaneen Dam were also addressed.

The key findings are:

a) Downstream of Nwamitwa Dam:

- *The dam will cause flood peak attenuation, ie. outflow peaks are less than inflow peaks, except for very large floods.*
- *The post-dam river will become narrower due to flood attenuation caused by the dam. Near the dam the main channel width could decrease by 19 % (22 m reduction on 116 m). In the KNP upstream of the Olifants River confluence the reduction of channel width could be about 17 % (70 m on 411 m channel width).*
- *The river bed between the dam and the Klein Letaba River tributary will become coarser due to sediment trapping at the dam: from 0.56 mm median diameter to 0.72 mm median sediment diameter.*
- *Slightly more sediment will be transported down the river in the post-dam scenario due to the narrower river and local bed degradation on the Klein Letaba River near the confluence with the Groot Letaba River.*

- *Local bed degradation (lower bed level) over a limited area near the dam of at least 2 m is expected.*

b) Tzaneen Dam raising

- *Small floods will be attenuated more and it is expected that the main channel width downstream of the dam to the first main tributary could decrease by less than 5 % of the current width. The river morphology downstream of Tzaneen Dam is not expected to change significantly.*
- *Elevated flood levels upstream of the reservoir could be expected due to future sedimentation above the raised full supply level. This has to be considered in the floodline assessment.*

c) Construction aspects related to Nwamitwa Dam

- *The coffer dam should be designed not to cause river bank erosion or local scour at the dam site. The sediment concentrations 300 m downstream of the dam site should be monitored during construction to ensure present (90 percentile) high sediment concentrations are not exceeded.*

d) Treatment plant and water reticulation pipelines

- *The upgrading of the treatment plant and construction of water reticulation pipelines should have limited effect on sedimentation as long as proper stormwater drainage is designed at river crossings and during construction the present stream sediment concentrations based on 90 percentile values should not be exceeded. If required, sedimentation basins should be constructed on site.*

Terrestrial ecology (Impact on fauna and flora)

Field visits were conducted from November 2007 to January 2008, focussing on the area likely to be impacted by the Nwamitwa Dam and bulk storage scheme. Two national vegetation types are represented within this area, namely Granite Lowveld and Tsende Mopaneveld. At a finer scale, three vegetation communities were identified and described: Acacia – Combretum Riparian Woodland, Colophospermum – Dichrostachys Plains Woodland and Combretum – Bridelia Rocky Outcrop Woodland. Fifteen conservation-important plant species were found during fieldwork, of which two have a status of Least Concern (Declining) and the rest are protected under provincial or national legislation. A

floristic importance assessment of the three vegetation communities revealed that Plains Woodland and Rocky Outcrop Woodland have Medium-High importance for plants, while Riparian Woodland has Low-Medium importance. Thirty-one plant species were pointed out by local traditional healers as being used by the local communities. Most of these are widespread and common species in the area, although three are protected under the National Forest Act.

*Only three conservation-important mammals were recorded during fieldwork, two of which are protected under the Limpopo Environmental Management Act, and one which has a Red Data status of Data Deficient. Two of the 186 bird species recorded in the field have Red Data status of Near Threatened. Fourteen reptiles were recorded, including one Vulnerable species and one Limpopo Province endemic lizard. Fourteen frog species were recorded, although only one has any conservation importance. Thirteen conservation-important invertebrates were recorded in the dam basin and along the bulk supply route. The most significant of these was *Dromica oberprieleri*, which was only discovered in 1981 and is currently known from very few sites in the Lowveld.*

The flora and fauna values of each vegetation community were integrated to provide intrinsic biodiversity values for each community. The vegetation community with the highest intrinsic biodiversity value is Colophospermum – Dichrostachys Plains Woodland, which has High-Medium importance for terrestrial biota, followed by Combretum – Bridelia Rocky Outcrop Woodland (Medium-High) and Acacia – Combretum Riparian Woodland (Medium-Low).

The most influential mitigation measures of the terrestrial Ecology impact assessment report are as follows:

- A major plant rescue operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species where possible; scientific institutions should also be invited to collect live specimens;*
- Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits);*
- A major trapping and relocation operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species where possible, particularly small mammals and reptiles; scientific institutions should be invited to collect live specimens;*

- *All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats;*
- *Conduct annual monitoring of dam surface for invasion by exotic aquatic plants. Any detection of target species to be followed up by rapid remedial action; and*
- *If dam construction is to proceed, the EMP should include an appropriate invertebrate biodiversity-monitoring programme, for which baseline assessments of selected indicator taxa (e.g. *Dromica* spp.) must be undertaken prior to any development of the site.*

Social impact Assessment

The social impact assessment considered demographic; economic; landuse; socio- cultural; institutional and biophysical change processes that are expected to occur during the various phases of the project.

Overall the demographic, biophysical and socio-cultural processes have a number of negative impacts. However all of these impacts can be mitigated successfully if effectively managed. Negative impacts are for the most part temporary in nature and expected to only last over the construction period. These can be further reduced should local labour be used for the construction.

High expectations from the project are evident amongst the inhabitants of villages. These expectations are focused on job opportunities, not only for individuals, but also for service providers and contractors. Attitude formation against the project can be expected should these expectations not be met.

The one permanent direct impact is on land use. Land will not be lost for the raising of the Tzaneen Dam, but for the construction of the new dam. The loss of land will impact on the activities of the affected parties, and the satisfactory mitigation of these impacts is crucial to ensure that negative attitude formation against the project does not happen. The commercial farmers are positive about the relocation process and the loss of land, mainly because of the expected benefits that the proposed dam will afford, specifically with regard to the security of water supplies for irrigation. Attitude formation against the project can be expected should these expectations not be addressed.

Impacts as a result of the presence of construction workers are more likely to be intensified along the bulk water supply pipelines, the pump stations, and the borrow pits, because of the proximity to local communities, and the fact that these activities will happen away from the dam wall construction site with all the necessary infrastructure and services such as water, and a construction camp.

Of particular concern are the potential health and safety impacts on pedestrians and road users. Impacts might be of high significance, specifically those around the borrow pits at Miragoma and Gamokgwathi and the four proposed water reservoirs that are close to ka-Matubana, Nwanedzi, ka-Mandehakazi, ka-Mavele, Runnymede, Serolorolo, ga-Mookgo, Morapalala, Kadzumeri, Makhwivirini, Ooghoek, Hlohlokwe, Kampakeni, Merekome, and Kharangwani.

The permanent indirect positive impact on Quality of Life (health related and non-health related) is the increase in water supply for domestic use. The successful implementation of water supply to affected communities, emerging farmers, etc. will outweigh the potential negative impacts.

Economic impacts

The quantification of economic impacts was done based on the input-output technique which provides the best indication of economic production at a given point in time.

The raising of the Tzaneen Dam will lead to the following positive economic impacts:

- *Stimulation of the economy: with direct, indirect and induced additional GDP generated in the economy during the construction phase to the value of R56 million.*

Direct positive impacts

- *An estimated 250 jobs will be created during the raising of Tzaneen Dam.*
- *An estimated R336 million will be created towards the GDP during the construction of the proposed dam at the site known as Nwamitwa.*
- *Increased standards of living: with new business sales to the value of R206 million during construction.*
- *R49.8 million is estimated to contribute to the GDP for the GLeWaP infrastructure.*

-
- *R2.2 million is estimated to contribute to GDP via operational expenditure.*

Indirect positive impacts

- *An estimated 630 jobs would be created indirectly predominately through trade and communication, mining and manufacture.*
- *A total of R307.8 million would be created indirectly via mining, manufacturing, trade and accommodation, and financial and business services during construction of the proposed dam.*
- *R46.3 million is estimated to contribute to GDP via the GLeWaP infrastructure.*
- *R4 million would be indirectly created during the operation phase contributing to GDP.*

Induced positive impact

- *An estimated 113 jobs will be created due to induced effects predominately via the manufacturing and financial and business services.*
- *A total of R62.9 million would be induced positive impacts. The predominate contribution is via financial and business services and manufacturing during construction of the proposed dam.*
- *R8.8 million would be created via the GLeWaP infrastructure.*
- *R0.8 Million would be a induced GDP contribution during the operational phase.*

The following negative economic impacts are also foreseen from the proposed Nwamitwa dam and the associated GLeWaP infrastructure:

- *Loss of land, improvements and resources: A total of 3,864 ha of land will be lost due to inundation by the proposed Nwamitwa dam with a total of 14,138 m² buildings. The estimated compensation value of which amounts to R 163,787,584. The estimated land lost as part of the GLeWaP infrastructure which is not within existing servitudes is 350.6 ha with an estimated compensation value of R6,388,800.*
- *Loss of employment and income: 2 129 jobs of farm labourers (many of which are seasonal) per annum could be affected for the duration of the time that it takes for the orchards to be re-established (should the affected farmers decide to develop new citrus*

orchards to make up for those inundated by the proposed Nwamitwa dam). This means a estimated loss of income of approximately R15,518,520 per annum over three years.

- *Change of movement patterns and potential associated increase in transport costs.*
- *Change in property values.*

Air quality

Particulate concentrations and deposition rates due to the proposed project was simulated using the US-EPA approved AERMET/AERMOD dispersion modelling suite. Ambient concentrations were simulated to ascertain highest daily and annual averaging levels occurring as a result of the proposed activities.

Construction of the raising of the Tzaneen dam is considered of low significance to sensitive receptors and maximum dust deposition will be well within the SANS and EC limits, but effective mitigation can be implemented.

For construction activities at the Nwamitwa Dam and road realignment, reservoirs, and pump stations the expected highest daily ground level dust concentrations will exceed the current SA standards as well as the stricter SANS and EC limits. The predicted maximum deposition at the closest sensitive receptor of Ka-Mswazi is 107 mg/m²/day (within SANS target of 600 mg/m²/day for residential areas).

The significance rating without mitigation was Medium for the construction activities at the Nwamitwa Dam and road realignment and the construction of the reservoirs due to short-term PM10 exposure. For the transportation of material, laying down of the pipeline, raising of the Tzaneen Dam and activities at the borrow pits, the significance rating was Low. However after mitigation all impacts are of low significance.

Visual Impact Assessment

The visual impact assessment method involved the identification of critical viewpoints / land uses / visual receptors that will overlook the various components of the project as well as the definition of viewshed (lines of sight) lines. The viewshed analysed the full extent of the zone of visual influence and was indicated on a plan. Changes in visual setting for each of the identified points were sketched and analysed.

Results of the study indicate insignificant impacts for the raising of the Tzaneen Dam.

Figure 1 shows the existing dam wall and **Figure 4** an artist's impression of what the Tzaneen Dam would look like once the wall is raised.



Figure 1: Picture of the existing dam wall

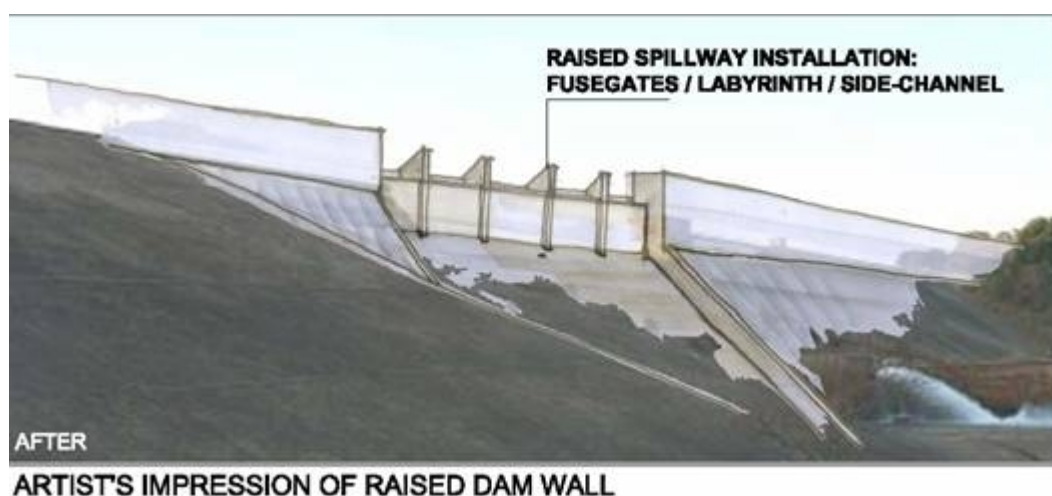


Figure 2: Artist impression of raised dam wall

Although construction activities and the resultant water body at the proposed new dam at the site known as Nwamitwa will be visible and noticeable the visual specialist assessment found that the visual impact would be acceptable to inhabitants of the study area or out of character with the receiving environment. Visual impacts are therefore considered to be of low significance for this project. Some mitigation measures (e.g. screening of construction activities) have however, been recommended and included in the EMP.

Figure 3 shows the existing orchards before the erection of the dam wall and **Figure 4** shows the construction of a new reservoir in the Babanana area.

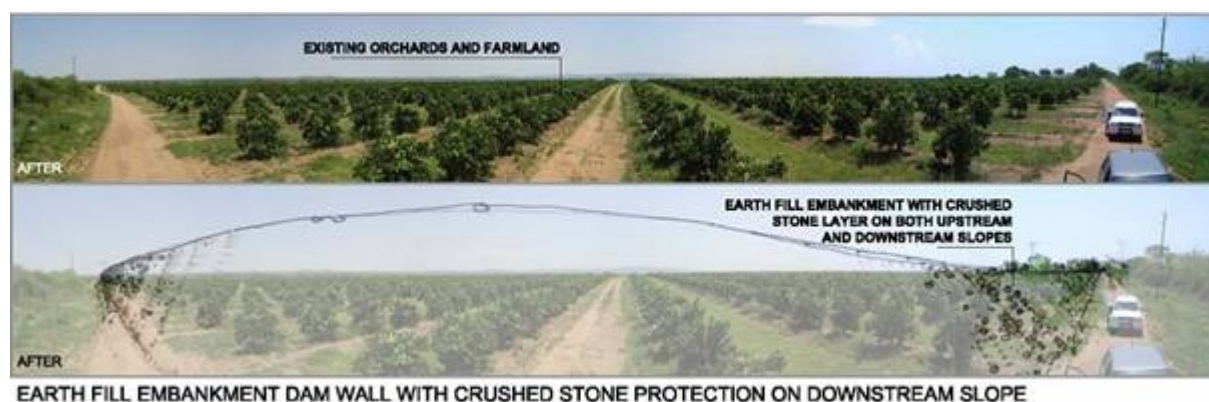


Figure 3: Erection of proposed new dam wall



Figure 4: Construction of a larger capacity reservoir in Babanana

Aquatic Ecology Specialist Study

The riverine habitat that falls within the full supply level of the proposed dam will be unavoidably and irrevocably lost due to inundation, siltation, change in flow regime loss of riparian vegetation and the formation of a largely anaerobic epilimnion (bottom layer of water). It is likely that at least 6 of the 17 fish species currently inhabiting the affecting river reach will permanently disappear from the dam basin due to the loss of specific habitat types. In terms of the Reserve Determination (RDS) undertaken in 2006, the loss of 6 species will have a negative impact on the Present Ecological State (PES) and may make the Recommended Ecological Category (REC) unattainable. The significance of potential impacts on aquatic ecosystems within the basin of the proposed new dam at the site known as Nwamitwa was therefore rated as high prior to mitigation, for the construction and operational

phases. The level of significance after implementation of the recommended mitigation, however, decreases to medium, for both phases.

The potential significance of impacts on aquatic ecosystems downstream of the proposed new dam at the site known as Nwamitwa was rated as medium for both the construction and operational phases. Shifts can be expected in the natural macroinvertebrate assemblages downstream of the dam due to the changes in the physical and chemical character of streamflow as well as the modified flows and habitats. This may reduce or eliminate certain taxa, while other species, such as Simuliidae sp. (Blackflies), may proliferate. The potential decrease in abundance of 14 fish species and loss or proliferation of certain species within the remaining reach (EWR3) (i.e. is the entire river reach of the Groot Letaba River from the Prieska Weir (DWAF Gauging weir: B8H017) near Hans Marensky to the confluence with the Letsitele River (DWAF Gauging weir: B8H009)) will have a negative impact on the PES and it is uncertain whether the REC and Ecospecs set out mitigation was rated as low for both phases.

The impact of an additional migration barrier on migratory fish species in the Groot Letaba River was identified as a potentially highly significant issue for both the construction and operational phases. Sixteen of the 17 indigenous fish species currently occurring within reach EWR3 could be impacted upon in terms of migration potential. This assessment is based on the precautionary principle in the absence of genetic information about fish species, and habitat suitability and accessibility upstream and downstream of the proposed new dam site. The mitigation measure is the construction of a fishway. The level of significance after implementation of mitigation is rated as medium for both phases.

Noise Impact Assessment

The primary source of noise impacting the respective study areas at present is from road traffic. This is likely to remain the case in the future, with the situation worsening as traffic volumes increase. The ambient noise climate at many of the areas where elements of the project are to be built can be defined as being degraded, particularly where these sites are along or close to main roads with attendant high traffic-generated noise levels. The noise situation varies between very quiet when there is no traffic to very noisy when vehicles pass by. Noise impact thus also varies from a situation of being insignificant to one of high significance. The noise climate in the Nwamitwa Dam and Bulk Water Supply infrastructure Area away from the main roads is relatively quiet. The noise from elements of the Project, if unmitigated, has the potential to have a negative impact on some of the noise sensitive

areas surrounding the respective project sites. The main impact period will be during the construction phase but noise problems are also possible during the operational phase. There are appropriate noise mitigating measures that can be implemented to reduce to acceptable levels or prevent any noise impact during construction and operation. These have been included in the Environmental Management Plans.

Heritage Impact Assessment

The aim of the heritage resources survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the area to be affected by the proposed project.

The survey identified 26 sites of cultural significance, which includes five Stone Age sites, nine Iron Age sites, four sites dating to historic times, and eight sites containing graves.

All of the identified sites are judged, according to Section 7 of the National Heritage Resources Act, No. 25 of 1999, to have Grade III significance. The implication of this is that there are no sites of cultural heritage significance that would prevent the construction of the dam and the associated infrastructure from taking place. However, in accordance with Section 28 of the National Heritage Resources Act, No. 25 of 1999, mitigation measures should be implemented for the identified sites. Recommendations detailed in the Environmental Management Plans include collection of examples of Stone Age Tools, documentation (mapping and photographing) Late Iron Age and historic sites, and relocation of graves.

Health Impact Assessment

The Health Impact Assessment considered impacts on both the construction workers and surrounding community. Priority potential health risks for construction workers include HIV, STI and TB transmission, exposure to excessive noise levels and exposure to excessive ergonomic stress which have been assessed as having a medium significance after mitigation. Priority potential negative health impacts for surrounding communities include HIV, STI and TB transmission. It is likely that these risks will have a medium significance after mitigation. Effective management of these priority health risks would be required if the impacts on the health of construction workers and community members are to be effectively controlled.

The completion of the project could however impact positively on Malaria (low significance following mitigation), Schistosomiasis (medium significance following mitigation) and Diarrhoeal diseases (medium significance following mitigation).

Traffic Impact Assessment

All roads were found to have ample spare capacity to accommodate construction traffic associated with the proposed Tzaneen Dam and Nwamitwa Dam construction without any significant impact on other road users.

Local access roads to villages will also be affected by the construction of the bulk water supply infrastructure. However these construction sites will generate very limited additional traffic. The impact on the road network will be more due to construction vehicles, which has to be minimised by traffic accommodation measures.

Due to the extent of the proposed dam basin, D1292, R81, R529 and the P43/3 will have to be realigned and this will have travel time implications. The least effected road alignment is that of the P43/3, which will have a few minor changes which are insignificant. The effect on the local farmers might be additional travel distance and time to transport farm or factory workers to the surrounding villages. The preferred re-alignment of road R529 will not increase the distance when travelling between Letsitele and Nwamitwa.

Some mitigation measures (e.g. additional turning lanes and a monitoring system) have been recommended and included in the EMP.

SUMMARY OF SIGNIFICANT IMPACTS AND MITIGATION

The Tzaneen Dam

The construction phase of the Tzaneen Dam is expected to have a positive local and regional economic impact as a result of the expenditure in the economy. The increase in the assurance of water supply in the irrigation sector will lead to increased stability in citrus industry.

Negative environmental impacts are limited to construction related activities such as dust and noise that could impact on the surrounding community and construction workers. These can all be mitigated to acceptable levels.

The proposed dam at the site known as Nwamitwa, and related bulk water supply infrastructure

The construction phase of this component of the project will lead to positive economic impacts resulting from expenditure in the economy, increased income generation, an increased tax base and direct, indirect and induced employment opportunities that in turn improve the standard of living.

The construction activities will, however, have the following negative impacts, all of which can be mitigated to acceptable levels:

- Loss of fauna and flora in the areas to be disturbed and inundated which can be mitigated to acceptable levels by plant and animal rescue programmes, and establishing a holding nursery where plants can be kept for rehabilitation purposes;*
- Inundation and disturbance of heritage sites and graves can be mitigated to acceptable levels by recording and excavating archaeological sites and the relocation of graves.*
- Impact of construction activities on the movement patterns, social relationships and safety of local communities which can be mitigated by providing safe passage as required;*
- Impacts on sense of place and non-health related quality of life (NHQOL) which can be mitigated by implementing noise and dust control measures and liaising with affected people;*
- Significant potential noise impacts on both construction workers and surrounding communities are expected. Impacts on construction workers can be mitigated by providing protective equipment. The impacts on the community are only expected to be significant when certain construction activities are in progress during the night time. Noisy construction activities should be limited to day time hours wherever possible.*
- Negative impacts on aquatic habitats and biota downstream of the construction activities are predicted if no mitigation is implemented. Mitigation includes limiting the disturbance on the local construction site, stabilising the downstream river bed and banks if necessary, and ensuring that connectivity between upstream and downstream riverine habitats is maintained at critical fish life-cycle periods during the construction phase.*

The proposed dam at the site known as Nwamitwa and related bulk water supply infrastructure (water treatment works, pumpstations, pipelines and reservoirs) will result in an increase in the water availability and associated health and economic sustainability and stimulation in the operation phase.

The only potentially significant negative long term negative impact is that the dam would form a barrier to the migration of fish resulting in an interruption of spawning and a permanent loss of species. The likelihood of this impact realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur then a fishway that enables the migration of the identified fish species should be included in the design of the dam.

Stratification is predicted to occur in the proposed new dam, and the release of cold, anoxic bottom water will have a detrimental effect on the aquatic life up to a distance of about 15 km below the dam wall. To overcome this effect it is recommended that a multiple level outlet structure, with outlets at 4 meter intervals from 6 meters below the fully supply level (FSL), be installed.

Although negative impacts on aquatic habitats and biota downstream of the dam have been predicted these must be evaluated in the context of the Management Class that has been set for the river system in terms of the Reserve. The Present Ecological State (PES) is higher than the REC that has been set, and one of the objectives of the dam is to enable the Department to implement the Reserve. The impact on aquatic habitats and biota should be judged against the implications of not building the dam rather than the present state. The potential decrease in abundance of 14 fish species and loss or proliferation of certain species within the remaining reach (EWR3) will have a negative impact on the PES and it is uncertain whether the REC and Ecospecs set out in the 2006 Reserve Determination Study (RDS) will be attainable. The level of significance after implementation of mitigation was, however rated as low for both phases.

ENVIRONMENTAL IMPACT STATEMENT

The Environmental Impact Assessment undertaken for the proposed Groot Letaba River Water Development Project has fulfilled the NEMA regulatory requirements and extensive measures have been taken to provide all interested and affected parties with the opportunity to participate in the identification of project alternatives and issues that require investigation.

Key issues identified in the Scoping Phase (Chapter 8) informed the specialist studies (Chapter 9) from which project alternatives and potential impacts were investigated and mitigation measures recommended.

Construction of the proposed new dam will inundate portions of existing roads. The preferred re alignment (Alternative 4) is recommended after considering the impacts on terrestrial ecology and heritage resources, cost of construction, technical aspects, traffic flow, distance travelled and community choice.

None of the of the alternative pipeline routes and reservoir alternatives would result in high impacts however, all pipeline routes through untransformed vegetation should be regarded as a least favourable option and routes should whenever possible traverse transformed habitats. Reservoir sites C1 and D3 are preferred among the options on the strength of leading to the least environmental impact, although site C4 is preferred to C1 because it is closest to the existing Rampepe Reservoir and will enable the Rampepe Reservoir to retain two sources of supply (the existing source from the Modjadji Dam as a backup and the proposed Nwamitwa Dam), which will increase the flexibility of supply to this sub-system.

All land owners whose property and other rights will be affected will be compensated. The EIA has found that the proposed project, together with supporting non-infrastructure components is the preferred option for providing improved water management to meet increased domestic requirements, socio-economic development and ecological water requirements in the catchment.

The EAP therefore recommends environmental authorisation of the raising of the Tzaneen Dam, the construction of the proposed dam at the site known as Nwamitwa and associated pre-construction activities, road re-alignments, flow gauging weir, water treatment works, pumpstations, pipelines and reservoirs, with the following conditions:

- Compilation of a Compensation and Development Plan (CDP) that includes the prioritisation of the land acquisition process in accordance with the established legal procedures to minimise impacts on citrus farmers that require a lead time to re-establish their landuse, and the procedures to deal with the loss of rights of access to water;*
- Labour procurement for construction to be undertaken through a Labour Desk in accordance the Departments procedures and policies and gender and race targets to be set and measured as stated in the EMP;*

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- *Continued liaison with directly affected landowners and occupiers in the pre-construction and construction phase;*
- *The implementation of general communication strategy for the implementation phase of the project;*
- *Continued liaison with authorities responsible for the implementation of water distribution;*
- *Multiple level outlets to be included in the dam design to mitigate downstream water quality impacts;*
- *Further investigation of fish genetics and habitat availability to confirm the potential impact on the loss of biodiversity as a result of the barrier that the proposed dam at the site know as Nwamitwa will cause, or the implementation of a fishway to mitigate the potential impact;*
- *Fauna and flora plant rescue programmes and a holding nursery to be established;*
- *Confirmation and detailed investigations of archaeological sites to be completed and the required excavation and documentation to be undertaken prior to the impact on the affected sections on the project;*
- *Implementation of a grave relocation programme in accordance with applicable legislation;*
- *Baseline studies should be undertaken to be completed as soon as possible before implementation commences in order to provide a benchmark against which impacts resulting from the construction and operation of the project can be measured. Aspects to be included are social, economic, water quality, aquatic ecology, terrestrial ecology, air quality and noise.*
- *Finalisation and Implementation of the draft Pre-construction Environmental Management Plan (this includes monitoring mechanisms and specifications);*
- *Finalisation of construction and operation EMPs based on the generic EMP (this includes monitoring mechanisms and specifications).*

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ABBREVIATIONS

CBO	Community Based Organisation
COH	Certified Occupational Hygienist
DM	District Municipality
DEAT	Department of Environmental Affairs and Tourism
DME	Department of Minerals and Energy
DSR	Draft Scoping Report
DWAF	Department of Water Affairs and Forestry
DOA	Directorate of Options Analysis of the Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EMPR	Environmental Management Programme Report
FSL	Full Supply Level
FSR	Final Scoping Report
GDP	Gross Domestic Product

GLeWaP	Groot Letaba River Water Development Project
GLLM	Greater Letaba Local Municipality
GTLM	Greater Tzaneen Local Municipality
GWW	Government Water Works
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
KNP	Kruger National Park
LP	Limpopo Province
LM	Local Municipality
MAP	Mean Average Precipitation
MAR	Mean Annual Runoff
MMSDsa	Mining Minerals and Sustainable Development (Southern Africa)
MDM	Mopani District Municipality
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
NEMA	National Environmental Management Act (Act 107 of 1998)
NGO	Non Governmental Organisation
NHQOL	Non Health Quality of Life
NWA	National Water Act (Act 36 of 1998)
NWRS	National Water Resource Strategy

PCMT	Project Co-ordination and Management Team
PES	Present Ecological State
PSP	Professional Service Provider
PM 10	Particulate matter with diameter of 10 µm
QOL	Quality of Life
RES	Recommended Ecological State
RDP	Reconstruction and Development Programme
RDS	Reserve Determination Study
SACNASP	South African Council for Natural Scientific Professionals
SIA	Social Impact Assessment
SAIOH	South African Institute for Occupational Hygienist
SUP	Sustainable Utilization Plan
VIP	Ventilation Improved Pit Latrine
WCD	World Commission on Dams
WMA	Water Management Area

GLOSSARY OF TERMS

Basin – The area of land that is drained by a large river, or river system.

Catchment – The area of land drained by a large river. The term can be applied to a stream, a tributary of a larger river or a whole river system.

Dam – The wall across a valley that retains water, but also used in the colloquial sense to denote the lake behind the wall.

Dissolved Air Flotation unit (DAF) – A separate unit designed to create air bubbles, this raises any solids and algae to the surface where it can be removed as sludge.

Design Flood Level- The highest static water level for which the structures of the reservoir were originally designed.

Full Supply Level (FSL) – The maximum level at which water can be stored indefinitely, equal to the crest level of the spillway unless otherwise indicated

Fish Ladder - A fish ladder (or fish way, fish pass) is a structure designed to allow fish the opportunity to migrate upstream and continue their function as part of the river ecosystem. Fish ladders may be recommended when blocking structures are as low as 1 to 2 feet in height. Critical components to determine when a ladder is necessary are the water depth below the blockage, the water velocity, and the type of species that need to pass.

Government Water Works (GWW)– A government water works infrastructure may be made up of a dam, pipeline, pump station, canal, weir, water purification facilities, electricity supply stations / systems, sewage works, hazardous waste lagoon, etc or combinations thereof.

Mean Annual Runoff (MAR) – This is the long term mean annual flow calculated for a specified period of time, at a particular point along a river and for a particular catchment and catchment development condition.

Purchase line- The area below which the Department of Water Affairs and Forestry will acquire property in order to be able to construct the dam and accommodate the basin.

1. STUDY INTRODUCTION

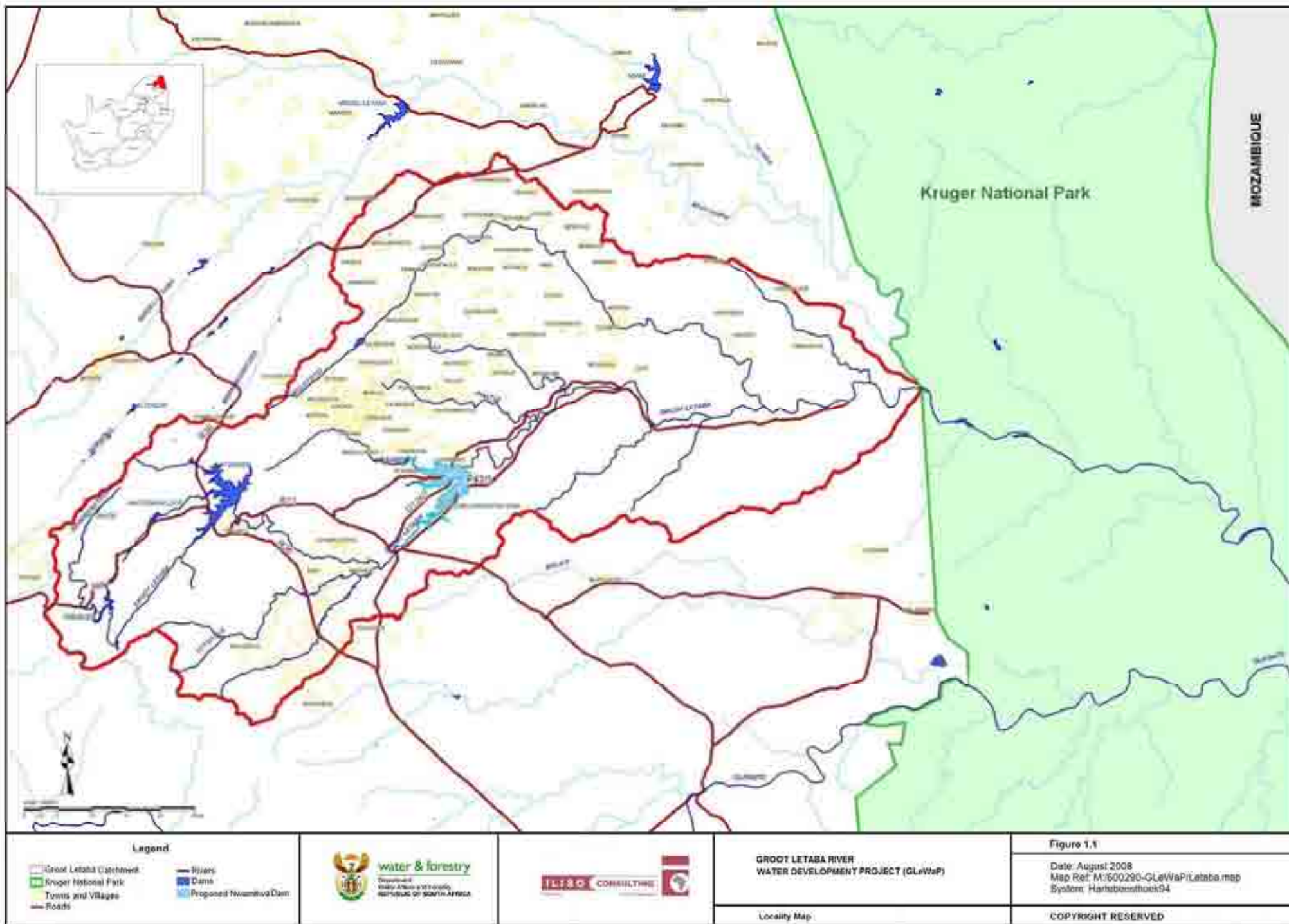
1.1 BACKGROUND TO THE PROJECT

In 1998, the Department of Water Affairs and Forestry (DWAF) completed an assessment of various options to improve the management of water available for social and economic development in the Groot Letaba catchment (**Figure 1.1**).

Since it was recognised that the water resources of the Groot Letaba River were already heavily committed, a wide range of strategic alternatives were considered to improve the water availability situation in the face of growing needs in the domestic water use sector, deterioration in the conservation status of the river ecology and increasing shortages in the irrigation sector. Consideration was given to the following options at a feasibility level of detail and reliability:

- Replacing commercial afforestation with natural vegetation.
- Ceasing the export of water to the Sand River catchment.
- Improving the utilization efficiency of water used for irrigation.
- Decreasing the water allocated for irrigation use.
- Water loss management in the reticulation systems for domestic and industrial water users.
- Creation of additional storage in the river system to further regulate the river flow.
- Improved water management in all user sectors.

The feasibility study indicated that additional storage facilities, combined with a range of management interventions, would provide for a more sustainable solution to the water resource problems. To this end, various alternative storage sites were examined, namely a site at Hobson's Choice, in the Letsitele River, sites in the Groot Letaba River of which only that at Nwamitwa was found to be reasonable (but not good), and the raising of the Tzaneen Dam.



The DWAF is now reviewing and updating the needs of this area and post-feasibility bridging studies are being conducted to confirm whether the recommendations made previously are still relevant and how they should be taken forward.

The post-feasibility bridging studies options to be investigated include the construction of a large dam on the Groot Letaba River at the site known as Nwamitwa, downstream of the confluence of the Nwanedzi River (**Figure 1.2**), realignment of the roads to accommodate the dam, construction of water treatment works, bulk water pipelines and pump stations from the dam site to communities in the area and the raising of the Tzaneen Dam.

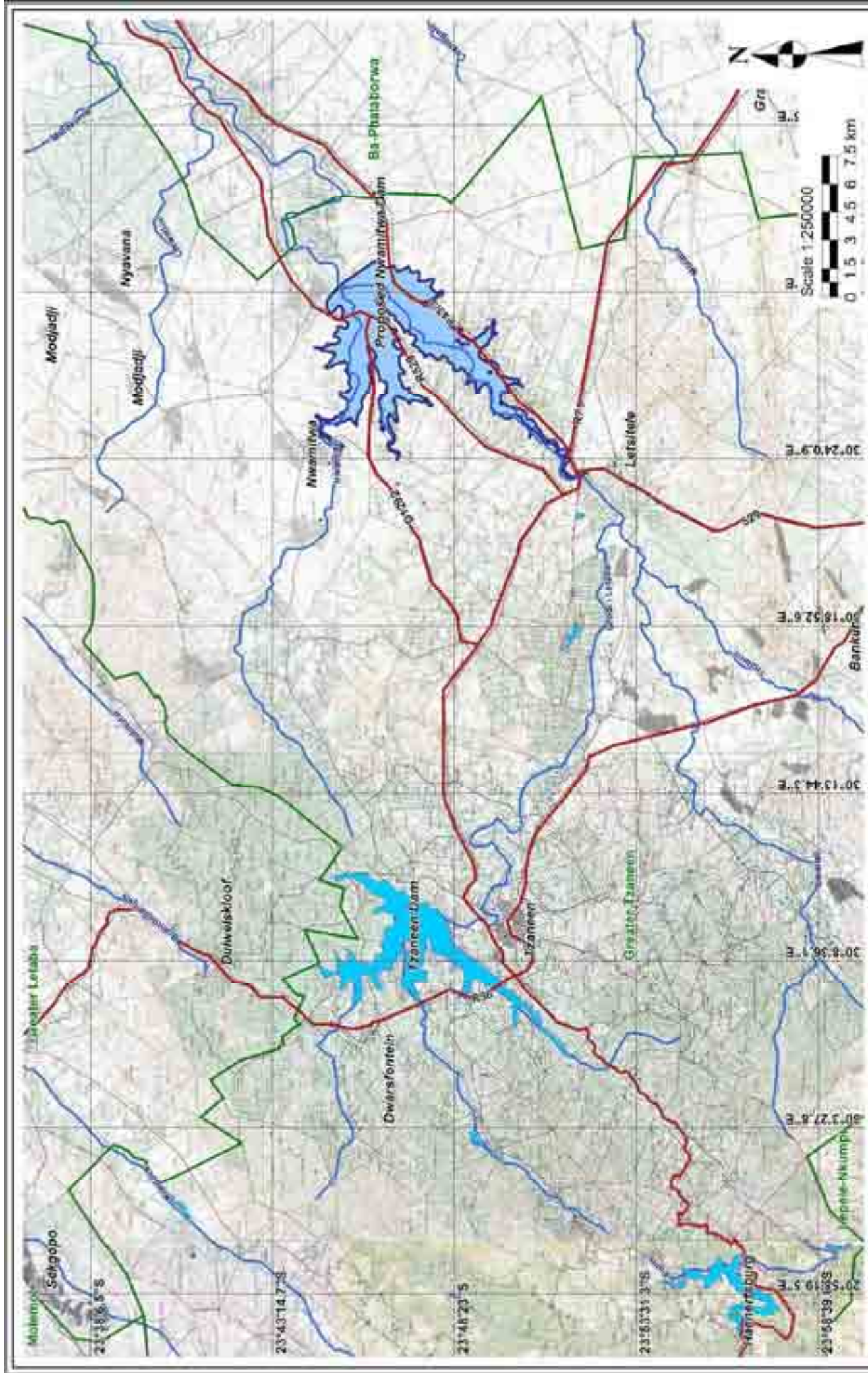
Environmental authorisation in terms of Section 24 (5) of the National Environmental Management Act (NEMA), Act No 107 of 1998 is required before the infrastructure components of the project can be implemented. An Environmental Impact Assessment (EIA) process commenced in June 2007 and is expected to be completed in the last quarter of 2008.

1.2 OBJECTIVE OF THIS STUDY

An EIA is a planning and decision making tool used to identify potential negative and positive impacts of a proposed project and to recommend ways to enhance the positive impacts and minimise the negative ones. The EIA will address the impacts associated with the project, and provide an assessment of the project in terms of the biophysical, social and economic environments to assist both the environmental authorities (in this case the national Department of Environmental Affairs and Tourism (DEAT)) and the proponent (i.e. the DWAF) in making decisions regarding implementation of the proposed project. The work will be undertaken in compliance with the National Environmental Management Act (No 107 of 1998) (NEMA), specifically Regulations in GN No 385, 386 and 387 of 21 April 2006.

The EIA process consists of three phases:

- The Scoping Phase;
- The Impact Assessment Phase; and
- The Decision-Making Phase.



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<p>Copyright 2008 Map: 1:250000 Groot Letaba River System: Hydrographic</p>	<p>Locality Map</p>	<p>Figure 1.2</p>	<p>water & forestry</p> <p>www.doe.gov.za</p>
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1.3 PURPOSE OF THIS REPORT

The purpose of the Impact Assessment Phase of the project is to:

- Investigate the key issues that were raised during the scoping phase;
- Investigate project level alternatives to the proposed activity;
- Assess all identified impacts and determine the significance of each impact; and
- Formulate mitigation measures that will minimise negative and maximise positive impacts.

The findings are presented in this report.

1.4 THE PROJECT TEAM

ILISO Consulting was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA. ILISO Consulting has used input from the specialists mentioned below.

Dr Martin van Veelen is a professional engineer with a PhD in aquatic health. He is the Business Unit Head of the ILISO Environmental Management Discipline Group and a certified Environmental Assessment Practitioner with 30 years experience. He specialises in project management, environmental impact assessments and water resource planning. He specifically has extensive experience in water quality, especially water quality management, water quality monitoring and water quality assessment. Martin has experience in managing projects that involve multi-disciplinary teams, and projects that involve public consultation and participation. Martin is the project leader and undertook the water quality specialist study.

Terry Baker is a certified Environmental Assessment Practitioner (EAP), has a MA in Environmental Management and specialises in Environmental Impact Assessments and Project Management. She has been involved in a variety of EIAs including for transmission lines, water supply projects, dams, roads and airports, in South Africa, Botswana, Uganda, Lesotho, and Mozambique. She has been involved in public participation programmes, water quality assessments, socio-economic and institutional development projects and the use of Geographic Information Systems on a number of projects. Terry is actively involved in the International Association for

Impact Assessment, and served on the National Executive Committee of the South African Affiliate from 2005 to 2008. Terry is the Project Manager.

Deon Esterhuizen has a MSc in Environmental Management with 16 years of experience in water related projects, which include water quality management, registration and licensing of water users, completion of Environmental Impact Assessments in support of the issuing of Record of Decisions, development of a management guide for domestic water use, project management, and implementation of the Resource Directed Measures as required by the Department of Water Affairs and Forestry. He was part of the team that compiled the Environmental Management Plan for the Gautrain Rapid Rail Link Project. Deon is responsible for compiling the EMPs for this project.

Dr Johnny van Schalkwyk 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, and 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. Johnny is responsible for the Heritage Impact Assessment.

Bert De Vries 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. Bert is responsible for the Traffic Impact Assessment for the EIA, assisted by Cobus de Kock.

Derek Cosijn 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 types of council, to private organizations, and has also worked in Canada. Derek undertook the noise specialist study.

Peter Kimberg is a qualified aquatic specialist for Golder and Associates (Pty) Ltd and specialises in Aquatic Biomonitoring, Ecological Baseline Assessments, Ecological Impact Assessments, and Biodiversity Assessments. Peter is responsible for the aquatic specialist study.

Cameron von Bratt is a qualified aquatic specialist for Golder and Associates (Pty) Ltd and is a specialist consultant in the aquatic environment, providing specialist input into EIAs, WULAs, Reserve Determinations, Biomonitoring, and baseline assessments. Cameron assisted Peter Kimberg with the aquatic specialist study.

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. Graham is responsible for the team of ecologists that undertook the terrestrial ecology specialist study.

Renee 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 Sighed 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, and chromium chemical operations, power stations, iron and steel industries, platinum industry, mining, cement industries, chlorine industries, Ferro-silicon industries and fertilizer plants. Renee is responsible for the air quality specialist input.

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. Russell and Nanja are the regional economics and landuse specialists of this project.

Anita Bron 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. Anita has undertaken the Social Impact Assessment.

The social impact assessment was reviewed by **Dr. Kay U. Brugge** who holds a MA (Research Psychology)(UP) and D. Litt et Phil (Psychology) (UJ). Since mid-1995 he has been consulting to private and public sector companies & institutions including engineering firms; national and local governments, as well as the Gauteng Provincial Legislature and other Legislatures (incl. Mpumalanga; Eastern Cape) on parliamentary oversight. On the substantive side, his expertise includes social impact analysis; review of social impact analyses/research conducted by other consultants;

project management; parliamentary oversight methodologies; facilitation; policy analysis/formulation; as well as all aspects relating to social research. Further to his research and consulting work, Kay is also an Executive Lifestrategist specializing in Emotional Intelligence, and coaching mainly corporate executives. Dr. Brugge was born in Namibia and lives with his family in Johannesburg.

Karen James 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. Karen has undertaken the Visual Impact Assessment.

Jo-anne Thomas has ten years experience, holds an MSc in Botany and is registered with the South African Council for Natural Scientific Professions (SACNASP) as an environmental scientist. Her key focus is Environmental Management, Strategic environmental advice, environmental compliance and advice monitoring, EIAs, policy, Strategy and guidelines, Project management and General Ecology. Jo-anne is responsible for the Environmental Management Programmes Reports (EMPR) in terms of the Mineral and Petroleum Resource and Development Act (MPRDA).

Andrew Dickson is a Certified Occupational Hygienists (COH), registered with the Southern African Institute for Occupational Hygiene (SAIOH). Mr Dickson has M+4 qualification and 12 years of field experience. Mr Dickson will be equipped to undertake the Health Risk Assessments in compliance with regulations of the Department of Labour and is responsible for Health impact assessment.

Professor Gerrit Basson is a qualified civil engineer and a professor, Director of the Institute for Water and Environmental Engineering, Department of Civil Engineering,

University of Stellenbosch. Professor Basson has over 20 years of experience in reservoir and river sedimentation investigations and research, hydraulic modelling and river engineering, design of hydraulic structures, determination of environmental water requirements for the river morphology, flood hydrology and flood line determination, water quality modelling of rivers and reservoirs and water resources planning. Gerrit has undertaken the Sedimentation Specialist Study.

Bryony Warmesley has over 28 years experience in environmental consulting, starting in Canada in 1980, but she has lived and worked in southern Africa since 1983. She founded Walmsley Environmental Consultants in 1990 and after 24 years as a consultant, she is now managing the South African office of the Southern African Institute for Environmental Assessment. She has an MA and MSc in Geography from St Andrews University and the University of Alberta respectively. She has extensive experience in Integrated Environmental Management, Due Diligence Audits and Environmental Liability Assessments, External Reviews, Environmental Impact Assessments, Site Selection Studies, Scoping Studies and Public Participation, Environmental Training and Environmental Management Plans. Bryony has undertaken the peer review.

1.5 STRUCTURE OF THIS REPORT

The following information, in accordance with Regulation 29 of Government Notice 385, is included in this report:

Table 1.1: Report structure according to regulations

Regulation number	Description	Location
32 (2) (a)	Details of - (i) the EAP who compiled the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment;	Chapter 1
32 (b)	A detailed description of the proposed activity;	Chapter 3
32 (c) (i) and (ii)	A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is -	Chapter 5

Environmental Impact Assessment

Regulation number	Description	Location
	(i) a linear activity, a description of the route of the activity; or (ii) an ocean-based activity, the coordinates within which the activity is to be undertaken;	
32 (d)	A description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Chapter 5
32 (e) (i- iv)	Details of the public participation process conducted in terms of subregulation (1), including- (i) steps undertaken in accordance with the plan of study; (ii) a list of persons, organisations and organs of state that were registered as interested and affected parties; (iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and (iv) copies of any representations, objections and comments received from registered interested and affected parties.	Chapter 7
32 (f)	A description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Chapter 2 and 4
32 (g)	An indication of the methodology used in determining the significance of potential environmental impacts;	Chapter 10
32 (h)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process;	Chapter 4

Environmental Impact Assessment

Regulation number	Description	Location
32 (i)	A summary of the findings and recommendations of any specialist report or report on a specialised process;	Chapter 9
32 (j)	A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;	Chapter 10
32 (k) (i- vi)	An assessment of each identified potentially significant impact, including - (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated;	Chapter 10
32 (l)	A description of any assumptions, uncertainties and gaps in knowledge;	Chapter 11
32 (m)	An opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 12
32 (n) (i-ii)	An environmental impact statement which contains - (i) a summary of the key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	Chapter 12
32 (o)	A draft environmental management plan that complies with regulation 34;	Chapter 11, Annexure N and O

Environmental Impact Assessment

Regulation number	Description	Location
32 (p)	Copies of any specialist reports and reports on specialised processes complying with regulation 33; and	Chapter 9 and Annexure A-N
32 (q)	Any specific information that may be required by the competent authority.	Not Applicable

2. MOTIVATION FOR THE PROJECT

The Groot Letaba Valley falls within the Luvuvhu-Letaba Water Management Area (WMA), one of the 19 WMAs into which South Africa is divided. Human settlement, agricultural production and tourism between the Drakensberg escarpment and the Kruger National Park have placed demands on the water resources of the Groot Letaba River which can no longer be met within reasonable risks of shortages from the existing infrastructure.

Faced with water shortages of increasing severity and frequency, the main consumptive users of water (irrigation, forestry, domestic and industrial) have from time to time had to compete for limited supplies by taking extraordinary measures (over abstraction, direct abstraction from the water body and high tech equipment) to survive. This has resulted in serious degradation of the riverine ecosystems. Historically the environment was not considered a water user and was not allocated any water from available resources. However, in the Letaba River catchment 14.8 million m³/ annum was allocated, on an ad hoc basis, for release from the Tzaneen Dam to the Kruger National Park but, as a result of evaporation and river abstractions, little if any of these releases reached the Park with real beneficial effect.

With the advent of the National Water Act (Act 36 of 1998) (NWA), a water allocation or Reserve for basic human needs and for sustaining ecological functioning, has placed a new perspective on water resource management in the Groot Letaba River. The emphasis in the past has been on the augmentation of supplies to mitigate shortages in the Groot Letaba River. This approach must be complemented by a strategy for managing the water resources in a sustainable manner. Proposals for augmenting reliable water supplies from the Groot Letaba River include the construction of a dam on the Groot Letaba River at Nwamitwa just downstream of the confluence with the Nwanedzi River as well as the possibility of the raising of the Tzaneen Dam. Bulk infrastructure for the treatment, conveyance and storage of potable water for primary use forms an integral part of the development proposals. Attention is focused on water needs for the increasing human population, for downstream riverine ecosystems (including those in the Kruger National Park) as well as for stabilising commercial irrigation, including the settlement of resource-poor farmers (**Figure 2.1**).

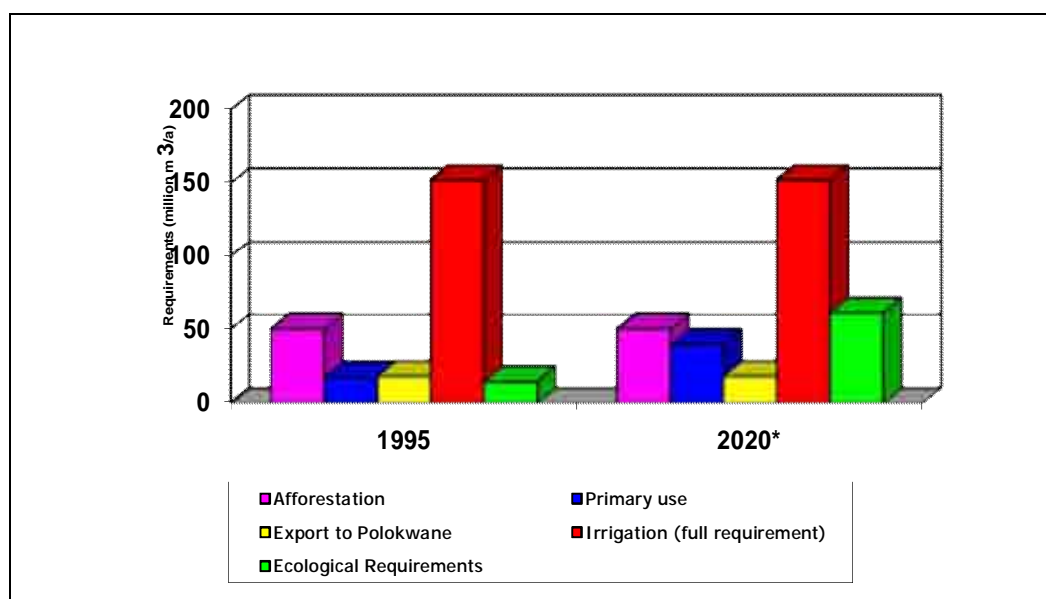


Figure 2.1: Water Utilization requirements

Estimated in 1998 Feasibility Study

The agricultural sector (fruit orchards dependant on irrigation) and the associated agro-industries provide the majority of employment opportunities in the area. Competition for the limited jobs is fierce and unemployment in the area is high and many people rely on income from family members working in the cities. Many communities do not have reasonable access to safe reliable water supplies and the ecosystems which rely on flow in the river system are subject to increasing stress and degradation.

The development proposals seek to address mainly the following:

- Reliable implementation of the Reserve which will require about 42 million m³/a more than was accounted for 1995, also distribution through the season strictly according to the requirements of the riverine ecosystem; and
- The increasing inadequate availability of safe and secure water supplies for primary use, even at a bare level of service.

The GLWaP is a major initiative by the Department of Water Affairs and Forestry in support of the Limpopo Provincial Government's development strategy for the province. The project aims to have a positive impact on the regional economics and on alleviating poverty. This will mainly be achieved through:

- Increasing the safe, reliable water supplies for domestic and industrial use;
- Minimizing the frequency, intensity and duration of restriction on the use of water allocated for irrigation of high value crops;
- An increase in total household income through stabilising the job market; and
- Providing leverage for the equitable distribution of resources.

The proposed infrastructure and non-infrastructures components will make it possible to improve the management of water resources so as to stop degradation of the conservation status of the riverine ecosystem.

The GLEWaP includes a number of infrastructure components, as well as a range of other initiatives as described in **Chapter 3**.

3. PROJECT DESCRIPTION

3.1 PROJECT OBJECTIVES

The GLWaP is aimed at improving the management of the water resources in the catchment as a whole. Provision is made for non-infrastructure management interventions to make more water available as well as for the construction of infrastructure components. Although only the construction of the infrastructure components require authorisation from the DEAT and is subject to this EIA, they cannot be fully understood or evaluated in isolation from the non-infrastructure management interventions.

3.2 NON- INFRASTRUCTURE COMPONENTS

The following non-infrastructure interventions are being pursued:

- Water conservation and demand management– The aim is to ensure effective and sustainable use of available water sources through water conservation, loss management and demand management, including recycling and re-use practices.
- Use of local groundwater resources – During the feasibility studies in the 1990s and from recent investigations, it was found that although groundwater cannot be considered as the only source of water to satisfy increasing needs, it can be used to good effect for small-scale domestic water supplies and food plot irrigation. In this area, with limited water resources, the conjunctive use of ground and surface water is promoted. This is particularly important because the ground water in the supply area has a high salinity and could be brought to an acceptable quality for domestic use by blending with treated water from the proposed new dam. Groundwater resources are to be developed incrementally to increase yields, but with ongoing monitoring to ensure good water quality. The DWAF will make recommendations to local authorities in this regard.
- Removal of alien invasive plants – The DWAF, Working for Water programme is currently engaged in the removal of alien invasive plants in the Groot Letaba Valley in order to increase the yield in the river system.

- Compulsory licensing – In view of the very high level of water use in the catchment compulsory licensing of water use must be implemented to facilitate equitable allocation and the management and control of water use. This process requires validation of information on existing use and verification of the lawfulness of each user.
- Implementation of the Reserve – A preliminary ecological Reserve has been determined at a comprehensive level for the whole catchment and has been approved.

3.3 INFRASTRUCTURE COMPONENTS

The infrastructure components of the project include:

- The raising of the Tzaneen Dam;
- A new dam at the site known as Nwamitwa;
 - Associated relocation of roads;
 - Associated temporary housing for construction workers;
 - Associated permanent administration buildings and staff accommodation; and
 - Access roads;
- A riverflow gauging weir;
- Upgrading of the existing Water Treatment Works;
- Pumpstations;
- Pipelines; and
- Reservoirs.

Borrow areas required to provide construction materials are covered separately by submission of the relevant documentation to the Department of Minerals and Energy.

It is important to note that all aspects related to the provision of bulk electricity do not form part of this EIA, as Eskom will be responsible for this.

The final design details were not available at the time of undertaking the specialist studies and writing this report. The precautionary principle was applied, and the greatest possible impact project (e. g highest possible dam wall) was therefore used for these investigations. The Environmental Assessment Practitioner (EAP) is

confident that the significant impacts predicted will therefore be accurate of if anything less than the assumption.

3.3.1 Pre- construction Phase

A pre-construction phase including materials investigations, geological drilling, site surveying, mitigation of impacts on heritage resources and plant rescue will be necessary before construction activities commence.

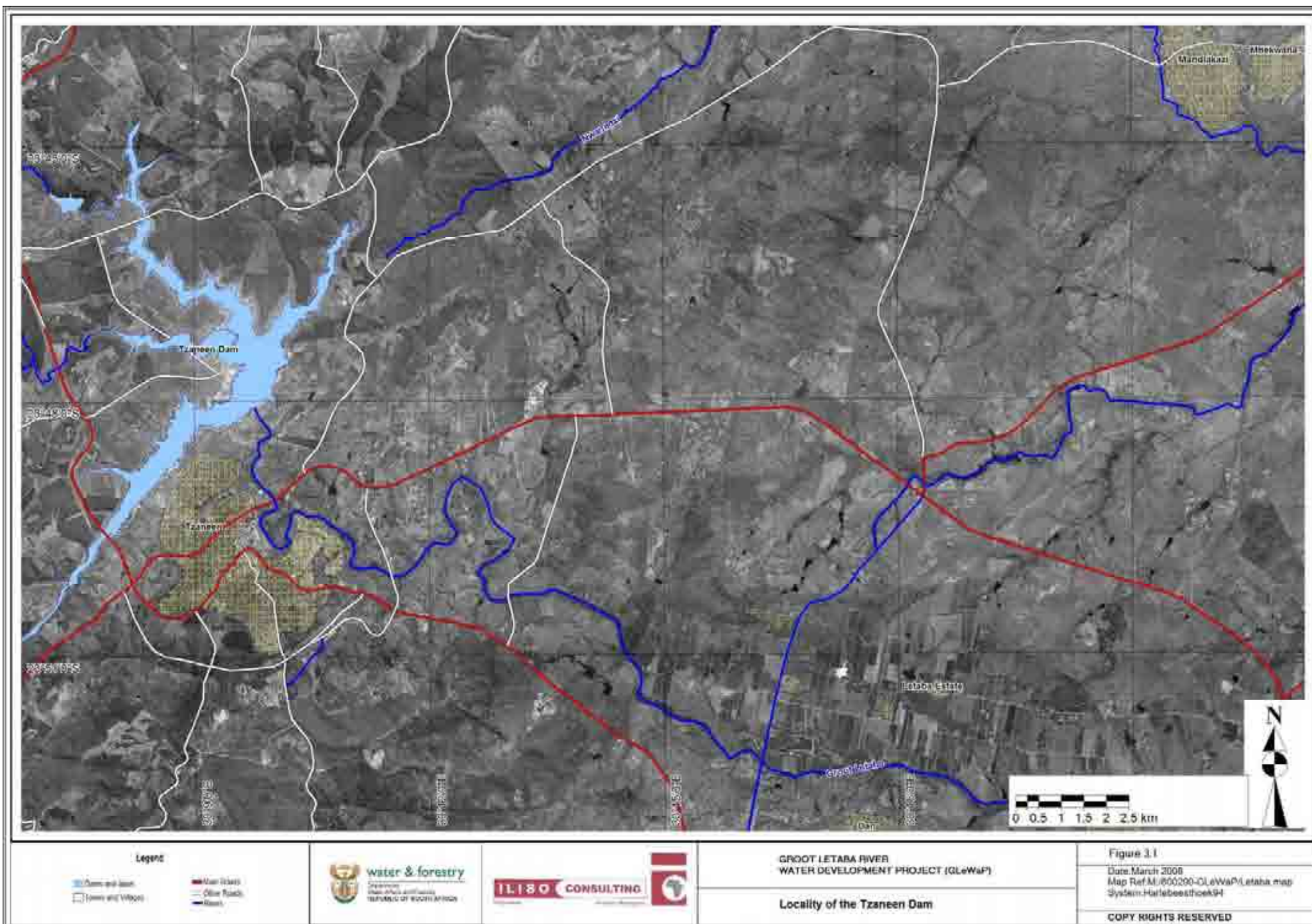
3.3.2 Raising of the Tzaneen Dam

The Tzaneen Dam, located on the Groot Letaba River near the town of Tzaneen (**Figure 3.1**) was completed in 1976. Its main statistics are:

Height	54, 9 m
Full supply capacity	158 million m ³
Yield (high assurance)	58 million m ³ /annum

The main purpose of raising the Tzaneen Dam at the time of the Feasibility Study was to increase the assurance of the supply of water for irrigation of high value permanent crops, mainly citrus. Current investigations indicate that this component of the project could be important for allocating more water for domestic use.

The dam wall will be raised by a maximum of 3.5 m and the spillway will be designed to accommodate a flood of 5100 m³/s. This will be achieved by using either a labyrinth spillway, fusegates or a side channel spillway. The storage capacity will be increased by 45 million m³ to 203 million m³ and the estimated firm yield would be increase by about 4 million m³ per annum to 62 million m³/annum.



- Hydroplus Fusegates – Fusegates are an innovative and reliable spillway gate system that represents a genuine alternative to conventional systems, such as radial gates, flap gates or inflatable tubes on the spillway to increase storage capacity (**Figure 3.2**). Fusegates have successfully been implemented on many dams throughout the world, providing solid evidence of their value and effectiveness. Fusegates comprise a number of hollow reinforced concrete, low maintenance structures installed side by side on the spillway crest.

Fusegates provide a safety measure against serious damage to the dam in case of major floods (**Figure 3.3**). This is achieved by each fusegate being set to topple at a predetermined separate water level in the dam as an extreme flood passes through the dam. In this way the flood discharge capacity of the spillway is increased incrementally from the design flood level to safely accommodate a specific flood extreme event.

Once fusegate structures topple from the spillway crest during an extreme flood event, they must be replaced to reinstate the increased capacity.



Figure 3.2: Operational Fuse gate



Figure 3.3: A Collapsing fuse gate

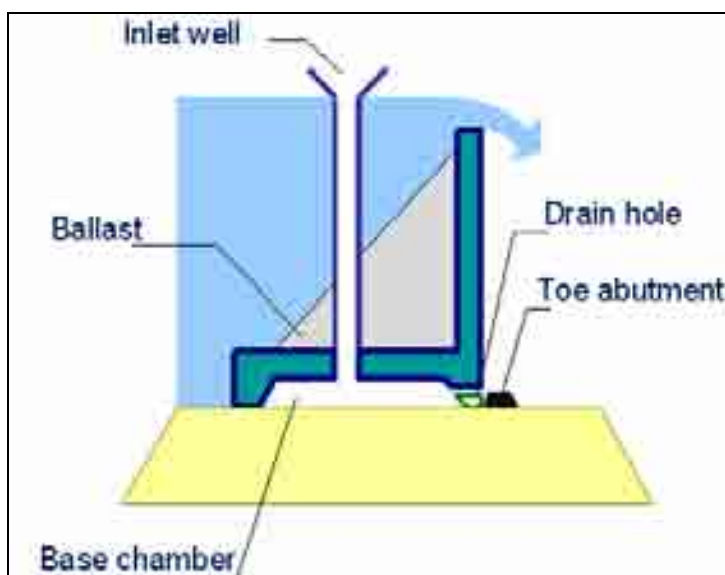


Figure 3.4: Cross – section of a fusegate

- Labyrinth Spillway – This is a maintenance free option aimed at raising the full supply level of the dam (**Figure 3.5**). The construction process entails the removal of a portion the existing spillway structure and replacing this with a higher labyrinth to raise the full supply level. To accommodate a flood of 5 100 m³/s the

full length of the non -overspill crest will be raised by up to 3.5 m. The crest length of the labyrinth is significantly longer than the existing straight ogee crest resulting in a lower overspill depth for a specific flood flow rate. The intention is to increase the full supply capacity without increasing the high flood level in and upstream of the dam basin.



Figure 3.5: Example of a labyrinth Spillway (the “teeth” downstream are used to break the energy of the water and prevent erosion)

- Side Channel Spillway – A side channel spillway can be used where the topography and geology allows it. In this case a 40 m long side channel spillway would be required on the left bank adjacent to the existing spillway. The flow would be returned to the river downstream of the dam.

The raising of the Tzaneen Dam will not require acquisition of additional land as the design flood level remains within the area purchased for the existing dam. The size of the downstream flood will also not be affected.

An estimated 50 construction workers would be employed some of which would be professionals and will be accommodated at Letsitele and some will be sourced from

the local community through the labour desk. The operation of the Tzaneen Dam would maintain its current number of employment.

Construction facilities such as offices, workshops and stores will be required on site, and will be located within the property of the existing Government Water Works (GWW). Construction is expected to start in February 2011.

3.3.3 Proposed dam at the site known as Nwamitwa

General description

The largest component of the GLEWaP project is the proposed new dam at the site known as Nwamitwa (**Figure 3.6**). The dam will be located on the Groot Letaba River downstream of the confluence of the Nwanedzi River. The catchment area of the proposed Nwamitwa Dam is 1, 400 km². The EIA has been undertaken for a dam with a storage capacity of 218 million m³ and a full supply level (FSL) of 479.5 masl. This capacity is 1,5 times the Mean Annual Runoff (MAR) at the site. The estimated increase in system yield available for domestic use is up to 18 million m³/a after providing for the instream flow requirements as was estimated at the time. The optimum size of the dam may however be smaller.

An earth fill embankment on both flanks with a central concrete spillway is envisaged (**Figure 3.7**). The detail design of the dam and outlet works has not yet been completed but the structure will have an appearance similar to other composite construction type dams such as the Tzaneen Dam.

The earth embankments will be protected against wave action and erosion on the upstream side by a layer of rock rip-rap. The downstream slopes will also be protected but by a layer of mainly crushed stone. The embankments are expected to have a total crest length up to 3,000 m while the length of the concrete spillway would be about 190 m. These dimensions are subject to finalization in the detailed design phase.

An outlet control structure with multiple draw off levels will be an integral part of the concrete spillway structure and will be located on the left flank of the spillway.

Figure 3.7: Artist impression of the proposed Dam at the site known as Nwamitwa



Construction Facilities

Construction is expected to commence approximately in February 2011, and take 5 years to complete, with the storage of water and associated benefits expected to commence in 2015.

The site of the construction camp for the dam will be on the left bank of the Groot Letaba River, just upstream of the dam wall (**Figure 3.8**). The construction camp will require approximately 35.6 ha excluding access roads. The site will accommodate the following:

- Concrete Batching Plants;
- Site Offices and Parking- comprising two office blocks (one to house the personnel of the Resident Engineer, and one to house the Site Agent and his personnel) and 20 covered parking bays per office block, and a taxi rank;
- Materials testing Laboratory;
- Workshops and Stores - approximately five buildings;
- Reinforcing Steel Bending Yard;
- Permanent Housing- Houses for married operating personnel;
- Weather Station;
- Sand and crushed stone Stockpile Areas – less than 450 m x 250 m with access roads (above area of inundation);
- Areas for the handling of hazardous substances;
- An explosives storage magazine;
- Wash bays for construction plant;
- Radio communication infrastructure;
- Facilities for the bulk storage and dispensing of fuel for construction vehicles,
- Power lines, a small-scale sewage treatment plant; and
- A temporarily licensed solid waste disposal facility.

Various temporary access roads, low level river crossings and haul roads will be required in and around the dam wall and a borrow pit will be located within the dam basin.

Construction procedure

Construction activities will commence with the stripping of vegetation and topsoil to establish access and construction roads, site offices, dam foundations and crusher and concrete mixer stations. Topsoil will be stockpiled for reuse during the rehabilitation stage, whilst cleared woody vegetation suitable for firewood will be stockpiled for collection by the local population for a period of time, after which it will be burnt.

Soon after commencement the river will be diverted to expose the rock foundations for the concrete spillway section. During this period, cofferdams will be constructed to protect all foundation activities in the riverbed against flood damage (**Figure 3.9**). Excavators, bulldozers and trucks will be engaged to remove all loose material on the foundation of the dam until sound founding material is exposed. Blasting will be necessary.

A team specializing in quarry operations and the crushing of aggregate for concrete will be set up on site. Drill rigs will be in operation 24 hours a day. Blasting will be required, on average, every 14 days, and will be scheduled to take place only during daylight hours. A crusher will also be erected.

Sand required for the production of concrete will be collected from the identified borrows areas. Unsuitable material will be disposed of at locations to be agreed on by the Environmental Control Officer (ECO).

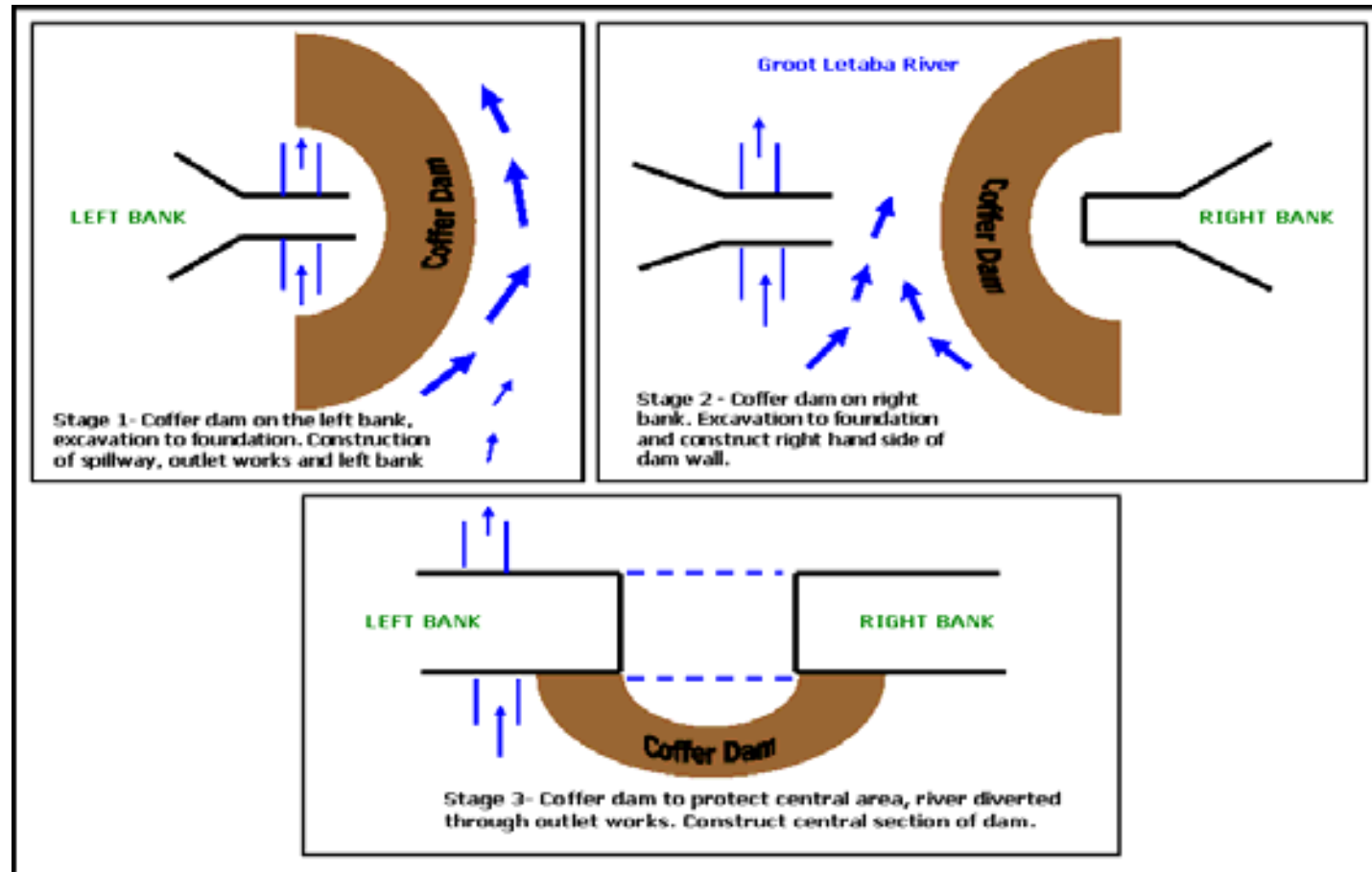


Figure 3.9: Stages of River Diversion

Concrete production at the batching plant will then commence and placement in the central spillway section, outlet works and apron areas, probably by roller compaction techniques and the use of high tower and mobile cranes, will occur 24 hours a day, seven days a week. Earth embankments will be constructed on both banks by compacting material hauled in by large trucks from the borrow areas upstream of the dam.

The temporary site administrative buildings will be erected complete with security fencing, a water supply, sewage purification plant and an electric overhead supply line.

After construction activities have been completed, estimated to be in 2013, all the crushers, mixers and site offices, etc. will be removed and the construction site rehabilitated. All temporary access roads not in the dam basin will be ripped and covered with a topsoil and planted with suitable grass and tree cover. The aim is to return the whole construction site as close as possible to its original appearance. Areas that are inundated by water in the dam will be shaped to accommodate storm runoff and no grass will be planted.

Two to five permanent houses will be erected within the project area to accommodate operation and maintenance staff.

The labour force for construction of the proposed dam will be approximately 300 people. Approximately 50 people will be skilled workers and be housed with their families in Letsitele. 200 workers will be recruited locally and approximately 100 of these workers will acquire a new skill by the end of this project. The remaining 50 workers will be experienced in dam construction and will be transferred from elsewhere and be housed at Letsitele or another established township in single quarter's accommodation. The EIA is based on approximately 50 workers being female and the 250 male. Operation of the proposed dam would endeavour to employ people from the community.

3.3.4 Borrow Areas

The proposed borrow area for the earth fill material is on the right flank (looking downstream) immediately upstream of the embankment (**Figure 3.8**).

Two potential borrow areas for filter materials and concrete sand have been identified in the Metronome River on the farm Letaba Drift and in the Phatle/Lerwatlou River on the farm La Parisa (**Figure 3.8**).

Coarse aggregates for concrete and rock for the rip-rap and rock toe zones of the embankment will be sourced from existing permitted quarries or commercial sources.

The estimated material requirements for the construction of the proposed dam are as follows:

• Earthfill materials	Borrow area to embankment	700 000 m ³
• Filter materials	Sand borrow area to embankment	30 000 m ³
• Rockfill materials	Quarry to embankment	70 000 m ³
• Concrete sand	Borrow area to embankment	260 000 m ³
• Concrete coarse aggregates	Quarry to embankment	300 000 m ³

Draft Environmental Management Programmes have been compiled for the two borrow areas that are not on the GWW. These documents are available on request for comment.

3.3.5 Flow Gauging Weir

A new flow measuring weir will be required downstream of the dam in order to measure the flow that is released from the dam (**Figure 3.10**). This flow gauging point will be important for monitoring the implementation of the Reserve and operation of the dam.

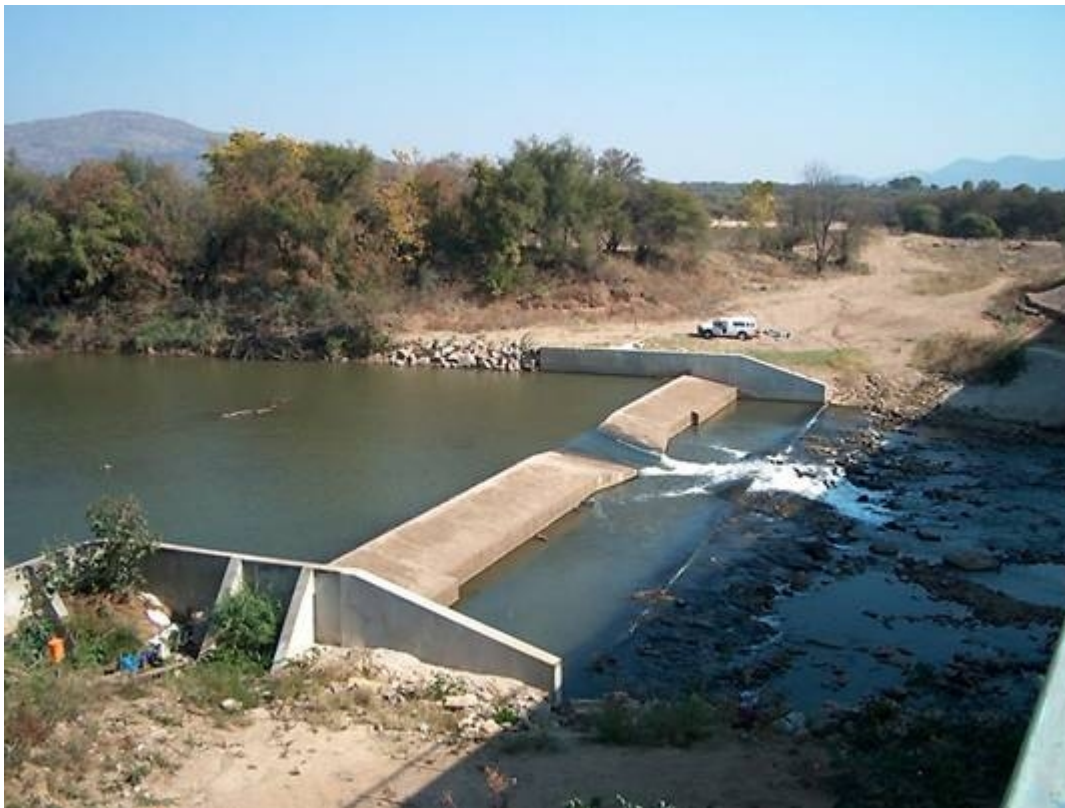


Figure 3.10: Flow Gauging weir in the Crocodile River at Nooitgedacht

The exact location of the weir has not yet been determined, but an approximate position is indicated on **Figure 3.8**.

The weir will take about three months to construct and will be a low concrete structure with erosion control measures on both banks to prevent out-flanking. It is envisaged that the construction of the weir will form part of the dam construction contract.

3.3.6 Local road re-alignment

The R529, D1292 and the P43/3 will require partial re-alignment to accommodate the proposed dam. Road re-alignment would require the construction of at least two major bridges and the upgrading of two existing bridges (Alternative 4 on **Figure 3.11**).

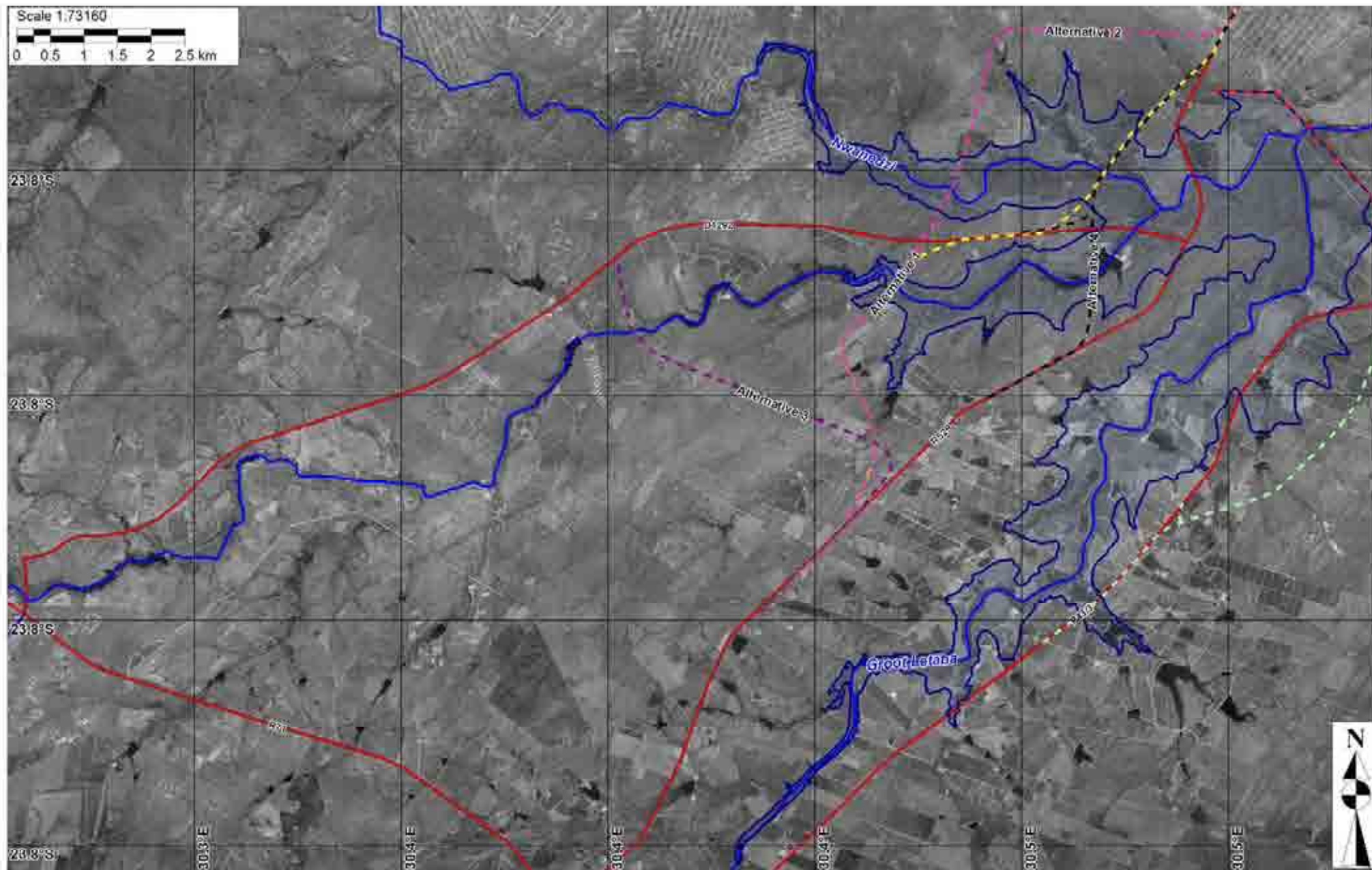
The road design will be very similar to the existing roads, which are of a high standard, as well as be constructed using the same material. The road pavement will be designed to accommodate normal traffic flow.

All road designs will be submitted to the relevant road authorities to attain approval before construction commences. The minimum road reserve width is expected to be 40 m but may have to be wider in places to accommodate earthworks required for cuts and fills.

The major items of work to be carried out are the following:

- Clearing of the road reserve;
- Installation and operation of a bitumen plant;
- Construction of the road to bituminous surfacing;
- The pavement structure for the road will consist of various gravel sub-base layers with a double stone surface seal;
- The gravel for the pavement layers and fill will be obtained from DME approved borrow pits and/or cuttings along the road;
- All stormwater drainage will be accommodated using either pipe or portal culverts; and
- The existing roads will be utilised whilst the new realigned roads are constructed so avoiding the need for temporary detours during construction.

Materials required for the construction of the roads will be sourced as far as possible from borrow areas with existing permits or from commercial sources. Any new sources required will be subject to a separate approval process.



Legend

- Existing Road
- Proposed Road
- Proposed Roadway Class
- Proposed Roadway

Water & Forestry

- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 4
- Proposed

water & forestry

Department of Water and Forestry
REPUBLIC OF SOUTH AFRICA

ILISO CONSULTING

GROOT LETABA RIVER
WATER DEVELOPMENT PROJECT (GLEWAP)

Alternative Road Re-alignments

Figure 3.11

Date: March 2008
Map Ref: M:600200.GLEWAP/Letaba map
System: Harthebeeshoek34

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3.3.7 Water treatment works

At present the Nkambako Water Treatment Works draws water from the Groot Letaba River about 1 km downstream from the Nwamitwa Dam site. The works has a nominal capacity of 6 M/d. After completion of the project, water will be abstracted from the dam and treated at the existing and new treatment works extensions located adjacent to the existing works (**Figure 3.8**). The existing run of river abstraction will be abandoned. Water produced at the treatment works will meet Class 1 quality requirements.

Water will be drawn from the most favourable level of the dam which is normally near the surface. The treatment plant is planned to be equipped with the following:

- Provision for the oxidation of iron and manganese at the inlet to the works; and
- Allowance for the addition of a dissolved air flotation unit at the head of the works to remove algae.

3.3.8 Pipeline, pump-stations and reservoirs

Pipelines

Bulk water distribution pipelines (**Figure 3.8**) will be constructed to augment potable water supplies in the various existing supply zones. The bulk distribution infrastructure from the treatment works will be optimised during the detailed design phase and the final configuration and sizing is not known at this stage.

Figure 3.12 illustrates the alternative pipeline routes linking existing and new command reservoirs with the enlarged water treatment works at Nkambako that were investigated in the EIA. It is envisaged that new pipelines will be located adjacent to

existing pipelines or along road reserves. Some sectors of pipeline may traverse open land.

Construction of the pipelines will commence with pipes being laid out along the pipeline routes and trenches up to 3.5 m deep and 2.5 m wide for the largest of the pipes being excavated. (**Figure 3.13**). Under normal circumstances a maximum of 5 km of open trench is permitted, whilst the pipes will be strung out as they arrive from the manufacturer. Excess spoil material from the trenches will be transported to a suitable disposal site and sandy material will be brought in as selected backfill for pipe protection. Once the pipes have been laid and tested, the trench will be backfilled, compacted and shaped to the natural ground profile. Topsoil will be replaced to re-establish vegetation.

A ten to thirty meter wide strip would be impacted during constructing (**Figure 3.14**).



Figure 3.13: Pipe laying



Figure 3.14: Trench for pipe laying

Pump stations

Currently one booster pump station (**Figure 3.8**) is envisaged along the pipeline routes although the exact number will only be determined during the detail design stage. An area of approximately 1 – 2 ha will be fenced for each pump station. No balancing dams are envisaged.

A new raw water pump station will be constructed to pump water to the WTW.

Building activities will include cranes, mixer trucks, excavators, tipper trucks, loaders and delivery vehicles. Construction of a single pump station will take approximately 24 months.

Reservoirs

Although the reservoirs associated with the pipelines may differ according to their individual capacity and local topography, the technical details are similar for each and are presented below.

Construction Material -	Concrete
Shape and Height-	Shape and height will be determined during the detail design stage but usually circular up to 8 m high (Figure 3.15). Large reservoirs may be rectangular.
Area Required -	Approximately 1 – 2 ha
Storage Capacity-	Approximately 1 M/to 30 M/providing between 4 and 24 hours storage per site, but subject to finalisation
Fencing and Security-	Each reservoir will be fenced. No permanent security staff will be present on site

Four new reservoirs are planned (**Figure 3.8**).

- Sorolorole (Reservoir A) ;
- Babanana (Reservoir B);
- Hlohlokwe (Reservoirs at C; and
- Gamokgwathi (Reservoir D).

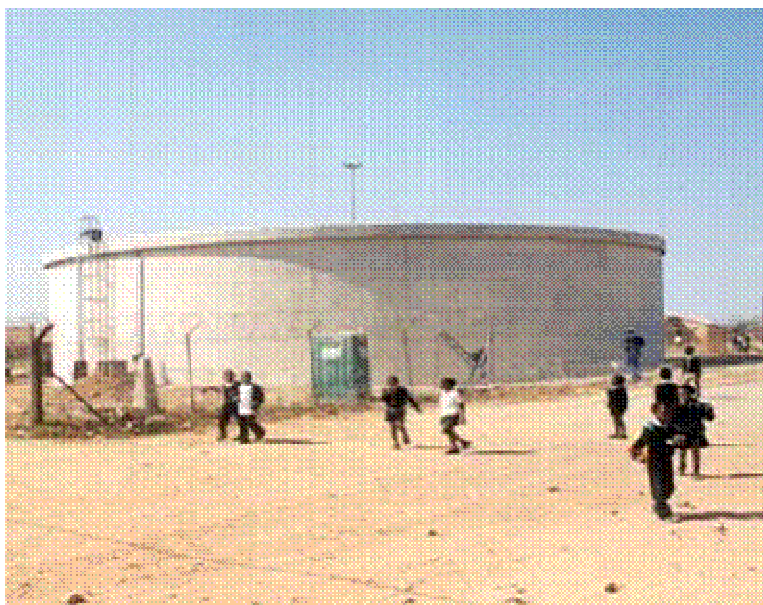


Figure 3.15: View of a typical reservoir

3.3.9 Cost of the project

The estimated cost for the raising of the Tzaneen Dam and the construction of the Proposed dam at the site known as Nwamitwa is shown in **Table 3.1**.

Table 3.1: Estimated costs for the raising of the Tzaneen Dam and the Proposed dam at the site known as Nwamitwa

	Raising of Tzaneen Dam	Proposed new dam
Operation cost for dam	Unchanged from current costs	R 3 million per year
Cost of bulk water supply infrastructure	Unknown	R 200 million
Operation cost of bulk water infrastructure	Unchanged from current costs	R 1 Million
Cost for construction	R100 Million	R1 200 Million

3.3.10 Sustainable Utilization Plan (SUP)

A SUP will be developed during the implementation phase of the project. Tourism opportunities directly associated with the dam are expected to be minimal; largely because the water level will often be low and there are already many competing tourist attractions in the vicinity.

3.4 WATER DISTRIBUTION

The GLeWaP project does not include water reticulation directly to the community but provides local municipalities with bulk water to distribute further.

4. ALTERNATIVES

4.1 ALTERNATIVES CONSIDERED IN THE SCOPING PHASE

The following alternatives to the project were considered during the Feasibility Study (1998) and presented in the Scoping Report:

- **The “Do Nothing” approach-** This was found to be not feasible as the ecological and socio-economic situation would deteriorate further, and the Reserve requirements would not be achieved in the catchment.
- **Replacing commercial afforestation with natural vegetation-** The positive impacts on the river flows in the river would be fairly limited due to the type of natural vegetation in the area of concern and the results would not meet the current water allocation demand. Programs (Working for Water programme) have however been put in place for the removal of alien vegetation in other parts of the catchment.
- **Ceasing Export of water to the Sand River-** An annual amount of 18.5 million m³ per annum is extracted from the Dap Naude Dam and Ebenezer Dam to Polokwana. Polokwane does not have reasonable alternatives for importing water and therefore this option would impact significantly on water supply to the Polokwane area. The quantity of concern is also not sufficient to fulfil the requirements identified for this project.
- **Improve utilization efficiency for irrigation water** The irrigation sector has invested considerably in modern technology and sophisticated equipment to improve water use efficiency. There is little scope for improvement.
- **Decrease irrigation allocations** This would have a tremendous impact on the economy and the community as the irrigation sector contributes significantly to majority of the labour force and the economic status of the area.
- **Water Conservation and Demand Management** Effective water conservation and demand management systems can contribute to the increased availability of water and must be pursued. However, estimates indicate that even optimistic projections will fall short of providing sufficient water to meet the requirements. If an optimistic 20% reduction in water requirements in domestic use is achieved as a result of water conservation and demand management initiatives

in the long term, this could decrease the need for new water supplies by about 8 million m³ per annum. This is far less than the objectives set for this project.

- **Water storage facilities** An additional water storage facility was found to be a preferred option, to meet the current water requirements.

4.2 PROJECT DETAIL ALTERNATIVES CONSIDERED IN THE EIA PHASE

4.2.1 Raising of the Tzaneen Dam

The raising of the Tzaneen Dam is being considered as a viable option. The raised dam could have a capacity of 203 million m³. This would improve the assurance of supply for irrigation purposes, and decrease water restrictions. The dam would be raised by a maximum of 3.5 m and would take place simultaneously with the construction of the proposed dam at the site known as Nwamitwa.

The design alternatives considered with regards to the spillway were a labyrinth, fuse gate and side channel spillway (**Chapter 3**).

None of the specialist studies found any of these alternatives to be environmentally favoured or not preferred as opposed to any of the others. The main factors influencing the preference which is therefore technical and cost.

4.3 A NEW DAM AT THE SITE KNOWN AS NWAMITWA

The sizing of the proposed dam at the site known as Nwamitwa was not final at the time that the EIA commenced. The EAP was therefore able to contribute to this process from an environmental perspective. Comparative impacts of a capacity of 0.5 MAR, 1 MAR and 1.5 MAR dams were considered, specifically from social, landuse and terrestrial ecology perspectives.

No relocation of rural village houses or infrastructure will be required for any of the three size dams. When considering the houses, irrigation dams, and packing facilities of commercial farmers affected, the difference in loss between the 1 and 1.5 MAR dams are minimal compared to the difference between these two levels and the 0.5 MAR dam. The differences are as follows:

- For the 1.5 MAR dam, 12 houses, 26 irrigation dams and two packing facilities will be affected.
- For the 1.0 MAR dam, 10 houses, 13-16 irrigation dams and two packing facilities will be affected.
- For the 0.5 MAR dam, 6 houses, 12 irrigation dams and only one packing facility will be affected.

The number of houses affected is not considered a significant factor in this decision, as the majority of land owners are willing to be compensated for their houses to secure the benefits of the dam. The preferred dam capacity is mainly based on the number of irrigation dams and packing facilities that will be lost. The difference between the number of dams that will be lost for the 1.5 MAR dam and 1 MAR seems significant. There is hardly a difference between the 0.5 MAR and 1 MAR in terms of loss of dams. The 1 MAR is then preferable to ensure that local communities benefit optimally. The implementation of the mitigation measures can reduce the negative impacts of the permanent loss of land significantly. The loss of established irrigated lands was also a key factor influencing the decision on the size of the dam.

Impacts of a larger dam could be minimized or offset by:

- Farmers not forfeiting water rights and allocations, and that water allocations lost will be replaced;
- Job losses be mitigated;
- Surrounding communities benefit (more people getting access to water).

Considering the affected villages, relocation will not be necessary for any of the three sized dams. The commercial farmers who will definitely be directly affected have come to terms with this prospect.

Impacts on the terrestrial ecology, aquatic ecology and heritage resources are directly related to the size of the area to be inundated. The smaller the dam the less the impact on the environment and community.

4.4 ROAD RE- ALIGNMENT

The construction of the proposed new dam will inundate some existing roads. Sections of Road R529, D1292 and Road P43/3 will require re-alignment to accommodate the proposed dam. Four alternative alignments were considered for Road R529 in the EIA (**Figure 3.11**):

- Alternative 1: The new road will deviate westwards from the existing R529 alignment approximately 5 km north of the intersection with Route R71 up to Road D1292, where it turns eastward to follow the alignment of the latter for 1 km where it deviates northwards again to link with the existing Road R529 alignment 1 km south of Ka-Malubana Village.
- Alternative 2: The new road will deviate westwards from the existing R529 alignment approximately 5 km north of the intersection with Route R71 up to Road D1292 (same as Alternative 1), where it turns directly northwards for approximately 3 km, it then turns eastwards to link with the existing alignment of Road R529 just south of Ka-Malubana Village.
- Alternative 3: The new road will deviate westwards from the existing R529 alignment approximately 5 km north of the intersection with Route R71 and will be aligned in a westerly direction up to Road D1292.
- Alternative 4: The new road will deviate northwards from the R529 approximately 8.5km north of the intersection with Route 71; it will cross over the D1292 until it links with the existing R529 1km south of Ka-Malubane.

The preferred re-alignment in terms of terrestrial ecology, heritage resources, social, cost, noise, and traffic impact is Alternative 4. Alternative 3 is the least preferred from the noise perspective due to the close proximity of some noise sensitive receptors along that route.

4.5 PIPELINES AND RESERVOIRS

The GLeWaP includes the construction of bulk water supply infrastructure to various communities in the area. The potential impacts on the environment of proposed pipeline routes and alternatives (**Figure 3.12**) were investigated.

Although no fatal flaws were found with any of the pipeline routes or alternatives, all pipeline routes through untransformed vegetation should be regarded as least

favourable options and routes should whenever possible traverse transformed habitats in order to minimise impacts on terrestrial ecology and heritage resources.

No fatal flaws at any of the alternative reservoir sites were found, however in terms of impacts on terrestrial ecology, C1 and D3 are preferred. D3 is the preferred alternative being proposed, but C4 is preferred to C1 because it is closest to the existing Rampepe Reservoir and will enable the Rampepe Reservoir to be served by two sources of supply (the existing source from the Modjadji Dam as a backup and the proposed Nwamitwa Dam), which will increase the flexibility of supply to this sub-system.

4.6 BOOSTER PUMP- STATIONS

No fatal flaws were identified for any of the areas identified for the location of booster pumps. Pump-stations should however be located at least 250 m from residences, school or public facilities in order to maintain acceptable noise levels.

4.7 DAM BASIN CLEARING

One of the project level alternatives considered is whether to clear vegetation from the dam basin prior to first impoundment or not.

The EAP obtained opinions from the water quality, aquatic ecology, terrestrial ecology and aquatic ecology, terrestrial ecology and social specialists, reviewed available literature and met with key stakeholders in the DWAF.

Attempts to use existing dams as case studies were not successful because data was not available. Interviews with key stakeholders provided input based on personal experience and knowledge.

Debushing of dam basin was historically undertaken mechanically. This process has cost (fuel, labour and equipment) and environmental (e.g. air pollution) impacts. Factors that should be considered include:

- the depth of the water;
- the size of the surface area;
- MAR;

- current and expected future water quality;
- landcover; and
- planned future use.

The following general principles regarding dam basin clearing are recommended:

The Developer should generally not de-bush the dam basin except for a 300 m stretch upstream of the entire dam wall (in order to prevent blocking of the outlet works and safety boom). Exceptions (i.e. basins that should be selectively de-bushed up to a predetermined level below the FSL depending on the nature of the dam) should be identified on a case by case basis and could include:

- Cases where commercial harvesting is viable;
- Cases where current or future water quality indicate potential negative impacts to be caused by rotting vegetation;
- Cases where the recreational use of the dam that requires the removal of potential dangerous obstacles is envisaged; and
- If cleared strips are required for silt surveys in the future.

In the cases where clearing is recommended the following principles should apply:

- Vegetation clearing should generally be understood to include trees and bushes, and to exclude grass. Identified very large trees may be left.
- The roots of plants should not be removed, but plants should rather be cut down close to ground level with a chain-saw.
- Topsoil should not be disturbed.
- Non-commercial material to be removed should be burned in a hot fire in order to minimise air quality impacts. This can be achieved by stacking the material in rows and burning on a windy day.
- The areas of the basin that are cleared/ not cleared should be marked on a map for future use.

This does not address the issues of community collection of plant material or plant rescue for bio-diversity conservation purposes.

In the specific case of the proposed dam at the site known as Nwamtiwa, the current and future water quality indicates that clearing of the orchards and trees/bushveld is recommended.

5. RECEIVING ENVIRONMENT

The Tzaneen Dam, proposed new dam at the site known as Nwamitwa and associated bulk water supply infrastructure are located in the Groot Letaba River catchment in the Luvuvhu-Letaba Water Management Area (WMA), in the Mopani District Municipality (MDM) in the Limpopo Province. The two affected local municipalities are the Greater Tzaneen Local Municipality (GTLM) and the Greater Letaba Local Municipality (GLLM).

The co-ordinates for the Tzaneen Dam are approximately between latitude 23 ° 51 and 23 ° 45' S and longitude 30 ° 05 and 30 ° 11 E. The proposed dam at the site known as Nwamitwa is located approximately between latitude 23 ° 51 and 23 ° 45 S and longitude 30 ° 24 and 30 ° 30 E.

The affected project area is characterised by the rural villages and a number of commercial farms. The only large town is Tzaneen.

The Groot Letaba River catchment is a highly productive agricultural area with mixed farming including cattle ranching, game farming, dryland crop production and a wide variety of crops produced under irrigation. Citrus and sub-tropical fruit are most widely produced under irrigation together with vegetables and other high-value crops. Agriculture and the irrigation sector in particular is the main base of the economy of the region and provides the major portion of local employment opportunities. The area to be affected by the proposed new dam is mostly citrus farms.

Apart from internal gravel roads, a fair tarred road network links most of the areas. Most of the roads in the area are poorly maintained.

The GTLM also has numerous areas with exceptional natural beauty and conservation areas downstream of the proposed Nwamitwa dam site, with considerable untapped tourism potential. Although an increase is evident, the tourism demand is well below that which could be expected from an area with such natural potential.

Irrigation is by far the largest water user and will remain so for the foreseeable future. Numerous irrigation schemes and irrigation boards exist in the catchment, some of which are supplied from storage and others depend on run-of-river abstractions.

5.1 CLIMATE

5.1.1 Temperature

Long-term average maximum, mean and minimum temperatures for Tzaneen (1979-1984) are shown in **Table 5.1** (Schulze, 1986).

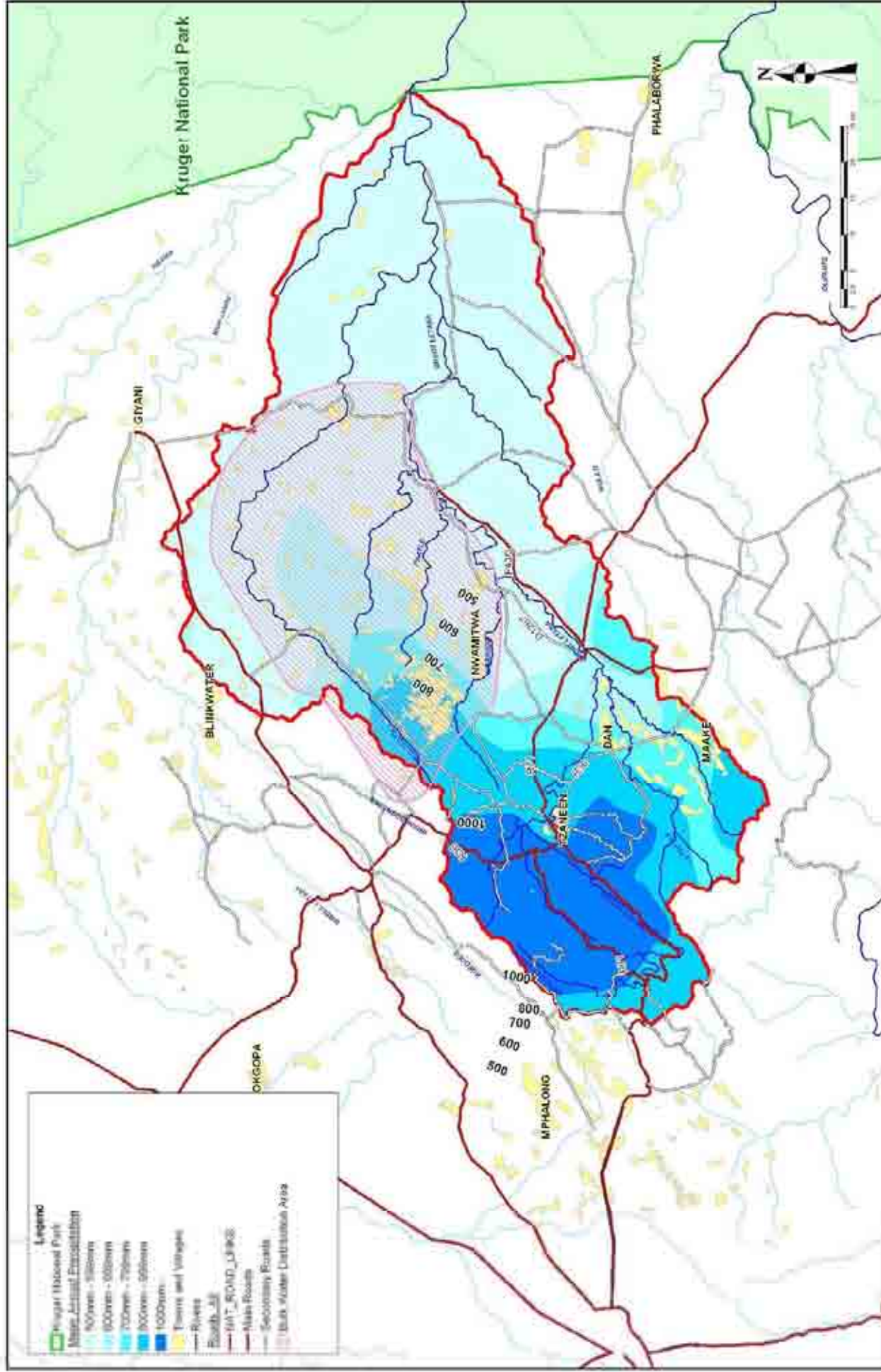
Table 5.1: Long-term maximum, minimum and mean monthly temperatures (°C) for various stations within the Tzaneen region for the period 1979 – 1984 (Schulze, 1986).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Max	29.6	29.1	28.0	27.1	25.3	23.1	22.6	23.9	26.1	26.3	27.9	28.9	26.5
Min	19.2	18.8	17.3	14.5	11.1	7.7	8.0	9.7	12.1	14.5	17.0	18.4	14.0
Mean	24.4	24.0	22.6	20.8	18.2	15.4	15.3	16.8	19.1	20.4	22.4	23.8	20.3

5.1.2 Rainfall

The mountainous topography results in rainfall with a Mean Average Precipitation (MAP) varying between 700 mm – 1, 500 mm in the mountainous region. The MAP for the remainder of the catchment varies from 450 mm – 800 mm. The data is evidence that most of the rainfall occurs in the western mountainous region of the study area (**Figure 5.1**).

Most of the rainfall is seasonal with more than 85 % occurring during the summer months. The peak rainfall months are January and February.



The rate of evaporation increases from 1 500 mm/a in the eastern plains to 1 900 mm/a in the mountainous west. Approximately 60 % of the evaporation occurs during the summer months from October to March.

5.1.3 Wind

As an average, the predominant wind field for the region is from the east (~10 % frequency of occurrence). A diurnal variation wind shift is clearly evident in the study area. During day-time conditions, the frequency of winds from the east increases (>15 % occurrence) with calm conditions of 31.4 %. During night-time conditions, the winds from the west and south increase in occurrence with an increase in calm conditions (45.5 %) as is typical of more stable conditions.

5.2 GEOLOGY, SOILS AND TOPOLOGY

The GTLM area is characterised by mountainous, inaccessible terrain in the west and south, and even topography (gentle slopes) to the north and east. The Greater Letaba, Greater Giyani and Ba-Phalaborwa municipal areas are flatter than the rest of the study area.

The geology of the proposed Nwamitwa dam site consists of Goudplaas Gneiss from the Swazian age. Underlying this is granite gneiss and diabase dykes. The Granite rocks surround various formations of the Petersburg group. The most widespread type is Leucocratic biotite gneiss, probably tonalitic in composition and shows clear intrusive relationships. The area is also characterised by numerous diabase dykes parallel to the Tzaneen lineament.

In the Southwest of the study area these granites are expected to be deeply weathered (up to 20 m) resulting in silty soils. The rest of the Groot Letaba catchment is made up of granites that allow shallow weathering (less than 10 m) and the soils formed are expected to be more sandy.

The Groot Letaba Catchment area can be divided into three zones.

- The Mountainous zone, which forms the headwater and originated at about 1600 masl in the Broederstroom Woodbrush forestry area. The two headwaters

are the Broederstroom and Helpmekaar streams. These two streams join in the Ebenezer Dam to form the Groot Letaba River. From here the river drops steeply through the mountainous zone to the Tzaneen Dam.

- From the Tzaneen Dam the Groot Letaba River flows through the Low mountainous foothills zone to the confluence of the Letsitele River.
- From the confluence of the Letsitele River, the Groot Letaba River meanders across the plains for a distance of 400 km before flowing into the Olifants River 7 km upstream of the Mozambique border. The proposed Nwamitwa Dam will inundate an area of the Nwanedzi River (upstream from the Groot Letaba River/Nwanedzi confluence) from where it meanders through the plains zone. The plains zone extends eastwards and northwards to the Lebombo and Soutpansberg mountains. Slopes rarely exceed a 5 % gradient and the altitude ranges from 200 m in the east to 600 m in the west.

The soils in the drier part of the proposed Nwanedzi Dam site are generally alkaline, shallow silty to sandy. The residual soils, where present, are usually between 1,5 to 2 m thick, coarsely textured, non-cohesive and consist mostly of quartz and feldspar aggregates.

The soil forms mainly present are the *Hutton* and *Shortlands*. *Hutton* soils have Orthic A horizon overlaying a red apedal B and have series *Faringham*, *Balmoraa*, *Msinga*, *Doveton* and *Vimy*. The *Shortlands* soil form has an Orthic A horizon over a red structured B horizon and has series *Argent*, *Richmond* and *Shortlands* present in the area. Possible problems can be that the sandy soils present upstream from the Groot Letaba River in the Nwanedzi River as these are very permeable, resulting in a high infiltration and thus reducing run off. The silty soils will be able to absorb large quantities of water but once saturated runoff will increase. It should be noted that where vegetation cover is destroyed, the soils are susceptible to extreme erosion which in turn will cause an increase in sedimentation in the river channels which might require rehabilitation measures.

5.3 SURFACE WATER

The Groot Letaba River is part of the Letaba River Catchment within the Luvuvhu-Letaba Water Management Area (WMA). The catchment is drained by the Groot Letaba River and its major tributaries. From the confluence of the Klein and Groot Letaba Rivers, the Letaba River flows through the Kruger National Park (KNP) until it joins with the Olifants River near the Mozambique border. The proposed dam site falls within the lower Groot Letaba River sub-catchment. The Nwanedzi River is a non-perennial tributary of the Groot Letaba River which confluences with the Groot Letaba River just upstream of the proposed dam wall site.

5.4 WATER QUALITY

The water in the Groot Letaba River is generally of a good quality with respect to irrigation, domestic use and the aquatic ecology, especially in the upper reaches. The quality of the water deteriorates somewhat in the lower reaches due to salination from natural sources, as well as nutrient enrichment due to human activities such as the discharge of treated domestic wastewater and run-off from agricultural areas.

5.5 AQUATIC ECOLOGY

A preliminary Reserve has been determined and approved by the DWAF. The study area has a present ecology state and proposed Ecological Management Category of D (i.e. largely modified. A large loss of natural habitats and basic ecosystem functions has occurred).

An estimated 34 indigenous fish species expected to occur in the sample area, 15 indigenous and one introduced species were recorded during the November 2007 survey. The presence of a numerous flow dependant fish species as well as numerous slow flow dependant species indicate that a wide variety of habitats occur in the sample area. The presence of the introduced species *Micropterus salmoides* (Largemouth Bass) in the area is cause for concern as this fish may have a significant impact on indigenous fish assemblages populations. One Red Data listed fish species: *Oreochromis mossambicus* (Mozambique Tilapia) was recorded in the sample area. This species is currently listed as Near Threatened (NT) on the IUCN

Red List of Threatened species. This fish species was recorded at all the sampling sites.

5.6 VEGETATION AND ANIMALS

Two national vegetation types are represented within this area, namely Granite Lowveld and Tsende Mopaneveld. At a finer scale, three vegetation communities were identified and described: Acacia – Combretum Riparian Woodland, Colophospermum – Dichrostachys Plains Woodland and Combretum – Bridelia Rocky Outcrop Woodland (**Figure 5.2**). Fifteen conservation-important plant species were found during fieldwork, of which two have a status of Least Concern (Declining) and the rest are protected under provincial or national legislation. A floristic importance assessment of the three vegetation communities revealed that Plains Woodland and Rocky Outcrop Woodland have Medium-High importance for plants, while Riparian Woodland has Low-Medium importance. Thirty-one plant species were pointed out by local traditional healers as being used by the local communities. Most of these are widespread and common species in the area, although three are protected under the National Forest Act.

Only three conservation-important mammals were recorded during fieldwork, two of which are protected under the Limpopo Environmental Management Act, and one which has a Red Data status of Data Deficient. Two of the 186 bird species recorded in the field have Red Data status of Near Threatened. Fourteen reptiles were recorded, including one Vulnerable species and one Limpopo Province endemic lizard. Fourteen frog species were recorded, although only one has any conservation importance. Thirteen conservation-important invertebrates were recorded in the dam basin and along the bulk supply route. The most significant of these was *Dromica oberprieleri*, which was only discovered in 1981 and is currently known from very few sites in the Lowveld.

The flora and fauna values of each vegetation community were integrated to provide intrinsic biodiversity values for each community. The vegetation community with the

highest intrinsic biodiversity value is *Colophospermum – Dichrostachys Plains Woodland*, which has High-Medium importance for terrestrial biota, followed by *Combretum – Bridelia Rocky Outcrop Woodland* (Medium-High) and *Acacia – Combretum Riparian Woodland* (Medium-Low).

The main factors of disturbance in the project area are human settlements, agriculture and forestry. Nearly 60 % of the project area is transformed or degraded by such developments.

5.7 SOCIO-ECONOMIC

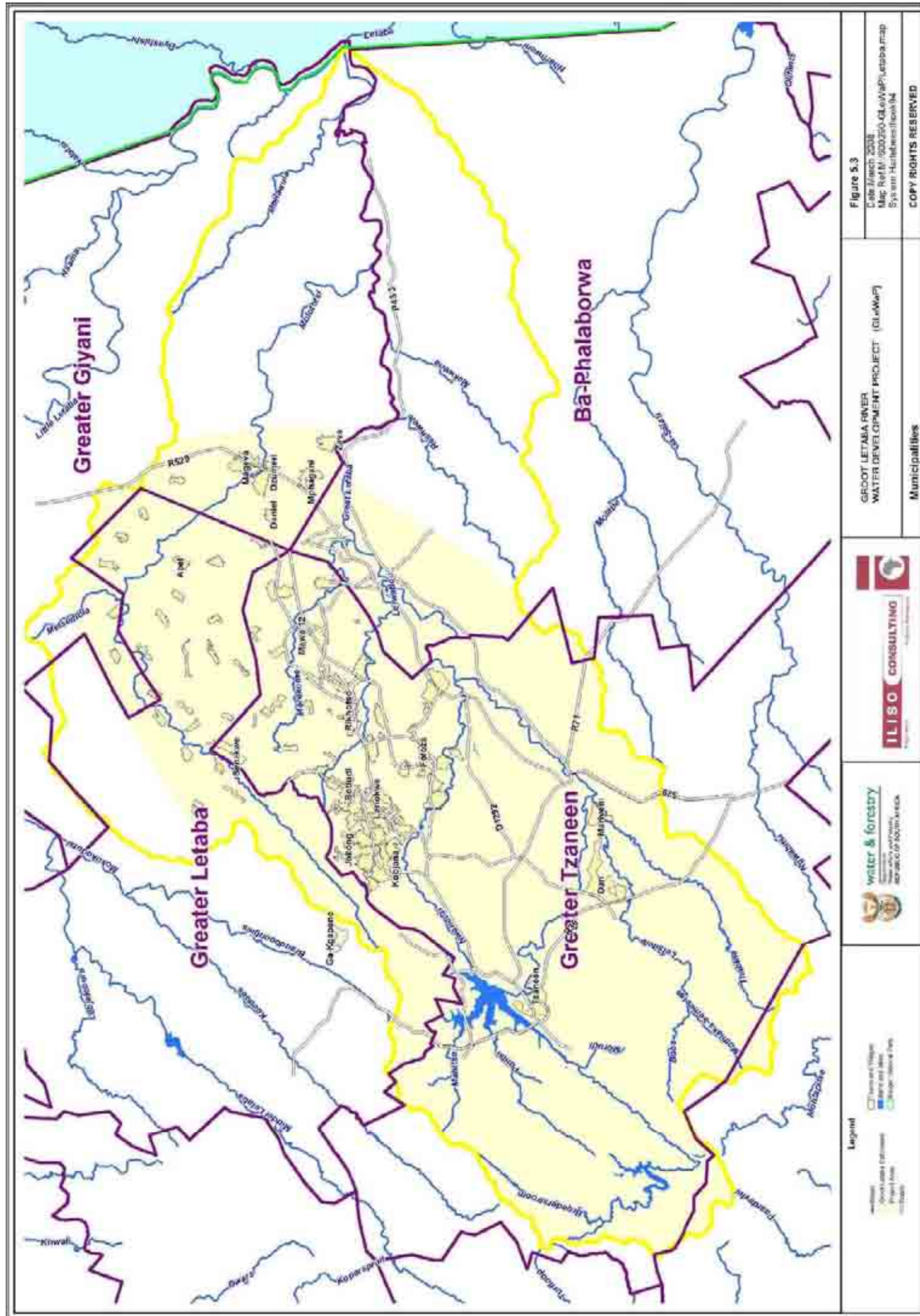
The study area falls in four local municipal areas. The two main affected local municipalities are the Greater Tzaneen and the Greater Letaba Local Municipalities. The other two municipalities are the Greater Giyani, and Ba-Phalaborwa Local Municipalities (**Figure 5.3**). These municipalities fall under the Mopani District Municipality. The study area is characterised by rural villages with a number of commercial farms.

The Greater Tzaneen Local Municipality (GTLM) and the Greater Letaba Local Municipality (GLLM) have approximately 190 settlements in total, with an average of 2,700 to 3,700 people per village. Approximately 33 settlements have more than 5,000 people. Villages develop outwards, resulting in rural sprawl.

The population profile of the people living in the study area is described as:

- Females are in the majority;
- Up to half of the population falls in the age bracket 0 -19 year olds;
- Educational levels are low;
- The population growth rate can be estimated at 1% per annum;
- Majority Black African; and
- HIV / Aids might impact significantly on population numbers.

In light of the female majority and the high number of 19 year olds, the communities are vulnerable. Their vulnerability is emphasised as males have re-located in search of



employment opportunities outside of the district municipality (e.g. Gauteng) resulting in only 55 % of the population between the ages of 15-64 years employed and 45 % are unemployed (Census 2001). More than a third of households don't have an income due to members being students, homemakers, or unable to work, thus one salary might have to provide for a household with an average of five people.

The majority of the households have services below the Reconstruction and Development Programme (RDP) standard, and this includes access to enough clean water within 200 m from the household, as well as sanitation other than pit latrines. The formal employment sector has limited opportunities and will not be able to absorb the economically active, and the creation and growth of informal opportunities are stimulated.

The agriculture sector (fruit orchards dependant on irrigation) and the associated agro-industries provide the majority of employment opportunities in the Groot Letaba Local Municipality (GLLM) and Greater Tzaneen Local Municipality (GTLM) area. This is followed by government and community services sector and the retail and trade sectors. The study area is responsible for approximately 17 % of the employment within the Limpopo Province. Commercial farms are mainly owned by white farmers, and emerging black farmers are challenged in terms of lack of training, finances, and access to water (amongst others).

The landowners who have land in the proposed dam basin are all commercial fruit farmers with a few who also grow vegetables on a commercial basis. Some also have cattle as not all the land is suitable for orchards, or available water for orchards is limited.

Twelve farmhouses and two packing facilities and approximately 26 small irrigation dams will be affected by the proposed new dam (at 1.5 MAR capacity). No re-location of rural village accommodation or infrastructure will be required.

6. REGULATORY AND BEST PRACTICE FRAMEWORK

6.1 ENVIRONMENTAL LEGISLATION

This EIA process has been undertaken in compliance with the principles of the: National Environmental Management Act (NEMA), Act 107 of 1998, and the Regulations, promulgated in terms of Chapter 5 of NEMA, Government Gazette 28753 on April 21 2006. The guideline documents produced by the Department of Environmental Affairs and Tourism were also considered.

Other legislation taken into account in the EIA is listed in **Table 6.1**.

Table 6.1: Legislative Requirements

Legislation	Applicable legislative requirements
Constitution of the Republic of South Africa Amendment Act (Act 35 of 1997)	Bill of Rights (Chapter 2) Environmental Rights (Section 24) Rights in property (Section 25) Administrative justice (Section 32) Access to information (Section 33)
National Environmental Management Act (Act 107 of 1998)	Principles and objectives (Section 2) Prevention measures (Section 24) Care for the environment (Section 28)
NEM: Protected Areas Act (No 57 of 2003)	The NEM: Protected Areas Act, as amended by the NEM: Protected Areas Act 31 of 2004 repeals sections 16, 17 & 18 of the ECA as well as the National Parks Act with the exception of section 2(1) and Schedule 1.
The Conservation of Agricultural Resources Act (No 43 of 1983) and regulations.	Implementation of control measures for alien and invasive plant species (Section 6)
Natural Environment Management : Air Quality Act (Act No.39 of 2004) Regulations	Dust Control
	Air Pollution by fumes emitted by vehicles
	Control of dust (Section 32)
	Control of Noise (Section 34)
Occupational Health and Safety Act (No 85 of 1993) and Regulations	Control of Offensive odours (Section 35)
	General duties of employers and their employees (Section 8)

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Legislation	Applicable legislative requirements
	General duties of employers and self employed persons to persons other than their employees (Section 9)
National Environmental Management : Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA)	Strategy for achieving the objectives of the United Nation's Convention on Biological Diversity, to which South Africa is a signatory
	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species (Section 65-69)
	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species (Section 71-73)
National Forests Act (Act 84 of 1998) and regulations	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species. (Section 7)
	These sections deal with protected trees, with the Minister having the power to declare a particular tree, a particular group of trees, a particular woodland; or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister. (Section 12-16)
Fencing Act (Act 31 of 1963)	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora (Section 17)

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Legislation	Applicable legislative requirements
National Water Act (Act 36 of 1998)	Prevention and remedying the effects of pollution (Section 19)
	Control of emergency incidents (Section 20)
	Water use principles (Section 21)
	Preliminary Determination of Reserve (Section 17)
All relevant Provincial Legislation and Municipal bylaws	
Water Services Act (Act 108 of 1997)	
National Heritage Resources Act (Act 25 of 1999)	Relates to objects of cultural and historical significance (Section 32)
	Relates to general protections of archaeological structures and burial grounds (part 2)
Promotion of Access to Information Act (Act 2 of 2000) as amended by the Promotion of Administrative Amendment Justice Act (Act 53 of 2002)	Relates to creation of a culture of transparency and accountability
Promotion of Administrative Justice Act (Act 3 of 2000)	Relate to the time period allowed for administrative action whose right are materially or adversely affected by the administrative action (Section 5)
	Relates to the variations of the time periods for judicial review (Section 9)
	Relates to procedures for public enquiries (Section 10)
Expropriation Act (Act 63 of 1975)	Relates to the power of the relevant minister to expropriate property for public and certain other purposes (Section 2)
	Relates to the relevant ministers' decision to expropriate land and appropriate notice being given to landowners (Section 7)
Mineral and Petroleum Resources Development Act (Act 28 of 2002)	Relates to sourcing material for construction. (Section 39 and 106)

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Legislation	Applicable legislative requirements
Limpopo Environmental Management Act (Act no 7 of 2003)	The Act refers to the management and protection of the environment in the Limpopo Province, to secure ecologically sustainable development and responsible use of natural resources in the province is applied and interpreted in accordance with NEMA and relates to the listing of protected species and management thereof.
SANS 69 - South African National Standard	Framework for setting & implementing national ambient air quality standards
SANS 1929 - South African National Standard	Ambient Air Quality - Limits for common pollutants, air quality limits for particulate matter less than 10 µm in aerodynamic diameter (PM10), dustfall, sulphur dioxide, nitrogen dioxide, ozone, carbon monoxide, lead and benzene.

6.2 LISTED ACTIVITIES

Authorisation of the activities listed in terms of section 24 (5) of NEMA that are being applied for by this EIA are listed in **Table 6.2**.

Table 6.2: Listed activities applied for in terms of the EIA Regulations

Indicate the number and date of the relevant notice	Activity No (s) (in terms of the relevant or notice):	Description of each listed activity:
No. R 387 of 21 April 2006	1 (c)	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1000 cubic metres or more at any one location or site including the storage of one or more dangerous goods, in a tank farm.
No. R 387 of 21 April 2006	1 (e)	Any process or activity which requires a permit or license in terms of legislation governing the generation or release of emissions, pollution, effluent or waste and which is not identified in Government Notice No. R. 386 of 2006.
No. R 387 of 21 April 2006	1 (p)	The treatment of effluent, wastewater or sewage with an annual

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Indicate the number and date of the relevant notice	Activity No (s) (in terms of the relevant or notice):	Description of each listed activity:
April 2006		throughput capacity of 15000 cubic metres or more.
No. R 387 of 21 April 2006	2	Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.
No. R 387 of 21 April 2006	5	The route The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before the publication of this notice and which has not been authorised by a competent authority in terms of the Environmental Impact Assessment Regulations, 2006 made under section 24(5) of the Act and published in Government Notice No. R.385 of 2006, where – it is a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); it is a road administered by a provincial authority; the road reserve is wider than 30 metres; or the road will cater for more than one lane of traffic in both directions.
No. R 387 of 21 April 2006	6	The construction of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more
No. R 387 of 21 April 2006	7	Reconnaissance, exploration, production and mining as provided for in the Mineral and Petroleum Resources Development Act 2002 (Act No. 28 of 2002), as amended in respect of such permits and rights.
No. R 387 of 21 April 2006	8	In relation to permits and rights granted in terms of 7 above, or any other right granted in terms of previous mineral legislation, the undertaking of any reconnaissance, exploration, production or mining related activity or operation within a exploration, production or mining area, as defined in terms of section 1 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
No. R 387 of 21 April 2006	1 (k)	The bulk transportation of sewage and water, including storm water, in pipeline with – an internal diameter of 0.36 metres or more; or a peak throughput of 120 litres per second or more.
No. R 387 of 21 April 2006	1(l)	Any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential

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Indicate the number and date of the relevant notice	Activity No (s) (in terms of the relevant or notice):	Description of each listed activity:
		use, but including – canals; channels; bridges; dams; and weirs.
No. R 387 of 21 April 2006	1(m)	The off-stream storage of water, including dams and reservoirs, with a capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of the activity listed in item 6 of Government Notice No. R 387 of 2006.
No. R 387 of 21 April 2006	1 (n)	The recycling, reuse, handling, temporary storage or treatment of general waste with a throughput capacity of 20 cubic metres or more daily average measured over a period of 30 days, but less than 50 tons daily average measured over a period of 30 days.
No. R 387 of 21 April 2006	4	The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic metres from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland.
No. R 387 of 21 April 2006	7	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1000 cubic metres at any one location or site.
No. R 387 of 21 April 2006	8	Reconnaissance, prospecting, mining or retention operations as provided for in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), in respect of such permissions, rights, permits and renewals thereof.
No. R 387 of 21 April 2006	15	The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.

6.3 RESERVE DETERMINATION

In accordance with the National Water Act, the Reserve is that portion of water required to meet basic human needs, and the needs of the aquatic ecosystem. The Department of Water Affairs and Forestry undertook a preliminary Reserve determination for the Groot Letaba River in 2006. The resulting requirements have been taken into account in both the yield analysis and technical design of the project.

6.4 AUTHORISATION OF BORROW AREAS

In terms of Section 106 (3) of the Mineral and Petroleum Resource Development Act, the DWAF does not have to prepare an EMP for the borrow area that is located on the Government Water Works (GWW) (i.e Borrow Area. No1). The DWAF has also been exempted from obtaining authorization for, and making financial provision for, borrow areas 2 and 3 in terms of Section 106 (1), but still has to prepare an Environmental Management Programme for approval by DME for these two borrow areas.

6.5 INTERNATIONAL REQUIREMENTS

The DWAF is required to continuously liaise with the country's neighbours, specifically Mozambique, during the planning and implementation of the GLWaP in line with international protocols and agreements. Under consideration is the potential impact of the GLWaP on Mozambique.

The EIA needs to take note of the associated responsibilities linked to the Revised SADC Protocol on Shared Watercourse Systems and the new SADC Water Policy that will shortly be signed and ratified by SADC countries.

6.6 WORLD COMMISSION ON DAMS

Cognisance is taken of the final report of the World Commission on Dams (WCD) that was published in November 2000.

(The following section is based on Applying the World Commission on Dams Report in South Africa Summary Report, the South African Multi-stakeholder Initiative on the World Commission on Dams: November 2004)

The World Commission on Dams (WCD), initiated in 1998, conducted the first comprehensive global and independent review of the performance and impacts of large dams, and the options available for water and energy development. The final report of the WCD was released in November 2000. At a multi-stakeholder symposium in Midrand in July 2001 South African stakeholders accepted the core values and approaches and declared themselves to be broadly supportive of the

strategic priorities outlined in the WCD report, but believed that the guidelines needed to be contextualised in the South African situation. A Co-ordinating Committee for the South African Multi stakeholder Initiative on the World Commission on Dams Report was elected to contextualise the WCD report and to make recommendations on its implementation in South Africa.

The five core values underpinning the WCD are

- Equity
- Efficiency
- Participatory decision-making
- Sustainability, and
- Accountability.

The WCD proposed an approach to guide future planning and decision-making based on recognition of rights and assessment of risks, in particular all rights at risk. According to this rights-and-risks approach, a first and essential step is to clarify the rights context for a proposed project (and its alternatives). This will allow for identification of legitimate claims and entitlements that might be affected by the project. It will also provide the basis for effective identification of stakeholder groups that must participate in the development process.

South Africa's Constitution provides a strong anchor for the rights-and-risks approach proposed by the WCD. Participation of all interested and affected parties has become a widespread fundamental principle of numerous pieces of legislation, including the National Water Act (36 of 1998) (NWA), and the National Environmental Management Act (107 of 1998), that have particular relevance for dams and development and which provide for equitable and inclusive decision-making.

The National Water Act provides the principles and legal framework for water resources management, based on equitable access, beneficial utilisation and environmentally sustainable practices. The provision of the Reserve (ecological and basic human rights) in the National Water Act, is fundamentally in line with the WCD values and principles.

The principles in the National Environmental Management Act (NEMA) include a people-centred approach to environmental management, transparency and access to information, a risk averse and cautious approach, environmental justice and equity.

The WCD identified seven strategic priorities and corresponding policy principles to further guide water and energy planning and decision-making.

- Gaining public acceptance
- Comprehensive options assessment
- Addressing existing dams
- Sustaining rivers and livelihoods
- Recognising entitlements and sharing benefits
- Ensuring compliance, and
- Sharing rivers for peace, development and security.

The seven strategic priorities are supported in the WCD report by sets of guidelines designed for adoption, adaptation and use by all stakeholders involved in water resources development and utilisation, where relevant.

The priority recommendations identified at the South Africa Multi-stakeholder Forum held in 2004 are:

- Addressing social impacts
- Enhancing governance of water and energy resources development, and
- Promoting river health and sustainable livelihoods.

Of particular relevance when undertaking an Environmental Impact Assessment for a proposed new dam are:

- Exploring and implementing mechanisms for recognising entitlements and sharing benefits for new dams: The Forum recommends that a clear national policy on recognising entitlements and sharing benefits for dam-affected people for new dams should be agreed to by all stakeholders. The Reparations Sub-Committee established during this Initiative should interact with DWAF to take this recommendation to develop a national policy on compensation further. Based on this national policy, a Compensation Assessment and Action Plan

(CAAP) should be developed for each project. Based on the CAAP, individual contracts with affected people should be entered into.

- Monitoring river systems against objectives of the Reserve: The flows of the Reserve are a function of the categorisation / classification system. Once the Reserve has been determined, through an equitable, objective and scientific methodology that is the product of broader participation, and applied to a river, the river system should be monitored closely to ensure that the Reserve is achieving its stated objectives of maintaining the ecological integrity of the river and providing for basic needs.

The United Nations Environment Programme's Dams and Development Project was established in November 2001 in response to a request of the Third Forum meeting of the World Commission on Dams (WCD) for a neutral entity to take forward the consideration of the WCD recommendations into local contexts through promoting inclusive multi-stakeholder dialogue and, widely disseminating the WCD materials.

A compendium of relevant Practices for Improved Decision-making was published in 2007. The key issues dealt with in the Compendium are:

- The identification of options;
- Stakeholder participation;
- Social Impact Assessment and addressing outstanding social issues;
- Compensation policy and benefit-sharing mechanisms;
- Environmental Management Plans;
- Compliance; and International policy on shared rivers.

The compendium aims to deal with key issues essential to ensuring environmental and social sustainability. It suggests that the sustainability of dams involves consideration of engineering, environmental, social, economic and financial aspects within the context of an informed and participatory decision-making process. This integrated approach includes dealing with the entire basin when planning, developing and managing water resources, recognizing upstream and downstream interlinkages and being aware of particular stakeholder interests and areas of potential conflict. (UNEP, 2007).

Many aspects of the compendium do not apply directly to an Environmental Impact Assessment. Cognisance has, however, been taken of aspects that are applicable (particularly related to EMPs, social impact assessment and public participation).

6.7 REGIONAL AND LOCAL PLANNING DOCUMENTS

The provincial and local government structures have been consulted both as part of the public participation process, and in order to obtain landuse planning information (**Annexure C**).

7. PUBLIC PARTICIPATION

7.1 INTRODUCTION

Public participation is an essential and legislative requirement for environmental authorisation. The principles that necessitate communication with society at large are best embodied in the principles of the National Environmental Management Act (Act 107 of 1998, Chapter 1), South Africa's overarching environmental law. In addition, the Generic Public Participation Guidelines 2001 of the Department of Water Affairs and Forestry contain further guidelines for public participation.

The public participation process for the Groot Letaba River Water Development Project (GLWaP) has been designed to satisfy the requirements laid down in the above legislation and guidelines. **Figure 7.1** provides an overview of the EIA technical and public participation processes, and shows how issues and concerns raised by the public are used to inform the technical investigations of the EIA at various milestones during the process. This section of the report highlights the key elements of the public participation process to date.

7.2 OBJECTIVES OF PUBLIC PARTICIPATION IN THE EIA

The objectives of public participation in an EIA are to provide sufficient and accessible information to I&APs in an objective manner to assist them to:

During Scoping:

- Identify issues of concern, and provide suggestions for enhanced benefits and alternatives.
- Contribute local knowledge and experience.
- Verify that their issues have been considered.

During the Impact Assessment:

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

The public participation process undertaken for the project is summarised below.

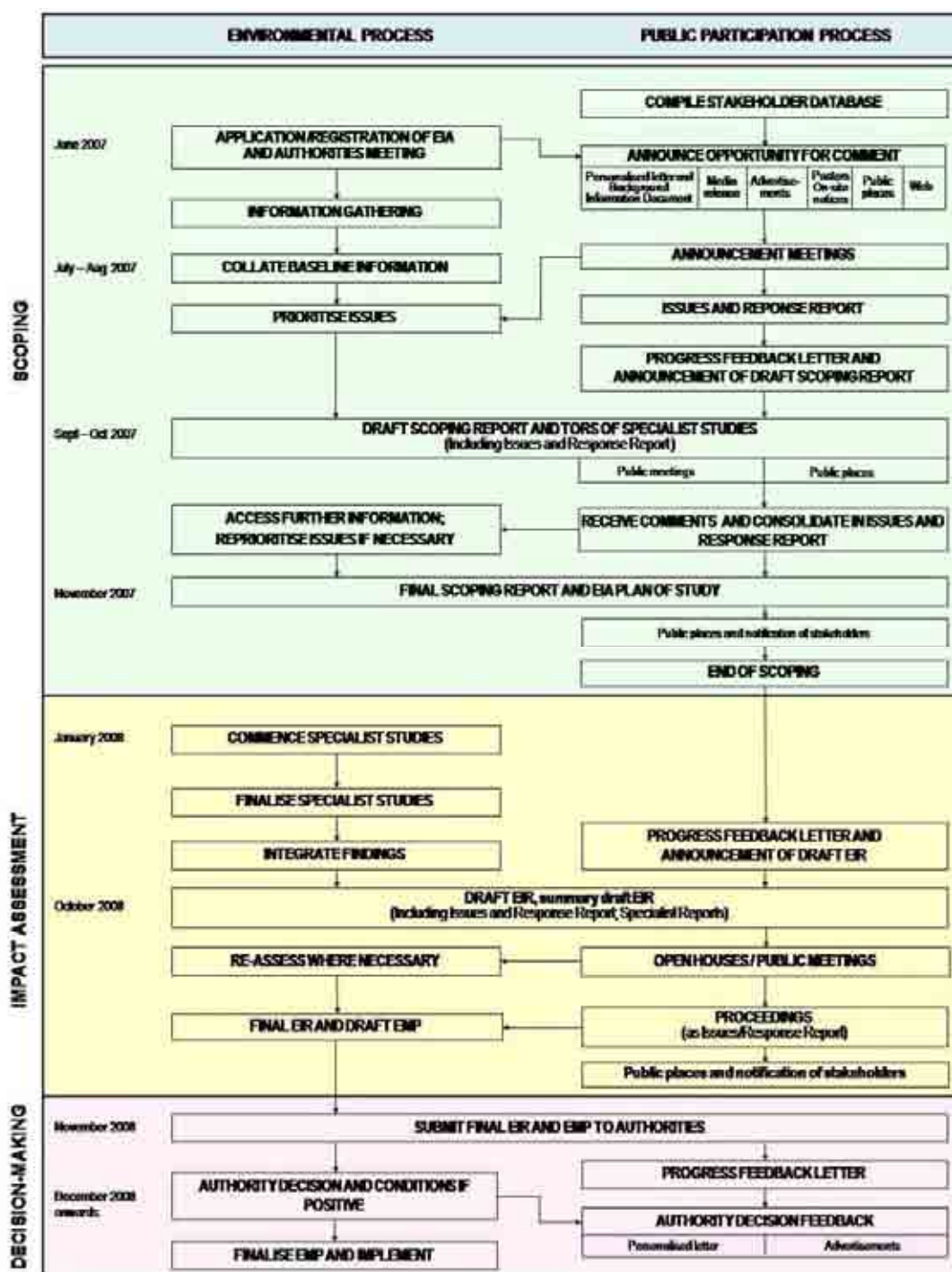


Figure 7.1: Technical and public participation process and activities that comprise the Environmental Impact Assessment for the Groot Letaba River Water Development Project

7.3 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The direct mailing list for this EIA consists of almost 1, 350 individuals and organisations from both within the project area and beyond its boundaries (**Appendix E1**). These include all those I&APs that expressed an interest during the Announcement Phase of the project between July and August 2007. **Table 7.1** shows that these I&APs represent a broad spectrum of sectors of society. Consultation has taken place with representatives of different sectors of society, rather than with every individual in the project area. Nevertheless, special efforts were made to obtain the contributions of all people who may be affected directly by the proposed project.

Table 7.1: Sectors of society represented by I&APs on the direct mailing list

q National government	q Local landowners (In the dam basin area)	q Non Government Organisations (NGOs)
q Provincial government (Limpopo)	q Local communities, including tribal authorities, women's groups, development committees and other community based organisations (CBOs) in the project area	q Ratepayers Associations
q Local government (district as well as local municipalities)	q Media (print and broadcast)	q Researchers and consultants
q Organised agriculture	q Labour unions	q Tourism
q Business/Commerce	q Water organisations (Irrigation Boards, Water Boards, Water Committees, and Water User Associations)	q Transport
q Environmental and conservation organisations		
q Health		
q Industry		
q Education: local schools and universities		

7.4 ANNOUNCEMENT OF OPPORTUNITY TO BECOME INVOLVED

The opportunity to participate in the EIA was announced in July and early August 2007 in four languages (English, XiTsonga, Sepedi and Afrikaans) as follows:

- Telephonic notification to the directly affected landowners on the farms directly affected by the proposed dam.
- Five meetings with stakeholders in the project area. See details below in **Table 7.2**.
- Distribution of a letter of invitation to become involved, addressed to individuals and organisations by name, accompanied by a Background Information Document containing details of the proposed project including maps of the project area and the dam site, and a registration sheet (**Table 7.3** and **Appendix E3**).
- Leaving the Background Information Document (**Appendix E4**) at public places in the study area (**Table 7.4**).
- Advertisements (**Appendix E3**) in the media (**Table 7.5**).



Plate 7.1: Example of advertisement

- Project notice boards at the following localities along roads in the project area:
 - Tzaneen Dam;
 - At the Tarentaal Friendly Grocer shop and service station on the R71 on route to the proposed dam site;
 - At the crossing with the R71 and the road from Taganashoek – on route to the proposed dam site;
 - At the crossing with the R71 and the road towards/from Giyani (R529);
 - At the Caltex Service Station, close to The Junction at the Letaba River;
 - At the crossing with the R71 and the road towards/from Letsitele/Lydenburg (R529);

- Close to the proposed dam site on the road reserve at the Gubitz Farm (Delhi); and



Plate 7.2: Notice at the Tzaneen Dam

- Close to the proposed dam site on the road reserve at the farm La Gratitude.



Plate 7.3: Notice board on the road reserve at the Gubitz Farm

- All documentation published on the project web site - www.dwaf.gov.za/projects/GrootLetaba.

Table 7.2: List of meetings held during the announcement of the EIA

Date	Venue	Time	Attended by:
Monday, 30 July 2007	Mopani District Municipality, Banquet Hall, Giyani	09:00 – 15:00	Key stakeholders and authorities
Tuesday, 31 July 2007	Fair View Country Lodge, Tzaneen	09:00 – 13:00	Key stakeholder and authorities
Tuesday, 31 July 2007	Groot Letaba Water User Association's offices, Tzaneen	14:00 – 16:00	Members of the Groot Letaba Water User Association's management board, representatives of irrigation boards and major water users
Wednesday, 1 August 2007	Tribal Council offices, Nwamitwa	09:00 – 13:00	Nwamitwa community, Ward Councillors, Chief Valoyi. Hosi Nwamitwa

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Wednesday, 1 August 2007	The Letaba Junction, Letsitele	14:00 – 16:00	Directly affected land owners in the dam basin area
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Table 7.3: Project announcement distribution data

Distribution	English	Afrikaans	Sepedi and Xonga
By mail, leaving in public places and leaving with stakeholders during meetings			
Almost 1 350 stakeholders on direct mailing list.	800	200	350
Nine newspapers and three radio stations.	20	20	20
Public places (e.g. libraries, post offices, office receptions of stakeholder organisations, etc).	150	50	80
During meetings as mentioned in Table 7.2	400	200	300
Department of Water Affairs and Forestry project and study teams and Limpopo Regional Office	100	100	150

Table 7.4: Public places where BIDs were available

Town/area/district	Locality	Contact person	Telephone
Giyani	Mopani District Municipality	Mr Timothy Maake Municipal Manager	(015) 811 6300
Giyani	Great North Farmers	Mr PM Mathe President and member	(015) 812 2913
Tzaneen	Greater Tzaneen Municipality	Mr Mabakane Mangena Municipal Manager	(015) 307 8000
Modjadiskloof	Greater Letaba Municipality	Mr IP Mutshinyali Municipal Manager	(015) 309 9246
Giyani	Greater Giyani Municipality	Municipal Manager	(015) 811 5500/44
Phalaborwa	BaPhalaborwa Municipality	Office of the Municipal Manager	(015) 780 6301

Table 7.5: Advertisements to announce opportunity to contribute to the EIA

Advertisements/announcements	Date published/announced
Newspapers	
Bulletin	20 July 2007

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Advertisements/announcements	Date published/announced
Ekasi bulletin	20 July 2007
Letaba Herald	19 July 2007
Seipone	18 July 2007
Agri Spectrum	25 July 2007
Northern Review	19 July 2007
Capricorn Voice	18 July 2007
Mopani News	19 July 2007
Polokwane Observer	19 July 2007
* Several newspapers such as the Daily Sun, Letaba Herald and others published information about the proposed project.	
Radio Stations	
Munghana Lonene FM, Polokwane	During the week of Monday 16 July - 20 July 2007
Thobela FM, Polokwane	During the week of Monday 16 July - 20 July 2007
Greater Lebowakgomo	During the week of Monday 16 July - 20 July 2007
Radio Sekgosese	During the week of Monday 16 July - 20 July 2007
Radio Univen	During the week of Monday 16 July - 20 July 2007
* Several other radio stations such as Jacaranda, RSG, Radio Botlokwa also announced information about the project	

Exemption from Regulation 56 2(b) (i.e. the requirements to give written notification to landowners and occupiers within 100m of the project components) has been received from DEAT (**Appendix E13**).

7.5 PARALLEL STAKEHOLDER LIAISON BY THE DEPARTMENT OF WATER AFFAIRS AND FORESTRY

In addition to the public participation process for the EIA, the Department of Water Affairs and Forestry has initiated several parallel stakeholder liaison initiatives for the project as a whole. Issues relevant to the EIA identified during these initiatives are incorporated into the process on an ongoing basis.

Table 7.6 lists the Department's formal liaison structures for this project, their purpose and representivity. **Table 7.7** lists additional Departmental liaison activities.

Table 7.6: Department of Water Affairs and Forestry formal liaison structures established for the GLWaP

Liaison Structure	Purpose	Representivity
Project Steering Committee (PSC) (Meetings already took place on 29 March, 29 August 2007, and 12 March 2008. Next meeting scheduled for October 2008)	Guidance pertaining to strategic issues related to the project, including international matters	<ul style="list-style-type: none"> § Department of Water Affairs and Forestry and other relevant national departments (DEAT, Treasury) § Limpopo Government § Municipalities in the project area § Key sectors such as conservation § Organised Agriculture
Technical Working Groups (TWG) on: <ul style="list-style-type: none"> - Water Resources - Dam Design - Services Infrastructure - Water Services - Agriculture Meetings with each Technical Working Group took place in February 2008 and April 2008. Next meeting scheduled for October 2008.	The Technical Working Groups were established as sub-committees of the PSC, to attend to specific matters of a more technical nature between PSC meetings. The TWGs are supported by the Study Teams and will report to the PSC. The TWGs will meet from time to time according to the needs of the work programme. to assist the Project Steering Committee with their tasks.	The representivity of each TWG is different however consists of: <ul style="list-style-type: none"> § Department of Water Affairs and Forestry and other relevant national departments (DEAT, Treasury) § Road Agency: Limpopo § Limpopo government § Telecommunications representatives § Municipalities in the project area § CMA representatives § Letaba and Nwamitwa Water User Associations § Study team members § Key sectors such as conservation and agriculture
International Liaison Strategy Committee	Liaison with neighbouring states	Department of Water Affairs and Forestry – specifically members that liaise with the Limpopo Basin Permanent Technical Committee
Institutional and Finance Strategy Committee	Strategic guidance relating to the development of institutional arrangements and financing matters	Department of Water Affairs and Forestry: Directorates

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Liaison Structure	Purpose	Representivity
Project Management and Co-ordination Team	To co-ordinate and synchronize all the activities, to ensure efficient communication and to manage components and phases of the project	Department of Water Affairs and Forestry: Options Analysis and other nominated members

Table 7.7: Departmental stakeholder liaison outside formal structures

Sector/Organisation	Purpose	Activity
Various National, Provincial and Local Government Authorities	To promote cooperative governance by providing them with project information, obtain their comment and support	Written invitations by Director General, presentation at various occasions (May, August 2007, etc)
Local authorities	To be informed of water requirements; to reach agreement on off-take points	Various meetings
National and Provincial Roads Authorities	To deliberate road realignments and diversions, and new road infrastructure	Various meetings
Eskom	To discuss electricity requirements and supply	Various meetings
Department of Environmental Affairs and Tourism	To discuss the Environmental Impact Assessment	Various meetings

7.6 DRAFT SCOPING REPORT

The purpose of the Draft Scoping Report (DSR) comment period was to enable I&APs to verify that their contributions have been captured, understood and correctly interpreted. The issues identified by the I&APs and by the environmental technical specialists, have been used to define the Terms of Reference for the Specialist Studies that were conducted during the Impact Assessment Phase of the EIA. A period of four weeks was available for public review of this report (from Wednesday, 3 October – Wednesday 31 October 2007).

In addition, a Summary of the DSR was compiled and translated into Afrikaans, XiTsonga and Sepedi, and proactively mailed to all key stakeholders as well as those who requested copies.

In addition to media advertisements to announce the opportunity to participate in the EIA, the opportunity for public review was announced as follows:

- In the Background Information Document (**Appendix E4**).
- At various meetings (as outlined previously).
- In a letter sent out in September 2007 (**Appendix E3**), and addressed personally to almost 1,350 individuals and organisations. The letter included a reply sheet for stakeholders to request their own copies of the report, and to register for one of the two public meetings that was held on 12 and 13 October 2007, respectively at the Tzaneen Lodge and Runnymede Thusong Centre in Nwamitwa Village.
- Radio announcements on regional radio stations.
- Telephone calls to key stakeholder organisations.

The Draft Scoping Report, including the Issues and Response Report, and its Summary (in Afrikaans, XiTsonga and Sepedi) was distributed for comment as follows:

- Left in public places throughout the project area (**Table 7.8**).
- Mailed to key stakeholders.
- Mailed to I&APs who requested the report.
- Distributed at the public meetings (**Table 7.8**).
- Posted on the Department of Water Affairs and Forestry's web site.

I&APs had the opportunity to comment on the report in various ways, such as completing a comment sheet that accompanied the report, submitting individual comments in writing or by email, attending public meetings and one-on-one discussions with members of the EIA team during the meetings.

Table 7.8: List of public places in the project area where Background Information Documents and the Draft Scoping Report were lodged for public review

Town/area/district	Locality	Contact person	Telephone
Mokwakwaela area, Letaba	Mokwakwaela Multi Purpose Community Centre	Mr Shilubane	082-453 3774
Sekgosese area, Duiwelskloof, Letaba	Sekgosese Multi Purpose Community Centre	Mr MC Tshamamo	083 289 7955
Modjadiskloof area, Letaba	Greater Letaba Local Municipality	Mrs H Kruger	(015) 309-9246/7
Letaba region	Department of Water Affairs and Forestry	Ms Morongwa Mbhalati	(076) 931 6177
Tzaneen area, City Centre	Greater Tzaneen Local Municipality Agatha Street, Civic Centre,	HOD: Public Participation: Mr	(015) 307 8000

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Town/area/district	Locality	Contact person	Telephone
	Tzaneen	Moroka Molale HOD Communication: Mr ZS Mkhathshwa	
Shilubane village, Tzaneen	Vula Mehlo Multi Purpose Community-Thusong Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Tzaneen	Tzaneen Public Library	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Letsitele area	Letsitele Public Library	HOD Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Haenertzburg	Haenertzburg Public Library, Mare Street, Community Centre	Ms Minnie de Villiers	(015) 276 4707
Tzaneen area, Letsitele	Agri Letaba	Mr Louis van Rooyen	(015) 345 1817
Tzaneen	Groot Letaba Water Users Association Offices	Mr Jurg Venter	(015) 307 2651
Tzaneen	Department of Water Affairs and Forestry	Mr Jakkie Venter/ Mr Isaac Nyatlo	(015) 307 3627/ 8600
Khopo village, Tzaneen	Lesedi Thusong Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Xihoko village, Tzaneen	Xihoko Multi Purpose Community Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Nwamitwa village, Tzaneen	Valoyi Traditional office	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Nwamitwa village, Tzaneen	Nwamitwa Traditional office	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Nkowankowa, Tzaneen	Nkowankowa Multi Purpose Community Centre, Nkowankowa	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Relela village, Tzaneen	Relela Multi Purpose Community Thusong Centre	HOD: Public Participation: Mr Moroka Molale HOD Communication: Mr ZS Mkhathshwa	(015) 307 8000
Dzumeri village, Giyani	Dzumeri Community Centre	Office of the Municipal Manager	(015) 812 5233
Giyani	Greater Giyani Local Municipality	Office of the Municipal Manager	(015) 812 5233
Giyani, Mopani District	Mopani District Municipality	Office of the Municipal Manager	(015) 811 5500
Giyani, Mopani District	Department of Water Affairs and	Mrs Matsie	(015) 812 0090

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Town/area/district	Locality	Contact person	Telephone
	Forestry	Molapisane	
Phalaborwa	Ba-Phalaborwa Local Municipality	Ms Riana Smit	(015) 780 6302
Namakgale, Phalaborwa	Namakgale Police Station Calvin Ngobeni Street, opposite Sediba Accommodation and next to magistrate offices	Station Commissioner	(015) 769 1530
Polokwane	Department of Water Affairs and Forestry	Ms Sarah Mamabolo/ Mrs Leah Matlala	(015) 290 1444
Mokwakwaela area, Letaba	Mokwakwaela Multi Purpose Community Centre	Mr Shilubane	082-453 3774
Sekgosese area, Duiwelskloof, Letaba	Sekgosese Multi Purpose Community Centre	Mr MC Tshamamo	083 289 7955
Modjadjiskloof area, Letaba	Greater Letaba Local Municipality	Mrs H Kruger	(015) 309-9246/7
Letaba region	Department of Water Affairs and Forestry	Ms Morongwa Mbhalati	(076) 931 6177

Public meetings were held to assist I&APs to comment on the Draft Scoping Report and to raise additional issues that may be considered necessary. The content of the report was presented verbally during the meetings. Each meeting also had a visual component to stimulate small-group discussions with members of the EIA team in the language of choice of I&APs. **Table 7.9** lists these meetings, their times and venues.

Table 7.9: Public meetings that were held to comment on the Draft Scoping Report

Date	Venue	Time
Friday, 12 October 2007	Tzaneen Lodge	08:30 – 13:00
Saturday, 13 October 2007	Runnymede Thusong Centre, Nwamitwa Village	08:30 – 13:00

The Final Scoping Report was prepared after the public comment period closed on 31 October 2007. It was updated with any additional issues raised by I&APs and new information that were generated as a result of this process. It was distributed to the Authorities and key I&APs, and to those individuals who specifically request a copy. I&APs was notified of the availability of the report (see the notification letter (dated 3 December 2007) as part of **Appendix E1**).

7.7 ISSUES AND RESPONSE REPORT AND ACKNOWLEDGEMENTS

Issues raised during the Announcement and Scoping Phase, were captured in an Issues and Response Report (Version 2 that was appended to the Final Scoping Report). This report reflected the additional I&AP contributions that were made based on the information presented in the Draft Scoping Report and at the public meetings held on 12 and 13 October 2007.

The contributions made by I&APs are acknowledged in writing.

7.8 PUBLIC PARTICIPATION DURING THE IMPACT ASSESSMENT PHASE

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Draft Environmental Impact Assessment Report, the summary of the Draft EIR, and volume of Specialist Studies, and the Draft Environmental Management Plans are made available to the public for comments. The report includes the Issues and Response Report (Version 3) (**Appendix E2**), which lists every issue raised with an indication of where the issue was dealt with in the technical evaluations, and the relevant findings. It also includes a full description of the EIA process, including the necessary appendices.

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 EIA report will be finalised and submitted to the authority who 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.

A summary of the Draft EIR is available for those I&APs that have neither the time nor the inclination to review the full EIR and the Specialist Studies. It contains 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 are referred back to the full report, which will be available in public places from 13 October 2008 to 10 November 2008, for further information.

The availability of the Draft Environmental Impact Assessment Report, Environmental Management Plans and the Summary Report, as well as the comment period and the deadline for comment, was announced by the following methods:

- Personalised letters to all individuals and organisations on the mailing list (see notification as part of **Appendix E3**).
- Posters at the public places to announce the opportunity to comment (**Table 7.10**– the same public places were used throughout the project to ensure consistency)
- Paid advertisements in the local and regional media and radio announcements (**Table 7.10**)

Table 7.10: Advertisements and announcements to announce the availability of the Draft Environmental Impact Assessment Report and the opportunity to comment on the findings of the EIA

Advertisements/announcements	Date published/announced
Newspapers	
Bulletin	Between 1-8 October 2008
Ekasi bulletin	Between 1-8 October 2008
Letaba Herald	Between 1-8 October 2008
Seipone	Between 1-8 October 2008
Agri Spectrum	Between 1-8 October 2008
Northern Review	Between 1-8 October 2008
Capricorn Voice	Between 1-8 October 2008
Mopani News	Between 1-8 October 2008
Polokwane Observer	Between 1-8 October 2008
* Several newspapers published information about the proposed project based on a news release that was distributed.	
Radio Stations	
Munghana Lonene FM, Polokwane	Between 1-8 October 2008

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Thobela FM, Polokwane	Between 1-8 October 2008
Greater Lebowakgomo	Between 1-8 October 2008
Radio Sekgose	Between 1-8 October 2008
Radio Univen	Between 1-8 October 2008
* Several other radio stations announced information about the project	

The full Draft Environmental Impact Assessment Report, Environmental Management Plans, Summary of the report, Issues and Response Report and the volume of Specialist Studies, will be left in public places (see **Table 7.8** – 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 Environmental Impact Assessment Report 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; and
- Be placed on the DWAF web site (www.dwaf.gov.za/projects/GrootLetaba).

Public review of the Draft Environmental Impact Assessment Report, Environmental Management Plans and Specialist Studies 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.

7.8.1 Public meetings

Two public meetings (**Table 7.11**) will be convened to assist stakeholders to comment on the findings of the investigations. The details of the meetings are as follows:

Table 7.11: Public meetings to comment on the Draft Scoping Report

Date	Venue	Time
24 October 2008	Tzaneen Lodge	08:30 – 13:00
25 October 2008	Runnymede Thusong Centre, Nwamitwa Village	08:30 – 13:00

7.9 ISSUES AND RESPONSE REPORT AND ACKNOWLEDGEMENTS

Issues raised thus far, including issues raised during the Announcement and Scoping Phase, are captured in an Issues and Response Report (Version 3), appended to this Draft Environmental Impact Assessment Report (**Appendix E2**). This report will be updated to include the additional I&AP contributions to be made based on the information presented in the Draft Environmental Impact Assessment Report and at the public meetings to be held on the 24 and 25 October 2008.

The contributions made by I&APs are acknowledged in writing.

7.10 FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ITS SUPPORTING REPORTS

The Final Environmental Impact Assessment Report and its supporting reports will incorporate public comment received on the Draft Environmental Impact Assessment Report, and will be distributed to the authorities and key I&APs, to anyone requesting a copy and it will be posted on the project web site. No summary of the Final Report is foreseen.

7.11 PROGRESS FEEDBACK

After the last round of public meetings (24 – 25 October 2008), stakeholders will be informed by way of personalized letter that the Final Environmental Impact Assessment Report and its supporting documents were submitted to the authorities for decision-making, and approximately when the decisions can be expected.

7.12 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.

7.13 EXPROPRIATION PROCESS

Public Participation for the EIA does not include negotiation with affected parties for land or servitude acquisition. This is a separate process to be undertaken by the DWAF as summarised in the **Textbox. 7.1**.

Textbox 7.1: Land Acquisition process

- a) Once the strategic approvals (i.e Ministerial approval of the project as a Government Water Scheme, and Environmental Authorization of the development proposals) are in place land owners can be advised of the land that is required for the project.
- b) Detailed plans will be prepared of each property affected by the project, indicating the extent of the land and improvements that have to be acquired.
- c) A panel of land valuers will be appointed to assess the fair market value of the land and improvements to be acquired on each property, taking into account the policy in relation to the maintenance of the rights to use existing water allocations for irrigating new orchards on adjacent land.
- d) Compensation recommendations prepared by the panel of valuers will be submitted to the Board on Land Matters for approval.
- e) Notifications of and expropriation on a specific date, with offers of compensation, will be served on each land owner in respect of each portion of land affected by the project. Land owners can accept these offers without prejudice to their rights to fair compensation and, within a reasonable time, submit motivated claims for increased compensation.

8. SUMMARY OF THE KEY ISSUES IDENTIFIED IN SCOPING

The Scoping Phase of the EIA identified the following key issues:

- Potential impacts on the quantity and quality of river flows

Although one of the motivations and intentions of the project is to improve the Department's ability to manage the water resources in the Groot Letaba River catchment which includes the ability to provide acceptable quantity and quality of flows downstream, a change in the flow and the MAR in the river as a result of building the dam could result in the degradation of aquatic and riparian habitats.

The storage of a large quantity of water in the proposed dam, which can lead to eutrophic conditions and an increase in salinity due to the concentrating effect of evaporation losses. These problems tend to be accentuated during periods of prolonged low inflow.

A possible change in water quality in the river downstream of the dam may occur. The change can be far-reaching, such as a cumulative change in salinity as a result of reduced flows, or it can be of a local nature, such as changes in temperature directly downstream of the dam due to the release of colder bottom water.

Potential impacts on downstream users such as the Kruger National Park and Mozambique should specifically be considered

Changes in flow could also affect aquatic and riparian habitats downstream of the dam.

- Terrestrial ecology

Scoping investigations found that the project could impact on some areas that have conservation- important plant and animal species. The Tzaneen Sour Bushveld (Endangered) is likely to be impacted by water-supply projects

downstream of the proposed Nwamitwa dam. Moreover, the inundation of the dam will directly impact on Granite Lowveld, a Vulnerable vegetation type.

Only three conservation-important mammals were recorded during fieldwork, two of which are protected under the Limpopo Environmental Management Act, and one which has a Red Data status of Data Deficient. Two of the 186 bird species recorded in the field have Red Data status of Near Threatened. Fourteen reptiles were recorded, including one Vulnerable species and one Limpopo Province endemic lizard. Fourteen frog species were recorded, although only one has any conservation importance. Thirteen conservation-important invertebrates were recorded in the dam basin and along the bulk supply route. The most significant of these was *Dromica oberprieleri*, which was only discovered in 1981 and is currently known from very few sites in the Lowveld.

- Social processes

The proposed project could impact on the size, composition and character of communities through the provision of services and landuse in the study area. The demographic profile may be impacted in a positive and negative way.

- Economy

Citrus is the main agricultural activity in the dam basin area. The replacement of these crops in a manner that enables the farmers to maintain throughput to packing facilities and other fruit industries will require a number of years. Land purchase arrangements should be scheduled as early as possible to ensure production continuity.

Direct and in-direct job opportunities will be created as a result of the construction and maintenance of the proposed dam. The project is expected to have a positive impact on the economy of the area, although the impoundment will result in a loss of agricultural land.

- Physical infrastructure

Some existing infrastructure could be impacted on by the proposed project. Any temporary or permanent disruptions must be mitigated.

Main roads in the project area will have to be relocated to accommodate for the dam basin. This will have significant impacts on traffic flow routes, during the construction phase and residential areas and the transportation of agricultural products to markets.

- Public Health

The proposed project may increase the risk of diseases to the downstream communities. The construction phase of the dam would result in an increase in the level of dust, which could have health implications and cause a possible inconvenience to residents in close proximity to the construction site. However the potential benefits of potable water, with improvements in sanitation and hygiene, will increase the overall standard of living.

- Heritage resources

Archaeological sites and graves in the study area may be affected by the project.

- Water rights

Land required for the project includes irrigation orchards and other crops. Water allocations to this land is a major issue and requires a policy directive, bearing in mind compensation costs as well as the impact on the economy in future.

9. SUMMARY SPECIALIST REPORT

Key issues identified in Scoping (**Chapter 8**) informed the following specialist studies that were undertaken as part of the EIA:

- Sedimentation Impact Assessment (**Annexure M**);
- Water Quality (**Annexure A**);
- Aquatic Ecology (**Annexure H**) ;
- Terrestrial Ecology (**Annexure B**);
- Social and Landuse Processes (**Annexure C**);
- Economic Processes (**Annexure D**);
- Air quality (**Annexure F**);
- Visual Impacts (**Annexure G**);
- Noise Impacts (**Annexure I**);
- Heritage Resources (**Annexure J**);
- Health Impacts (**Annexure K**); and
- Traffic Impacts (**Annexure L**).

The specialist studies were conducted in compliance with regulation 33(2) of GN 385. These studies are summarised in the rest of this Chapter.

9.1 SEDIMENTATION SPECIALIST STUDY

The Sedimentation specialist study can be found in **Annexure M**.

This study investigated the impacts of the proposed Nwamitwa Dam on the sediment transport balance in the Groot Letaba River. The upstream impacts were analysed by analytical and empirical methods while the downstream impacts were assessed by mathematical hydrodynamic modelling. Other aspects of the development such as access roads and raising of Tzaneen Dam were also addressed.

The key findings are:

a) Downstream of Nwamitwa Dam:

- The dam will cause flood peak attenuation (reduced flood peaks) by about 7 % for large floods (3, 000 m³/s), but more for smaller floods: 30 % attenuation for a 1 600 m³/s flood peak and 70 % attenuation for a 270 m³/s flood peak.
- The post-dam river will become narrower due to flood attenuation caused by the dam. Near the dam the main channel width could decrease by 19 % (22 m reduction on 116 m). In the KNP upstream of the Olifants River confluence the reduction of channel width could be about 17 % (70 m on 411 m channel width).
- The river bed between the dam and the Klein Letaba River tributary will become coarser due to sediment trapping at the dam: from 0.56 mm median diameter to 0.72 mm median sediment diameter.
- Slightly more sediment will be transported down the river in the post-dam scenario due to the narrower river and local bed degradation on the Klein Letaba River near the confluence with the Groot Letaba River.
- Local bed degradation (lower bed level) near the dam of at least 2 m is expected.

b) Upstream of Nwamitwa Dam

- The estimated sediment deposition volume in Nwamitwa Reservoir over a 50 year period is 17.5 million m³ which is relatively small compared to the reservoir storage (1.2 MAR = 187 million m³) . Deposition of sediment above full supply level has to be considered in the detailed design and floodline analysis of the reservoir as it would affect flood levels.

c) Flow gauging station downstream of Nwamitwa Dam

- The weir downstream of the dam will have a negligible impact on the flow and sediment balance of the river.

d) Tzaneen Dam raising

- Small floods will be attenuated more and it is expected that the main channel width downstream of the dam to the first main tributary could decrease by less

than 5 % of the current width. The river morphology downstream of Tzaneen Dam is not expected to change significantly.

- Elevated flood levels upstream of the reservoir could be expected due to future sedimentation above the raised full supply level. This has to be considered in the floodline assessment.

e) Relocation of roads and proposed dam access roads

- As long as the relocated roads and access roads are designed based on the guidelines of the NRA Road Drainage Manual (2007), no significant problems are foreseen in term of sedimentation.

f) Construction aspects related to Nwamitwa Dam

- The coffer dam should be designed not to cause river bank erosion or local scour at the dam site. The sediment concentrations 300 m downstream of the dam site should be monitored during construction to ensure present (90 percentile) high sediment concentrations are not exceeded.

g) Treatment plant and water reticulation pipelines

- The upgrading of the treatment plant and construction of water reticulation pipelines should have limited effect on sedimentation as long as proper stormwater drainage is designed at river crossings and during construction the present stream sediment concentrations based on 90 percentile values should not be exceeded. If required sedimentation basins should be constructed on site.

9.2 WATER QUALITY

A detailed Water Quality Specialist Report can be found in **Annexure A**.

The water quality is assessed in terms of electrical conductivity, ammonium, orthophosphate, chloride, sulphate, nitrate/nitrite and pH. Water quality data was assessed according to a fitness for use range (water quality criteria), which was based on the Department of Water Affairs and Forestry water quality guidelines.

A non-parametric statistic analysis was used to calculate the variability in water quality data from the river flow stations and the boreholes. With non-parametric statistics the interquartile range, which lies between the 25 th and the 75 th percentile, is generally used to describe the central tendency or average conditions. For the purposes of this study the 95 th percentile was included as it provides an indication of variability and can be used to assess the frequency of excursions into higher and possibly unacceptable water quality conditions.

On the whole the surface water quality is still good and fit for all uses. Of concern, however, are the consistently high concentrations of chloride, nitrate/nitrite and electrical conductivity in the boreholes from which water is supplied to some of the communities.

The water quality situation in the catchment of the proposed new dam is such that no water quality problems are expected to occur. The dam will be able to provide water of an acceptable quality to a community that is at present reliant on water from boreholes of which some of the water is not fit for human consumption. The requirements in terms of the Reserve for Water quality can be met.

The only possible effect, in terms of water quality, is the release of cold and anaerobic bottom water during periods when the dam becomes stratified. This can effectively be mitigated by the installation and correct operation of multiple level outlets.

There is some risk of contamination from construction material and waste discharge during construction. This can be mitigated by the implementation of proper construction methods and effective waste management.

In terms of water quality there is therefore no significant effect on the environment from either the construction of the proposed new dam, or the raising of the Tzaneen Dam wall.

9.3 AQUATIC ECOLOGY SPECIALIST STUDY

The aquatic ecology specialist study was aimed at assessing the potential impacts the proposed dam would have on the aquatic ecosystems in the Groot Letaba River. A detailed assessment can be found in **Annexure H**.

The significance of potential impacts on aquatic ecosystems within the dam basin was rated as high prior to mitigation, for construction and operational phases. The riverine habitat that fall within the full supply level of the proposed dam will be unavoidably and irrevocably lost due to inundation, siltation, change in flow regime loss of riparian vegetation and the formation of a largely anaerobic epilimnion (bottom layer of water). It is likely that at least 6 of the 17 fish species currently inhabiting reach EWR3 (i.e. the entire river reach of the Groot Letaba River from Prieska Weir (DWAF Gauging weir: B8H017) downstream near Hans Marensky up to the confluence with the Letsitele River (DWAF Gauging weir: B8H009)). This site is located downstream of the Tzaneen Dam and upstream of the Molototsi River confluence, about 7 km upstream of Prieska Weir) will permanently disappear from the dam basin due to the loss of specific habitat types. In terms of the 2006 Reserve Determination Study (RDS) the loss of 6 species will have a negative impact on the Present Ecological State (PES) and may make the Recommended Ecological Class (REC) unattainable for this specific section of the river. The level of significance after implementation of recommended mitigation decreased to medium, for both phases.

Key mitigation measures include:

- Implementation of a suitable management action plan, based on analysis of monthly water quality and bi-annual biological monitoring data collected at sites upstream, downstream and within the Nwamitwa Dam;
- Preventing further introductions, or the proliferation of introduced fish species such as *M. salmoides* (Largemouth Bass) within the dam basin;

Maintaining connectivity between fish assemblages and remaining riverine habitats upstream and downstream of the dam by means of a fishway (*The likelihood of the impact on the migration of fish species realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur, then a fishway that enables the migration of the identified fish species should be included in the design of the dam.*);

- Preventing the encroachment of invasive aquatic vegetation such as Water hyacinth (*Eichornia crassipes*) or Kariba weed (*Salvinia molesta*);

The potential significance of impacts on aquatic ecosystems downstream of the dam was rated as medium for both the construction and operational phases. Shifts can be expected in the natural macroinvertebrate assemblages downstream of the dam due to the changes in the physical and chemical characteristics as well as the modified flows and habitats. This may reduce or eliminate certain taxa thus, while other species, such as *Simuliidae* sp. (Blackflies) may proliferate. The potential decrease in abundances of 14 fish species and loss or proliferation of certain species within the remaining reach (EWR3) (the entire river reach of the Groot Letaba River from Prieska Weir (DWAf Gauging weir: B8H017) downstream near Hans Marensky up to the confluence with the Letsitele River (DWAf Gauging weir: B8H009)) will have a negative impact on the PES and it is uncertain whether the REC and Ecospecs set out in the 2006 RDS will be attainable. The level of significance after implementation of mitigation was rated as low for both phases. Key mitigation measures would include:

- Ensuring adequate stabilisation of the downstream river bed and banks;
- Maintaining connectivity between fish assemblages and remaining riverine habitats upstream and downstream of the dam wall by means of a fishway (*The likelihood of the impact on the migration of fish species realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur, then a fishway that enables the migration of the identified fish species should be included in the design of the dam*);
- A properly managed timing and release strategy that will ensure that presently existing or naturally seasonal variability in flows are released and or maintained within the downstream Groot Letaba River. This will enable specific ecosystem functions such as migration queues, seasonal floodplain inundation and temperature variations to be maintained.

The potential significance of an additional migration barrier on migratory fish species in the Groot Letaba River was rated as high for both the construction and operational phases. Sixteen of the 17 indigenous fish species currently occurring within reach EWR3 are likely to be impacted upon in terms of migration potential. The level of significance after implementation of mitigation was rated as medium for both phases. Key mitigation measures include:

- Identifying remaining riverine habitats upstream and downstream of the Nwamitwa Dam and affording these habitats special conservation significance;
- Maintaining connectivity between fish assemblages and upstream and downstream riverine habitats by means of a fishway.

This assessment is based on the precautionary principle in the absence of genetic information about fish species and habitat suitability and accessibility upstream and downstream of the proposed dam site. The likelihood of the impact on the migration of fish species realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur, then a fishway that enables the migration of the identified fish species should be included in the design of the dam.

Box 9.1: Stakeholder Issues: The proposed new dam at the site known as Nwamitwa and Implementation of the Reserve

Issues regarding the Reserve raised by stakeholders during the EIA process include:

- The practicality of improving ecological conditions in the Kruger National Park (from PES of C to a REC of B) in line with their mandate to improve biodiversity within the park. To achieve this, the release strategy from the proposed dam would have to result in more assured flow in the river from August to October.
- That the ecological reserve is immediately implemented and monitored – pre, during and post development monitoring of the water quality and riverine ecology both up and downstream of the dam.

Response:

The Reserve is a requirement of the National Water Act (no 36 of 1998) (NWA). It is expressed as quantity of water. The proposed new dam at the site known as Nwamitwa will improve the overall availability of water and therefore the Department's ability to manage the Reserve in the catchment. Each tributary and sub-catchment of the river system should contribute its relevant proportion to the Reserve requirement. Although the dam itself will have a direct impact on the area of inundation and immediately downstream of the wall (as is mentioned in the Aquatic Ecology Specialist Study) it will enable the Department to achieve the Reserve requirements for the relevant stretch of the river downstream.

The Kruger National Park's desire to improve the Management Category of the river in their area requires careful investigation, including that of the consequences to all water users, and would have to be undertaken in the Reserve determination process as required by the NWA.

The implementation of the Reserve is a complex process in which various aspects such as Basic Human Needs, Ecological Water Requirements, and Social and Economic Impacts of adjustments to allocations must be considered. A Preliminary Reserve has been determined and is factored in when applications for new licences are considered. Registration (completed), Validation (initiated) and Verification (initiated) of water use are further steps towards implementation of the Reserve. The requirements of the Preliminary Reserve were provided for in the hydrological analyses.

9.4 TERRESTRIAL ECOLOGY SPECIALIST STUDY

A detailed terrestrial ecology specialist study can be found in **Annexure B**.

A desktop terrestrial ecology study of part of the Groot Letaba Catchment area was completed as part of the Scoping Phase of the project in August 2007. That study recommended further site-specific ecological field studies, in order to make a more objective assessment of conservation importance of various untransformed vegetation communities.

Field visits were conducted from November 2007 to January 2008, focussing on the area likely to be impacted by the Nwamitwa Dam and bulk storage scheme. Two national vegetation types are represented within this area, namely Granite Lowveld and Tsende Mopaneveld. At a finer scale, three vegetation communities were identified and described: Acacia – Combretum Riparian Woodland, Colophospermum – Dichrostachys Plains Woodland and Combretum – Bridelia Rocky Outcrop Woodland. Fifteen conservation-important plant species were found during fieldwork, of which two have a status of Least Concern (Declining) and the rest are protected under provincial or national legislation. A floristic importance assessment of the three vegetation communities revealed that Plains Woodland and Rocky Outcrop Woodland have Medium-High importance for plants, while Riparian Woodland has Low-Medium importance. Thirty-one plant species were pointed out by local traditional healers as being used by the local communities. Most of these are widespread and common species in the area, although three are protected under the National Forest Act.

Only three conservation-important mammals were recorded during fieldwork, two of which are protected under the Limpopo Environmental Management Act, and one which has a Red Data status of Data Deficient. Two of the 186 bird species recorded in the field have Red Data status of Near Threatened. Fourteen reptiles were recorded, including one Vulnerable species and one Limpopo Province endemic lizard. Fourteen frog species were recorded, although only one has any conservation importance. Thirteen conservation-important invertebrates were recorded in the dam basin and along the bulk supply route. The most significant of these was *Dromica oberprieleri*, which was only discovered in 1981 and is currently known from very few sites in the Lowveld.

The flora and fauna values of each vegetation community were integrated to provide intrinsic biodiversity values for each community. The vegetation community with the highest intrinsic biodiversity value is Colophospermum – Dichrostachys Plains Woodland, which has High-Medium importance for terrestrial biota, followed by Combretum – Bridelia Rocky Outcrop Woodland (Medium-High) and Acacia – Combretum Riparian Woodland (Medium-Low).

Key recommendation from the study are:

- A major plant rescue operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species where possible; scientific institutions should also be invited to collect live specimens;
- Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits);
- A major trapping and relocation operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species where possible, particularly small mammals and reptiles; scientific institutions should be invited to collect live specimens;
- All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats;
- Conduct annual monitoring of dam surface for invasion by exotic aquatic plants. Any detection of target species to be followed up by rapid remedial action; and
- If dam construction is to proceed, the EMP should include an appropriate invertebrate biodiversity-monitoring programme, for which baseline assessments of selected indicator taxa (e.g. Dromica spp.) must be undertaken prior to any development of the site.

9.5 SOCIAL IMPACT ASSESSMENT

The Social Impact Assessment can be found in **Annexure C**.

The social impact assessment considered demographic; economic; landuse; socio-cultural; institutional and biophysical change processes that are expected to occur during the various phases of the project.

Overall the demographic, biophysical and socio-cultural processes have a number of negative impacts. However all of these impacts can be mitigated successfully if effectively managed. Negative impacts are for the most part temporary in nature and expected to only last over the construction period. These can be further reduced should local labour be used for the construction.

High expectations from the project are evident amongst the inhabitants of villages. These expectations are focused on job opportunities, not only for individuals, but also for service providers and contractors. Attitude formation against the project can be expected should these expectations not be met.

The one permanent direct impact is on land use. Land will not be lost for the raising of the Tzaneen Dam, but for the construction of the new dam. The loss of land will impact on the activities of the affected parties, and the satisfactory mitigation of these impacts is crucial to ensure that negative attitude formation against the project does not happen. The commercial farmers are positive about the relocation process and the loss of land, mainly because of the expected benefits that the proposed dam will afford, specifically with regard to the security of water supplies for irrigation. Attitude formation against the project can be expected should these expectations not be addressed.

Box 9.2: Stakeholder Issue: Water Allocations

Issues raised by stakeholders regarding water allocations included the following:

- That clarity must be provided whether present water allocations will be affected.
- That water for irrigation is currently being sourced from the river and that clarity is needed on how water rights will be handled in future?
- That clarity is needed on how sources of ground water will be compensated for that might possibly be under water should the proposed dam continue.
- That clarity is required in terms of water allocation to farmers: how will emerging black farmers get water rights because there was no water provision for them? Will water rights or licences be accompanied by a farm acquired in future? Land without water does not help emerging farmers.

Response:

A licence is not needed to continue with an existing lawful use authorised by previous legislation until the responsible authority requires that a person claiming to have such an entitlement apply for a licence. If a person could not use the water he is entitled to during the qualifying period the National Water Act provides that such a use could under certain circumstances be declared an existing lawful use.

The Department's Water Allocation Reform programme pays particular attention to equitable distribution of water and emerging black farmers who did not receive their water for farming are advised to apply that their allocations are declared as existing lawful use. Allowance was made in the hydrological analyses to include this as a usage. Irrigable land will have to be identified on which this water may be used. Implementation of the project with a new major storage dam will make it possible to better manage the water available for irrigation.

While the GLeWaP Bridging Studies deal with water availability for the different uses in each reach of river, licencing and monitoring of abstractions (such as for irrigation) is a responsibility and function that must follow in the operation of the project.

Reviewing of water use authorisations is a major undertaking that has commenced under the direction of the DWAF Regional Office, Polokwane. The licencing processes include validation and verification of present lawful uses, implementation of the Reserve, implementation of planning for the GLeWaP and attention to the relevant policies consistent with the National Water Act, Act 36 of 1998. A number of factors specifically relevant to the GLeWaP such as the accommodation of emerging, resource-poor farmers and the replacement of productive citrus orchards (and other irrigated crops) affected by the proposed new dam, have important policy implications. Policy proposals are being formulated for approval to enable the GLeWaP to be implemented as planned.

Impacts as a result of the presence of construction workers are more likely to be intensified along the bulk water supply pipelines, the pump stations, and the borrow pits, because of the proximity to local communities, and the fact that these activities will happen away from the dam wall construction site with all the necessary infrastructure and services such as water, and a construction camp.

Of particular concern are the potential health and safety impacts on pedestrians and road users. Impacts might be of high significance, specifically those around the borrow pits at Miragoma and Gamokgwathi and the four proposed water reservoirs that are close to ka-Matubana, Nwanedzi, ka-Mandehakazi, ka-Mavele, Runnymede, Serolorolo, ga-Mookgo, Morapalala, Kadzumeri, Makhwivirini, Ooghoek, Hlohlokwe, Kampakeni, Merekome, and Kharangwani.

The permanent indirect positive impact on Quality of Life (health related and non-health related) is the increase in water supply for domestic use. The successful implementation of water supply to affected communities, emerging farmers, etc. will outweigh the potential negative impacts.

Box 9.3: Social Issue: Impact on unregistered rights and labourers

The World Commission of Dams work highlights the issue of social impacts on vulnerable groups and individuals when large dams are constructed. In this project these groups could be individuals with unregistered rights or who currently provide part time labour on citrus farms. Compensation of these groups of people will be dealt with in accordance with the relevant laws that apply.

9.6 ECONOMIC SPECIALIST STUDY

A detailed assessment of the economic specialist study can be found in **Annexure 4**.

9.6.1 The raising of the Tzaneen Dam Wall

The raising of the Tzaneen dam will lead to the following positive economic impacts:

- Stimulation of the economy: with direct, indirect and induced additional GDP generated in the economy during the construction phase to the value of R56 million.
- Increased government income (tax revenue).
- Employment creation: approximately 250 direct jobs, 630 indirect jobs and 113 induced employment during the construction phase will be created.
- Increased standards of living: with new business sales to the value of R200 million during construction.
- Higher stability in the agriculture industry due to increased water surety.

9.6.2 The proposed dam at the site known as Nwamitwa

The proposed dam at the site known as Nwamitwa site and associated GLWaP infrastructure is associated with the following positive economic impacts:

- Stimulation of the economy: with additional direct, indirect and induced GDP generated as follows:
 - Proposed Nwamitwa Construction: R700 million during phase
 - Proposed construction of GLeWaP infrastructure: R100 million during phase
 - Operation: R7 million per annum
- Increased government income and expenditure (tax revenue).
- Employment creation: with direct, indirect and induced employment generated as follows:
 - Proposed Nwamitwa Construction: 3100 direct jobs, 6640 indirect jobs and 1360 induced jobs would be created.
 - GLeWaP infrastructure Construction: 540 direct jobs, 1 000 indirect jobs and 190 induced jobs could be created.
 - Proposed Operation: 30 jobs per annum.
- Increased direct, indirect and induced business output and sales to the value of:
 - Proposed Nwamitwa Construction: R2 342 million during phase
 - Proposed construction of GLeWaP infrastructure: R370 million during phase
 - Operation: R23 million per annum.
- Increased water availability and associated economic sustainability and stimulation

The following negative economic impacts are also foreseen from the proposed dam at the site known as Nwamitwa and the associated GLeWaP infrastructure:

- Loss of land, improvements and resources: A total of 3,864 ha of land will be inundated by the proposed dam at the site known as Nwamitwa with a total of 14,138 m² buildings. The estimated compensation value of which amounts to

R 163,787, 584. The estimated land lost as part of the GLeWaP infrastructure which is not within existing servitudes is 350 ha with an estimated compensation value of R6,388,800.

- Loss of employment and income: 2 129 jobs of farm labourers (many of which are seasonal) per annum are affected for the duration of the time that it takes for the orchards to be re-established (should the affected farmers decide to develop new citrus orchards to make-up for those inundated by the proposed dam at the site known as Nwamitwa). This means a estimated loss of income of approximately R15,518,520 per annum for three years, or the time it takes to re-establish the orchards.
- Change of movement patterns and associated increase in transport costs
- Change in property values

The raising of the Tzaneen Dam only requires a few construction related facilities located within the property of the Government Water Works thus no acquisition of additional land is required nor will the higher dam wall affect the size of the downstream flood. Only positive economic impacts are foreseen as a result of the raising of the Tzaneen Dam.

The negative economic impacts associated with the proposed dam in terms of the loss of land and loss of jobs will not lead to impoverishment of families as during the operation far more positive impacts can be created if a sustainable water source is provided in this area. The positive impacts on the long-term sustainability of the citrus industry and sustainable job creation will be greater than the temporary losses and/or negative impacts during the construction phase

9.7 AIR QUALITY

The aim of the air quality specialist study was to quantify the possible impacts resulting from fugitive sources on the surrounding environment and to human health. To achieve this, a good understanding of the regional climate and local dispersion potential of the site is necessary and subsequently an understanding of the existing sources of air pollution in the region and resulting air quality. Particulate

concentrations and deposition rates due to the proposed project were simulated using the US-EPA approved AERMET/AERMOD. Ambient concentrations were simulated to ascertain highest daily and annual averaging levels occurring as a result of the proposed activities. A detailed assessment of the air quality specialist report can be found in **Annexure F**.

9.7.1 Impact Assessment

- The highest daily and annual average Particulate matter with diameter of 10 µm (PM10) ground level concentrations at the sensitive receptor of Tzaneen due to the proposed raising of the dam wall with no dust control measures was predicted to be 0.59 µg/m³ and 0.04 µg/m³ respectively (well within all relevant standards and guidelines).
- The predicted maximum deposition due to the raising of the Tzaneen Dam was predicted to be 0.98 mg/m²/day at the sensitive receptor of Tzaneen (well within the SANS target of 600 mg/m²/day for residential areas).
- For construction activities at the Nwamitwa Dam and road realignment, the highest daily and annual predicted PM10 ground level concentrations at the closest sensitive receptor of Nkamboko were 345 µg/m³ and 30 µg/m³ respectively (assuming no dust control). The highest daily ground level concentrations exceeded the current SA standards as well as the stricter SANS and EC limits. The predicted maximum deposition at the closest sensitive receptor of Ka-Mswazi is predicted to be 107 mg/m²/day (within SANS target of 600 mg/m²/day for residential areas).
- For the construction of the reservoirs and pump houses, the highest predicted daily and annual average PM10 ground level concentrations at the closest sensitive receptor of Serolorolo was 66 µg/m³ and 9 µg/m³ respectively. The highest daily ground level concentrations are within the SA standards and in line with the SANS limits, but exceeded the EC limits by 33%. During this construction phase (assuming uncontrolled emissions), the predicted maximum deposition at the closest sensitive receptor of Ka-Mswazi was predicted to be 107 mg/m²/day (within SANS target of 600 mg/m²/day for residential areas).

- The highest daily and annual average ground level concentrations due to borrow pit activities were well within the SA standards, SANS and EC limits.
- For highest daily PM10 concentrations due to vehicle entrainment from the transportation of various materials, the SANS (75 $\mu\text{g}/\text{m}^3$) and EC limits (50 $\mu\text{g}/\text{m}^3$) were exceeded for 50 m (transportation of earthfill material) from the road as the vehicle passes. For annual average PM10 concentrations, the SANS and EC limits of 40 $\mu\text{g}/\text{m}^3$ are exceeded for 40 m (transportation of earthfill material) from the source. The predicted maximum deposition, exceeded the SANS industrial (1200 $\text{mg}/\text{m}^2/\text{day}$) and residential targets (600 $\text{mg}/\text{m}^2/\text{day}$) for 50m with the transportation of earthfill material. With the transportation of concrete and concrete coarse aggregate, the SANS residential target of 600 $\text{mg}/\text{m}^2/\text{day}$ is exceeded for 50m from the source.
- The predicted daily PM10 concentrations and dust deposition for the trenching and covering of the pipeline path exceeded the SANS limit of 75 $\mu\text{g}/\text{m}^3$ and EC limit of 50 $\mu\text{g}/\text{m}$ for a distance of 10 m and 20 m from the source respectively. For annual average PM10 concentrations, the SA standard of 60 $\mu\text{g}/\text{m}^3$ was exceeded for 10 m from the source, and the SANS and EC limits of 40 $\mu\text{g}/\text{m}^3$ was exceeded for 20 m from the source. The predicted maximum deposition, exceeded the SANS industrial (1200 $\text{mg}/\text{m}^2/\text{day}$) and residential (600 $\text{mg}/\text{m}^2/\text{day}$) targets for 10 m and 20 m from the source respectively.
- Due to demolition of the proposed construction camp, the highest daily predicted PM10 ground level concentrations at the closest sensitive receptor of Nkamboko exceeded the current SA standards (180 $\mu\text{g}/\text{m}^3$) as well as the stricter SANS (75 $\mu\text{g}/\text{m}^3$) and EC limits (50 $\mu\text{g}/\text{m}^3$). The annual average ground level concentrations were within the SA standards, SANS and EC limits. During this phase (assuming uncontrolled emissions), the predicted maximum deposition at the closest sensitive receptor of Nkamboko was predicted to be 41 $\text{mg}/\text{m}^2/\text{day}$ (within SANS target of 600 $\text{mg}/\text{m}^2/\text{day}$ for residential areas).

The significance impact rating without mitigation was Medium for the construction activities at the Nwamitwa Dam and road realignment, the construction of the reservoirs due to short-term PM10 exposure and for the demolition of the

construction camp. For the transportation of material, laying down of the pipeline, raising of the Tzaneen Dam and activities at the borrow pits, the significance rating was Low.

The construction at the proposed dam at the site known as Nwamitwa is estimated to exceed SANS and EC limits during the construction of the dam and reservoirs and trenching. All impacts can be mitigated o within acceptable levels.

Box 9.4: Dust and Citrus

The Environmental Assessment Practitioner acknowledges that citrus, which will probably continue to be cultivated in the dam basin during part of the construction phase, could be sensitive to dust and that mitigation and monitoring that is implemented should specifically include this receiver.

9.8 VISUAL IMPACT ASSESSMENT

The aim of the visual impact assessment is to assess the visual impact the raising of the Tzaneen Dam and the proposed dam at the site known as Nwamitwa will have on the environment. The method of assessment involved the identifying of critical viewpoints / land uses / visual receptors that will overlook the various components as well as the defining of viewshed lines. The viewshed analysed the full extent of the zone of visual influence. Changes in visual setting for each of the identified points were sketched for analysis. A Detailed assessment specialist study can be found in **Annexure G**.

9.8.1 Raising of the Tzaneen Dam

As a result of the natural topographic landscape features, the viewshed of impacted land use zones is relatively narrow and localised. The raising of the Tzaneen Dam wall will increase the extent of the zone of visual influence that the existing structure has at present. The impact is, however, of insignificant measure and sensitivity of associated visual receptors is relatively low.

Figure 9.1 shows the existing dam wall and **Figure 9.2** demonstrates an artist impression of what the Tzaneen Dam would look like once the wall is raised.



Figure 9.1: Picture of the existing dam wall

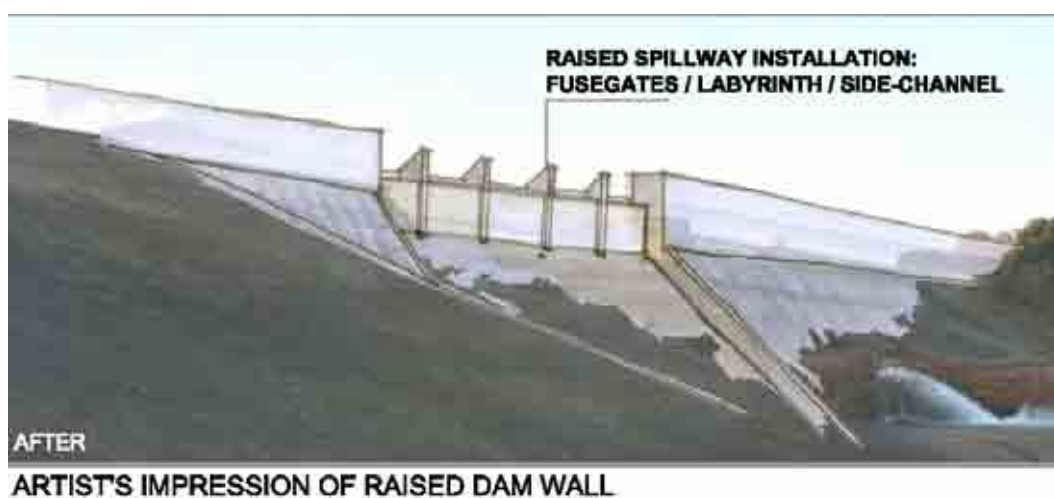


Figure 9.2: Artist impression of raised dam wall

9.8.2 The proposed dam at the site known as Nwamitwa

Although construction activities and the resultant water body at the proposed new dam at the site known as Nwamitwa will be visible and noticeable the visual specialist assessment found that the visual would not be unacceptable to inhabitants of the study area or out of character with the receiving environment. Visual impacts are

therefore considered to be of low significance for this project. Some mitigation measures (e.g. screening of construction activities) have, however been recommended and included in the EMP. **Figure 9.3** shows the existing orchards before the erection of the dam wall and **Figure 9.4** shows the construction of a new reservoir in the Babanana area.



Figure 9.3: Erection of proposed new dam wall



Figure 9.4: Construction of a larger capacity reservoir in Babanana

9.9 NOISE SPECIALIST STUDY

The noise specialist study can be found in **Annexure I**.

The key findings and recommendations are as follows:

- The primary source of noise impacting the respective study areas at present is from road traffic. This is likely to remain the case in the future, with the situation worsening as traffic volumes increase.

- The ambient noise climate at many of the areas where elements of the project are to be built can be defined as being degraded, particularly where these sites are along or close to main roads with attendant high traffic-generated noise levels. The noise situation is one varying between very quiet when there is no traffic to very noisy when vehicles pass by. Noise impact thus also varies from a situation of being insignificant to one of high significance.
- The noise climate in the Nwamitwa Dam and Bulk Water Supply infrastructure Area away from the main roads is relatively quiet.
- The noise from elements of the Project, if unmitigated, has the potential to have a negative impact on some of the noise sensitive areas surrounding the respective project sites.
- The main impact period will be during the construction phase but noise problems are also possible during the operational phase.
- There are appropriate noise mitigating measures that can be implemented to reduce to acceptable levels or prevent any noise impact during construction and operation. These have been included in the EMPs (**Annexure N and O**).

9.10 HERITAGE RESOURCES SPECIALIST STUDY

A detailed Heritage Impact Assessment Report can be found in **Annexure J**.

The aim of the survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the area to be affected by the proposed project.

The survey identified 26 sites of cultural significance located in the above mentioned development areas as well as the dam basin:

- Five Stone Age sites;
- Nine Iron Age sites;
- Four sites dating to historic times; and

- Eight sites containing graves.

All of the identified sites are judged, according to Section 7 of the National Heritage Resources Act, No. 25 of 1999, to have Grade III significance. The implication of this is that there are no sites of cultural heritage significance that would prevent the construction of the dam and the associated infrastructure from taking place. However, in accordance with Section 28 of the National Heritage Resources Act, No. 25 of 1999, mitigation measures should be implemented for the identified sites. Based on what was found and its evaluation, the following, as detailed in the EMPs (**Annexure N and O**) is recommended:

- Examples of the Stone Age tools occurring in the area should be collected as they are identified, ideally when mitigation of the archaeological sites take place, i.e. when the archaeologists are active in the area. This collection can then be used in a local display on the prehistory of the area, or by local schools in their educational activities.
- Documentation (mapping and photographing) and limited excavations should be done on the identified Late Iron Age sites.
- Documentation (mapping and photographing) of some of the identified historic structures should be done.
- Where necessary the graves should be relocated after consultation with descendants.
- Workshops should be held by the archaeologists with the various construction crews, at least on 'section head' level, in order to sensitise them about what to expect and how to act if something is uncovered.
- A direct link should be established by the developers with the archaeologist, who should be on call at all times, in the event that something is uncovered.

9.11 HEALTH IMPACT ASSESSMENT

The detailed Health Impact Assessment can be found in **Annexure K**.

The key findings are:

- The population within close proximity to the construction sites, migratory as well as locally sourced labour are all likely to have a high prevalence of HIV infection and Tuberculosis.
- Although the Mopani District Municipality (MDM) is not considered to be an endemic malaria region, the Local climate in the MDM can accommodate the insect vectors (*Anophele sp. mosquitoes*) necessary for the spread of the malaria parasite (*P. falciparum*).
- The incidence of *Schistosomiasis* (bilharzia) is difficult to estimate as it is not a notifiable disease. It is however recognised that schistosomiasis is second only to malaria in contributing to the disease burden in the developing world. The climate and rainfall characteristics of the MDM make it likely that both *S. haematobium* and *S. mansoni* are endemic to the area, provided that suitable intermediate hosts (pulmonate snails sp) are present. Residents of the villages in the area of the proposed GLeWaP bulk water distribution area are at risk of infecting as they currently rely heavily on communal taps, borehole and/or river water.
- The lack of water borne sewage systems in the proposed GLeWaP bulk water distribution area increase the risk of spread of diarrhoeal diseases as untreated sewage may enter rivers, streams and underground water resources.
- Latest available information shows that the status of healthcare services within the GTLM and GLLM is inadequate to effectively respond to the community health needs.
- The majority of communities within the GTLM and the TLLM are impoverished with generally poor levels of nutrition, especially amongst children . Poor nutritional standards impact adversely on the health status of populations and significantly increase the risk of disease.

Priority potential health risks for construction workers include:

- HIV, STI and TB transmission
- Exposure to excessive noise levels

- Exposure to excessive ergonomic stress

Even following the implementation of the recommended mitigation measures (detailed in the Specialist Study (**Annexure K**) and the Environmental management Plan (**Annexure O**), it is likely that these risks would still present a medium significance in terms of their impact on the health of construction workers. Effective management of these priority health risks would be required if the impacts on the health of construction workers are to be effectively controlled.

- Priority potential negative health impacts for surrounding communities therefore include:

- HIV, STI and TB transmission

Even following the implementation of the recommended mitigation measures (detailed in the Specialist Study (**Annexure K**) and the Environmental management Plan (**Annexure O**), it is likely that these risks would still present a medium significance in terms of their health impact on surrounding communities. Effective management of these priority health risks would be required if the impacts on the health of community members are to be effectively controlled.

- The completion of the project could however impact positively on the following health risks to surrounding communities:
 - Malaria – low significance following mitigation
 - Schistosomiasis – medium significance following mitigation
 - Diarrhoeal diseases – medium significance following mitigation

9.12 TRAFFIC SPECIALIST REPORT

The detailed Traffic Impact Assessment report can be found in **Annexure L**.

The traffic specialist used data from a 7 day 24 hour counting at stations along potentially affected roads to gather data on the existing traffic. The impact of the projected Tzaneen and Nwamitwa Dam construction related traffic on these roads was then assessed. All roads were found to have ample spare capacity to accommodate the construction traffic without any significant impact on road users.

Local access roads to villages will also be affected by the construction of the bulk water supply infrastructure. However these construction sites will generate very limited additional traffic. The impact on the road network will be more of a construction vehicles and road works, which has to be minimised by traffic accommodation measures.

Due to the extent of the proposed dam basin the following roads, D1292, R529 and the P43/3 will have to be realigned and this will have travel time implications. The least effected road alignment is that of the P43/3, this road will have a few minor changes which are insignificant. There are four proposed alternatives (see **Figure 3.11**) of which Alternative 4 has the least impact.

Some mitigation measures (e.g. additional turning lanes and a monitoring system) have been recommended and included in the EMP.

10. ASSUMPTIONS, UNCERTAINTIES AND GAPS

The technical project configuration and design was not available at the time of the initiating the EIA and specialist studies. The pre-cautionary principal was therefore applied and a “greatest Impact” project description (**Chapter 3**) was used for the assessment. The EAP is confident that the assessment of impacts is accurate or conservative (in that the actual project will have less of a negative impact than predicted).

The assumptions, uncertainties and gaps unique to each specialist study are listed in **Annexure A- M**.

11. KEY FINDINGS

11.1 INTEGRATION

The integration of information from the team of specialists is an essential component of the impact assessment process. The approach on this project was to facilitate interaction and exchange of data and information directly between specialists. This was achieved by:

- Combined project team briefing meeting;
- Arranging a combined site visit with an integration meeting;
- Sharing of draft documents and findings; and
- An integration meeting at which specialists presented their findings and views followed by discussion.

11.2 REVIEW

The following peer reviews were undertaken as part of the project process:

- The Draft Scoping Report was reviewed by Mr Sean O Beine;
- The Social Specialist Study was reviewed by Dr K Brucher; and
- The remaining specialist studies, sections of the draft EIR and framework EMPs were reviewed by Ms Bryony Walmsley.

11.3 IMPACT ASSESSMENT

The key issues identified during the Scoping Phase of the EIA are listed in **Chapter 8**, and informed the structure of the specialist studies summarised in **Chapter 9**. 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. This chapter summarises the assessment of these potential impacts, provides an indication of the significance of the impact and identifies recommended mitigation.

The following criteria were used to evaluate significance:

Extent

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 assessment practitioner or specialists 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.

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.

The possible cumulative impacts are also considered.

The significance of the expected impacts for the various phases of the project are summarised in tables **11.1 – 11.4**. Each potential impact is evaluated in detail in terms of the criteria above the specialist studies (**Annexure A-O**).

The significance of the potential impacts of raising of the Tzaneen Dam during construction are summarised in **Table 11.1**.

Table 11.1: Summary of potential impacts during the construction for the raising of the Tzaneen Dam

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
1.	Water Quality			
1.1	Contamination of river water from construction materials and the discharge of waste from the construction site.	Medium - negative	Adhere to requirements of the NWA and good house-keeping on site	Low - Negative
2.	Social			
2.1	Influx of job seekers and opportunists	Medium - negative	None	Low - negative
2.2	Impact of construction workers on community.	Medium to high – negative	Raise awareness amongst workers about local traditions and practices. Ensure that the local community communicate their expectations of construction workers' behaviour with them.	Medium to low - negative
2.3	Influx of construction workers might have an impact on the recipients on psycho-social level, mainly in the form of fear and/or anxiety and crime and stocktheft	Low – negative	Appoint security personnel. Erect fences to increase security. Local people should be employed to increase support for the project and reduce the potential for criminal activities.	Low - negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
2.4	Increase in Quality of Life (QOL) because of economic benefits as a result of employment opportunities.	Medium - positive	<p>Develop a procurement policy that is easy to understand.</p> <p>Develop targets for local suppliers to ensure that timeframes are adhered to.</p> <p>Agree on specific performance criteria prior to appointment.</p> <p>Assist with skills development.</p> <p>Encourage construction workers to use local services.</p>	High - positive
2.5	<p>If there is a breakdown in the negotiation process, the potential impact would be on a psychosocial and NHQOL.</p> <p>Construction workers lose their jobs once construction is completed, the potential impact would be on a psychosocial and NHQOL and economic impacts.</p> <p>Impacts on a NHQOL and psychosocial level as a result of social mobilisation.</p>	Medium – negative	<p>The implementation of a fair and transparent and culturally sensitive negotiation process.</p> <p>Negotiations should be approached with the necessary cultural sensitivity.</p> <p>Training opportunities.</p> <p>Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project.</p> <p>Assist farm workers with finding alternative work.</p> <p>It should be made clear that job opportunities will be limited and temporary.</p> <p>Employment opportunities should be given to locals.</p> <p>A photographic and written history as early as the pre-decision phase.</p> <p>Deliver on undertakings with the community.</p> <p>Establish a project steering committee.</p>	Low - negative
2.7	The implementation of an effective Disaster Management Plan (DMP) implies that a medical emergency can be addressed efficiently within a short response time. In a serious situation, an effective plan can mean the difference	Low – positive	<p>Train first aid officers on site (levels 1 to 3).</p> <p>Consult with private ambulance services and/or hospitals.</p> <p>Implement and maintain actions aimed at preventing</p>	Medium - positive

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
	between life and death. The plan should be seen as a support structure to the affected municipalities' emergency response team and should be developed in consultation with these municipal services.		disasters, or mitigating their impact if they do occur. Integrate risk management programmes with the IDP. Establish pro-active media liaison. Educate and inform surrounding communities and/or households on the standard operating procedures to follow during accidents.	
3.	Economic			
3.1	Increase expenditure in the economy will lead to increased GDP in the economy which in turn will stimulate the economy.	High – positive	Encourage local purchasing.	High- positive
3.2	Increase expenditure in the economy will lead to increased income generation and increased tax generation or government income which will enable increased government expenditure, indirect and induced employment creation and increase business sales that will increase standard of living.	Medium - positive	Use locals suppliers.	Medium –positive
4.	Air Quality			
4.1	Fugitive Dust	Low - negative	Dust control measures specified in EMP	Low - negative
5.	Visual			
5.1	Obstruction of existing views from the buildings over the dam	Medium – negative	Hoarding of construction site facilities to screen views where possible.	Medium – negative
5.2	Obstruction for surrounding Residential and Recreational / Tourism Sector	Low – negative	Hoarding of construction site facilities to screen views where possible.	Low – negative
5.3	Impact of the dam wall on its surrounds.	High – negative	Hoarding of construction site facilities to screen views where possible. Discourage the unnecessary usage of high voltage lights during through-night construction. The extent of unnecessary damage to natural surrounds	Medium - negative

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
			must be kept to a minimum. All construction facilities should be kept tidy and organised.	
5.	Noise Specialist Study			
5.1	Noise from general construction	Medium – negative	Acceptable noise levels and monitoring requirements specified in the EMP (Annexure O)	Medium - negative
6.	Health Specialist study			
6.1	Transmission of HIV, syphilis, TB	Medium	Testing, Treatment, Education	Low
6.2	Exposure to excessive noise rating levels (LA _{8h} > 85dBA)	High	Testing, Treatment, Education	Medium
6.3	Inhalation Exposure to Hazardous Chemical Substances (total inhalable, respirable particulates, cement dusts, bitumen fume, welding fume, VOC, diesel exhaust emissions)	Medium	Baseline HCS Risk Assessment, Personal and ambient air sampling surveys, PPE (respiratory protective equipment), Medical surveillance, Training	Low
6.4	Dermal Exposure to Hazardous Chemical Substances (cement dusts, bitumen, VOC, misc oils and greases)	Medium	Baseline HCS Risk Assessment, Personal and ambient air sampling surveys, PPE (respiratory protective equipment), Medical surveillance, Training	Low
6.5	Exposure to Cold Stress Conditions	Medium	Baseline Cold Stress Risk Assessment, PPE, Medical surveillance, Training	Low
6.6	Exposure to Vibration Stress	Medium	Baseline Ergonomics Risk Assessment, Vehicle, Tool, Plant Maintenance, PPE, Medical surveillance, Training	Low
6.7	Exposure to Ultraviolet Radiation (sunlight)	Medium	PPE, Medical surveillance, Education, Training	Low
6.8	Exposure to Ergonomic Stress	Medium	Mechanical assistance, Medical surveillance, Education, Training	Medium
6.9	Exposure to Hazardous Biological Agents - Malaria	Medium	Prophylaxis, Chemical control (Spraying of Accommodations with DDT), Medical surveillance, Education, Training	Low
6.10	Inhalation Exposure to ambient concentrations of Hazardous Chemical Substances (total inhalable, respirable particulates, cement dusts, diesel exhaust emissions)	Low	Baseline Air Quality Impact Assessment, effective dust control programmes	Low
7.	Traffic			
7.1	Additional Traffic on the Roads Network	Low	Construction Signage as part of the project by the Contractor	Low

Table 11.2: Summary of potential impacts resulting from the raising during the operation phase of the Tzaneen Dam

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
1.	Visual Impact Assessment			
1.1	The raising of the wall by 3.5m will obstruct any existing views from the buildings over the dam	Low	Design should respond to the structural language of the existing wall. Repair / rehabilitate all areas damaged during construction.	Low
1.2	Obstruction on surrounding Residential and Recreational /Tourism Sector	Low	Design should respond to the structural language of the existing wall. Screen planting where possible.	Low
1.3	Impact of the dam wall on its surrounds.	Medium	Design should respond to the sensitivity of the scenic continuity. Repair / rehabilitate all areas damaged during construction. Landscape interventions may be utilised to screen / minimise the viewshed, eg. berming, dense hedges, etc.	Low
2.	Noise Specialist Study			
2.1	Noise from general construction for raising of dam wall and operation of dam	Low	N/A	N/A
3.	Economic			
3.1	Increase assurance of water supply in the irrigation sector will lead to increased stability in the citrus industry.	Medium	None.	N/A

Table 11.3: Summary of potential impacts during the construction/ decommissioning of the proposed dam at the site known as Nwamitwa associated road re-alignment, flow gauging weir, and bulk water supply infrastructure (water treatment works, pipelines, pumpstations and reservoirs)

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
1.	Water Quality			
1.1	Contamination of river water from construction materials and the discharge of waste from the construction site	Medium - negative	Adhere to requirements of the National Water Act and good house-keeping on site.	Low – negative
2.	Terrestrial Ecology			
2.1	Transformation and fragmentation of habitat for plants and animals	Medium - negative (untransformed habitats) Low - negative (transformed habitats)	1. A major plant rescue and animal trapping and relocation operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species where possible, particularly plants, small mammals and reptiles; scientific institutions should be invited to collect live specimens. 2. Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits).	Medium – negative (untransformed habitats) Low – negative (transformed habitats)
2.2	Increased harvesting pressure on vegetation	Medium - negative (untransformed habitats) Low - negative (transformed habitats)	1. Construction teams should not be allowed access to areas of untransformed vegetation for collection of firewood, etc; construction camps and work sites should be fenced off. Penalties should be levied on any construction teams that transgress. 2. Allow local communities access to plant resources below full supply level, but not before plant rescue has been completed.	Medium – negative (untransformed habitats) Low –negative (transformed habitats)
2.3	Increased invasion by alien plants	Medium - negative (Dam) Low – negative (transformed habitats)	Allow local communities access to plant resources below full supply level, but not before plant rescue has been completed.	Medium – negative (Dam) Low – negative (transformed habitats)

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
2.4	Impoverishment of populations of important plants and animals	Medium - negative (Dam) Low –negative (transformed habitats)	1. A major plant rescue and animal trapping operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species where possible; scientific institutions should also be invited to collect live specimens. 2. Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits). 3. All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats.	Medium - negative (Dam) Low - negative (transformed habitats)
2.5	Dam acts as a barrier disrupting seed dispersal by water (along river) or animals (across river) and to terrestrial animal movement, particularly reduction of riparian zone as a migration corridor.	Low – negative	None required.	N/A
2.6	Increased soil erosion	Medium – negative	1. Topsoil from the construction camp and borrow pits should be stored for post-construction rehabilitation work and should not be disturbed more than is absolutely necessary. 2. Topsoil should also be stored in such a way that does not compromise its plant-support capacity. 3. Protect topsoil in order to avoid erosion loss on steep slopes (notably on drainage crossings). 4. Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and industrial waste. 5. Construct adequate erosion-control measures at stream crossings below dam wall (eg. gabions). 6. If sand is needed for dam wall construction, then this must be acquired from within the dam basin, or if upstream or downstream of the proposed full-supply level then from transformed areas.	Low – negative
2.7	Increased poaching of animals	Medium - negative	Construction teams should not be allowed access to areas of untransformed vegetation where opportunities for poaching may be present; construction camps and work sites should be fenced off. Penalties should be levied on any construction teams that transgress	Low - negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
			and poachers should be prosecuted under relevant provincial legislation.	
2.8	Death of populations or individuals of protected invertebrate species	High - negative	Flora rescue exercise.	Medium - negative
3.	Social			
3.1	Displacement and relocation	Low – High negative (depending on individual)	Sufficient compensation and assistance with the relocation process. Formal grievance procedure. Minimum disruption. Develop a Land Acquisition Process and Compensation Assessment and Action Plan. Implement heritage specialist report mitigation measures.	Low – medium (negative) depending on individual
3.2	Influx of job seekers and opportunists	Medium - negative	A recruitment policy and process should be finalised. Identifiable construction workers. Safe and secure construction sites and village. Remove loiterers. Monitor areas where people gather in the field on a regular basis. Aerial photos of the area should be taken to monitor changes.	Low - negative
3.3	Influx of construction workers might have an impact on the recipients on psycho-social level, mainly in the form of fear and/or anxiety and crime and stock theft	Low – negative	Appoint security personnel. Erect fences to increase security. Local people should be employed to increase support for the project and reduce the potential for criminal activities.	Low - negative
3.4	Outflow of labourers could negatively impact on Non Health Quality Of Life (NHQOL), social relationships, and impact on a psychosocial level. It could positively impact on NHQOL of the worker and the family.	Medium – positive or negative	Create health awareness. Develop skills transfer plans. Comply with applicable Labour Law legislation. Move the families of the workers with them. Give basic financial training about budgeting.	Medium – positive or negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
3.5	Increase in Quality of Life (QOL) because of economic benefits as a result of employment opportunities.	Medium - positive	<p>Develop a procurement policy that is easy to understand.</p> <p>Develop targets for local suppliers to ensure that timeframes are adhered to.</p> <p>Agree on specific performance criteria prior to appointment.</p> <p>Assist with skills development.</p> <p>Encourage construction workers to use local services.</p> <p>Compensation for the land should not be restricted to financial compensation.</p>	High - positive
3.6	<p>If there is a breakdown in the negotiation process, the potential impact would be on a psychosocial and NHQOL.</p> <p>Construction workers lose their jobs once construction is completed, the potential impact would be on a psychosocial and NHQOL and economic impacts.</p> <p>Impacts on a NHQOL and psychosocial level as a result of social mobilisation.</p>	Medium – negative	<p>The implementation of a fair and transparent and culturally sensitive negotiation process.</p> <p>Negotiations should be approached with the necessary cultural sensitivity.</p> <p>Training opportunities.</p> <p>Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project.</p> <p>Assist farm workers with finding alternative work.</p> <p>It should be made clear that job opportunities will be limited and temporary.</p> <p>Employment opportunities should be given to locals.</p> <p>A photographic and written history as early as the pre-decision phase.</p> <p>Deliver on undertakings with the community.</p> <p>Establish a project steering committee.</p>	Low - negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
		Medium - negative		
3.7	The implementation of an effective Disaster Management Plan (DMP) implies that a medical emergency can be addressed efficiently within a short response time. In a serious situation, an effective plan can mean the difference between life and death. The plan should be seen as a support structure to the affected municipalities' emergency response team and should be developed in consultation with these municipal services.	Low – positive	<p>Train first aid officers on site (levels 1 to 3).</p> <p>Consult with private ambulance services and/or hospitals.</p> <p>Implement and maintain actions aimed at preventing disasters, or mitigating their impact if they do occur.</p> <p>Integrate risk management programmes with the IDP.</p> <p>Establish pro-active media liaison.</p> <p>Educate and inform surrounding communities and/or households on the standard operating procedures to follow during accidents.</p>	Medium - positive
3.8	Construction, operation and maintenance workers might go against cultural norms, which will impact on social well-being (NHQOL).	Medium – high negative	<p>Raise awareness amongst workers about local traditions and practices.</p> <p>Ensure that the local community communicate their expectations of construction workers' behaviour with them.</p> <p>See mitigation measures in the economic and health specialist reports and the economic and health EMP measures.</p> <p>To ensure that the local traditions and cultures are respected, local residents should play an active participatory role in the planning process. This could be achieved by means of establishing a community forum that meet once a month to discuss issues and progress surrounding the project. The commercial farm landowners, construction company, the municipality and the DWAF should also be represented on this board. Not only an Environmental Control Officer, but also a Social Officer should be appointed on the project. Community members should be given the opportunity to communicate in their own language.</p>	Medium – Low negative
3.9	Impact of construction activities on movement patterns of local communities, potentially impacting on safety and ease of	High – negative	<p>Provide a safe passage way for community members.</p> <p>Road rehabilitation.</p>	Medium - negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
	movement, and the establishment and maintenance of social relationships.			
3.10	Psycho-social and NHQOL impacts of construction activities on the sense of place of surrounding inhabitants.	High - negative	Manage construction activities to reduce noise. Always consult property owners. Dust must be managed.	Low - negative
3.11	Loss of land might have NHQOL and psycho-social impacts.	Low to high (depends on individual) negative	Compensation should be such that landowners are able to implement their plans elsewhere (e.g. a tourist facility). Water allocations and licenses should be verified. Compensation should take into account the time, energy that will have to go into planning. Mitigation measures should be implemented to avoid any negative impact on animals (e.g. fencing off the construction area).	Low to high (depends on individual) negative
4	Economic			
4.1	Increase expenditure in the economy will lead to increased GDP in the economy which in turn will stimulate the economy.	High - positive	Increase local spending Increase local job opportunities	High - positive
4.2	Increase expenditure in the economy will lead to increased income generation and increased tax generation or government income which will enable increased government expenditure.	Medium - positive	None.	N/A
4.3	Increase expenditure in the economy will lead to direct, indirect and induced employment creation and increase business sales that will increase standard of living.	Medium - positive	Utilisation of local construction companies for subcontracting work Maximum utilisation of local suppliers Entice employees to spend income locally.	Medium - positive

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
4.4	Loss of farm land, production and employment.	Medium - negative	Determine compensation in manner prescribed by legislation. Compensation should seek to make individuals or affected parties as well off as they were prior to the development. Minimise temporary disturbance to properties and land owners/residents during construction such as with pipeline construction Communicate disturbances properly and timeously. Communicate loss of employment to farm workers from affected farms well in advance	Medium - negative
4.5	Rerouting of transport routes with associated increased transport costs.	Medium – negative	Undertake final road relocations in consultation with those affected	Medium - negative
4.6	Perceptions of both property price increases due to perceived positive benefits as well as property price decreases due to perceived social ills during construction.	Medium – positive and negative	Keep interested and affected parties informed of the project outcomes.	Medium - positive and negative
5.	Air Quality			
5.1	Fugitive Dust and vehicle entrainment – at the dam, reservoirs and pumpstations	Medium - negative	Wetting,chemical stabilization, and the reduction of surface wind speed though the use of windbreaks and source enclosures as specified in the EMP	Low - negative
5.2.	Fugitive Dust at borrow pit, vehicle transportation, vehicle exhausts, pipeline and construction camp	Low – negative	Wetting,chemical stabilization, and the reduction of surface wind speed though the use of windbreaks and source enclosures. Paving transportation areas where possible, or wheel truck wash facilities.	Low - negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
6.	Visual Impact Assessment			
6.1	Inundation of the dam basin	Low	None.	N/A
6.3	Visual Impact of re-location of roads	Medium – negative	All new roads and bridges should mimic the style and visual character of the existing infrastructure. All new roads routed through untransformed land should be regarded as least favourable.	Low - negative
6.4	Visual impact of new / existing Reservoirs	Medium - negative	Hoarding or screening of construction work where possible. Circular structures will blend into the natural surrounds better than rectangular forms	Medium - negative
7.	Aquatic Ecology			
7.1	Change in Physical and chemical water conditions within the proposed Nwamitwa Dam basin	High - negative	Bioaccumulation assessments of plant and biotic tissue Implementation of a suitable management action plan based on monthly water quality assessment and bi-annual biological monitoring surveys	Medium - negative
7.2	Aquatic habitats downstream of the proposed Nwamitwa Dam	High-negative	Limit the amount of disturbances to local construction site only Stabilisation of downstream river bed and banks Implementation of a suitable management action plan based on bi-	Low-negative

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
			annual habitat integrity monitoring at selected downstream sites	
7.3	Aquatic biota downstream of the proposed Nwamitwa Dam	High-negative	<p>Limit the amount of disturbances to local construction site only</p> <p>Identifying and assessing the suitability and accessibility of remaining habitats upstream for specific biota (aquatic macroinvertebrates and fish) that may migrate upstream in search of specific habitat requirements</p> <p>Maintain connectivity between fish assemblages upstream and downstream of the proposed dam wall by means of a fishway.</p> <p>Maintain access for downstream fish assemblages to remaining sections of riverine habitats upstream of the dam by means of a fishway. (The likelihood of this impact realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur, then a fishway that enables the migration of the identified fish species should be included in the design of the dam.)</p>	Low-negative
7.4	Migration barrier on fish assemblages in the Groot Letaba River	High-negative	Identifying and assessing the suitability and accessibility of remaining habitats both upstream and downstream for specific biota (aquatic macroinvertebrates and fish) that may migrate in search of specific habitat requirements	Medium-negative

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
			Maintain connectivity between upstream and downstream riverine habitats by means of a fishway. (The likelihood of this impact realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur, then a fishway that enables the migration of the identified fish species should be included in the design of the dam.)	
8.	Noise			
8.1	Noise from general construction of the dam	Medium (Daytime) - negative High (Night-time) - negative	Notify affected parties and keep high construction during daytime hours.	Medium (Daytime) - negative High (Night-time) - negative
8.2	Noise impact from construction of the new sections of road, water treatment works, water supply pump stations, reservoirs and pipelines	Medium – negative	Trucks should be routed away from sensitive noise areas. Notify affected areas and keep high construction during daytime hours. Designs of the new water treatment works and delivery pump station are to incorporate all the necessary acoustic design, not exceed a maximum noise level of 70dBA.	Medium - negative
9.	Heritage Resources			
9.1	Inundation of sites by rising dam water / destruction of sites in the construction area Destruction of sites due to trenching / construction activities	High– negative	Document and test excavate / Relocate graves	Medium – negative

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
	Destruction of sites due to road construction			
10.	Public Health			
10.1	Exposure to excessive noise rating levels (LA _r ,8h > 85dBA)	High	Noise survey, Noise zoning, issue of PPE (hearing protective devices), Audiometry, Training	Medium
10.2	Dermal ,heat, vibration, inhalation exposure to Hazardous Chemical Substances (total inhalable, respirable particulates, cement dusts, bitumen fume, welding fume, VOC, diesel exhaust emissions)	Medium	Baseline HCS Risk Assessment, Personal and ambient air sampling surveys, PPE (respiratory protective equipment), Medical surveillance, Training	Low
10.3	Exposure to Ergonomic Stress	Medium	Mechanical assistance, Medical surveillance, Education, Training	Medium
10.4	Exposure to Hazardous Biological Agents - Malaria	Medium	Prophylaxis, Chemical control (Spraying of Accommodations with DDT), Medical surveillance, Education, Training	Low
10.5	Exposure to Hazardous Biological Agents – Schistosomiasis and Infectious Diarrhoeal Diseases	Low	Clean water supply, Medical surveillance, Education, Training	Low
10.6	Inhalation Exposure to ambient concentrations of Hazardous Chemical Substances (total inhalable, respirable particulates, cement dusts, bitumen fume, diesel exhaust emissions) – Bulk infrastructure sites (reservoirs, pumpstations, water treatment plant)	Medium (Nkamboko and Serolololo))	Baseline Air Quality Impact Assessment, effective dust control programmes	Low
10.7	Inhalation Exposure to ambient concentrations of Hazardous Chemical Substances (total inhalable, respirable particulates, cement dusts, bitumen fume, diesel exhaust emissions) – Transportation of material	Low	Baseline Air Quality Impact Assessment, effective dust control programmes	Low
10.8	Ingestion exposure to pollutants released into existing water courses	Medium	Ingestion exposure to pollutants released into existing water courses	Low
10.9	Exposure to excessive ambient noise rating levels	Medium	Baseline ambient noise survey, Engineering control measures, Noise control program	Low
10.10	Exposure to Hazardous Biological Agents -	Low	Prophylaxis, Chemical control (Spraying of dwellings with DDT),	Low

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
	Malaria		Medical surveillance, Education, Training	
10.11	Exposure to Hazardous Biological Agents - Schistosomiasis	Medium	Clean water supply, Medical surveillance, Education, Training	Medium
10.12	Exposure to Hazardous Biological Agents - Infectious Diarrhoeal Diseases	Medium	Clean water supply, improved ablution facilities, improved food hygiene and personal hygiene, Education	Medium
11.	Traffic Impact Assessment			
11.1	Additional Traffic on the Roads Network	Low – negative	Construction Signage	Low – negative
11.2	Additional Heavy Construction Vehicles on the Local Roads affecting pavement.	Low – negative	Monitoring and Remedial Road Works if Required	Low - negative
	Increased travel time and cost to community members due to realignment of the R529 and the R81 due to the extent of the dam basin	Low – negative	None	N/A

Table 11.4: Summary of the potential impacts during the Operation phase of the proposed dam at the site known as Nwamitwa

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
1.	Water quality			
1.1	Better quality water for users	High - positive	None	N/A
1.2.	Water quality changes (temperature and oxygen) in the river downstream of the proposed dam	Medium - negative	Stratification is predicted to occur in the proposed new dam, and the release of cold, anoxic bottom water will have a detrimental effect on the aquatic life up to a distance of about 15 km below the dam wall. To overcome the effect it is recommended to install a multiple level outlet structure, with outlets at 4 meter intervals from 6 meters below the full	Low (totally mitigated)

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
			supply level of the dam.	
2.	Social			
2.1	<p>The fact that the municipalities will not be held responsible for the provision of services to the construction team will benefit the local municipalities in that they will be able to focus on improving the QOL of the inhabitants in the municipal boundaries.</p> <p>The provision of water to some of the villages in the study area will have a positive impact on QOL. The impact will be negative should the water that become available not be provided.</p>	High - negative	<p>Effective utilisation of bulk water supply.</p> <p>Cooperative governance between the DWAF, local government, municipalities and water boards</p>	High- Positive
3.	Economic			
3.1	Increase expenditure in the economy will lead to new direct, indirect and induced business sales that will increase standards of living.	Low - positive	<p>Utilisation of local construction companies for subcontracting work</p> <p>Maximum utilisation of local suppliers</p> <p>Entice employees to spend income locally</p>	Low-positive
3.2	The proposed Nwamitwa dam and GLEWaP infrastructure will lead to rerouting of transport routes with associated increased transport costs.	Medium	Additional river crossings to compensate for loss of low water informal drifts	Medium
3.3	The proposed Nwamitwa Dam and the GLEWaP infrastructure will lead to increased	High-positive	N/A	High-positive

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
	water availability and associated economic sustainability and stimulation.			
4.	Air Quality			
4.1	Fugitive Dust	Low	Wetting, chemical stabilization, and the reduction of surface wind speed through the use of windbreaks and source enclosures.	Low
5.	Visual			
5.1	Inundation of dam basin	Medium	Continued landscape rehabilitation measures. Ensure and refine flow releases from the dam.	Medium
5.2	Visual impact on the re-location of roads	Low	Re-instating of landscape where existing roads are no longer in use. Planting of indigenous trees and shrubs and grasses along new roads.	Low
5.3	Visual Impact of new/ existing reservoirs	Low	Landscape rehabilitation measures. Planting of vegetative screening.	Low
6	Aquatic Ecology			

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
6.1	Change in Physical and chemical water conditions within the proposed Nwamitwa Dam basin	High-negative	Implementation of a suitable management action plan based on monthly water quality assessment and bi-annual biological monitoring surveys	Medium-negative
6.2	Aquatic habitats downstream of the proposed Nwamitwa Dam	High-negative	Bi-annual identification and removal of exotic vegetation within the Nwamitwa Dam basin Identified habitat areas, if any, should be made conservation areas during the operational phases of the Nwamitwa Dam. This will ensure the sustainability of the upstream aquatic biodiversity. Implementation of a suitable management action plan based on bi-annual biological monitoring data	Medium-negative
6.3	Aquatic biota downstream of the proposed Nwamitwa Dam	Medium – negative	Prevent any introductions of <i>M. salmoides</i> (Largemouth Bass) Control access to fishing activities within, the proposed Nwamitwa Dam basin Identified habitat areas, if any, should be made conservation areas during the operational phases of the Nwamitwa Dam. This will ensure the sustainability of the upstream aquatic biodiversity.	Low – negative

	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
			<p>Setup a management action plan based on bi-annual monitoring of the population levels of <i>M. salmoides</i>.</p> <p>Assess the genetic status of the <i>O.mossambicus</i> population within the project area.</p> <p>Biotic compensation through the setup of an ecoregion (a wildlife park, or eco-reserve) around the dam</p>	
6.4	Migration barrier on fish assemblages in the Groot Letaba River (The likelihood of this impact realising can be confirmed by undertaking additional studies to determine the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm the impact will probably occur, then a fishway that enables the migration of the identified fish species should be included in the design of the dam.)	High – negative	<p>Proper release management</p> <p>Setup a Management action plan based on monthly monitoring of the water quality and bi-annual biomonitoring of aquatic ecosystems at selected downstream sites</p>	Medium – negative
7.	Noise			
7.1	Noise impact from operation of the Dam and water works	Medium – negative	Designs of the new water treatment works and delivery pump station are to incorporate all the necessary acoustic design, not exceed a maximum noise level of 70dBA.	Low - negative
8.	Public Health			

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	Description of potential Impact	Significance before mitigation	Recommended Mitigation	Significance after mitigation
8.1	Transmission of HIV, syphilis, TB	Medium	Testing, Treatment, Education	Low
	Dermal exposure to hazardous substances, exposures to heat stress, exposure to cold stress, Exposure to excessive noise rating levels (LA _r , 8h > 85dBA)	Medium	Noise survey, Noise zoning, issue of PPE (hearing protective devices), Audiometry, Training Baseline Heat and cold Stress Risk Assessment, PPE, Acclimatisation, Medical surveillance	Low
8.2	Exposure to Hazardous Biological Agents - Infectious Diarrhoeal Diseases.	Low	Clean water supply, improved ablution facilities, improved food hygiene and personal hygiene, Education	Low

11.4 CUMULATIVE IMPACTS

All specialists and the Environmental Assessment Practitioners considered cumulative impacts when undertaking their impact assessment. No significant cumulative impacts were identified for this project.

11.5 SUMMARY OF SIGNIFICANT IMPACTS AND MITIGATION

1.1.1 The Tzaneen Dam

The construction phase of the Tzaneen Dam is expected to have a positive local and regional economic impact as a result of the expenditure in the economy. The increase in the assurance of supply in the irrigation sector will lead to stability in citrus industry in the operational phase.

Negative environmental impacts are limited to construction related activities such as dust and noise that could impact on the surrounding community and construction workers. These can all be mitigated to acceptable levels.

1.1.2 The proposed dam at the site known as Nwamitwa, and related bulk water supply infrastructure

The construction phase of this component of the project will result in positive economic impacts resulting from expenditure in the economy, increased income generation, an increased tax base and direct, indirect and induced employment opportunities that in turn improve the standard of living.

The construction activities will, however, have the following negative impacts, all of which can be mitigated to acceptable levels:

- Loss of fauna and flora in the areas to be disturbed and inundated which can be mitigated to acceptable levels by plant and animal rescue programmes, and establishing a holding nursery where plants can be kept for rehabilitation purposes;

- Inundation and disturbance of heritage sites and graves can be mitigated to acceptable levels by recording and excavating archaeological sites and the relocation of graves.
- Impact of construction activities on the movement patterns, social relationships and safety of local communities which can be mitigated by providing safe passage as required;
- Impacts on sense of place and non-health related quality of life (NHQOL) which can be mitigated by implementing noise and dust control measures and liaising with affected segments of the public ;
- Significant potential noise impacts on both construction workers and surrounding communities are predicted. Impacts on construction workers can be mitigated by providing protective equipment. The impacts on community are only expected to be significant during the night time and during certain construction activities. Limiting noisy construction activities to day time hours should be implemented wherever possible.
- Negative impacts on aquatic habitats and biota downstream of the construction activities are predicted if no mitigation is implemented. Mitigation includes limiting the disturbance to the local construction site, stabilising the downstream river bed and banks if necessary, and ensuring that connectivity between upstream and downstream riverine habitats is maintained at critical fish life-cycle periods during the construction phase.

The proposed dam at the site known as Nwamitwa and related bulk water supply infrastructure (water treatment works, pumpstations, pipelines and reservoirs) will result in an increase in the water availability and associated health and economic sustainability and stimulation in the operation phase.

The only potential significant negative long term negative impact is that the barrier of the dam forms could impact the migration of fish resulting in a permanent loss of species. The probability of this impact realising can be confirmed by undertaking additional studies to determining the genetic distribution of species and the availability of spawning habitats in the other accessible sections of the river system. If these studies are not undertaken, or if they confirm that this is probable then a fishway that

enables the migration of the identified fish species should be included in the design of the dam.

Stratification is predicted to occur in the proposed new dam, and the release of cold, anoxic bottom water will have a detrimental effect on the aquatic life up to a distance of about 15 km below the dam wall. To overcome the effect it is recommended to install a multiple level outlet structure, with outlets at approximately 5 meter intervals from 6 meters below.

Although actual potential negative impacts on aquatic habitats and biota in the direct vicinity of the dam have been predicted these must be evaluated in the context of one of the objectives of the dam, which is to enable the Department to implement the Reserve.

12. ENVIRONMENTAL IMPACT STATEMENT

The Environmental Impact Assessment undertaken for the proposed Groot Letaba River Water Development Project has fulfilled the NEMA regulatory requirements and extensive measures have been taken to provide all interested and affected parties with the opportunity to participate in the identification of project alternatives and issues that require investigation.

Key issues identified in the Scoping Phase (**Chapter 8**) informed the specialist studies (**Chapter 9**) from which project alternatives and potential impacts were investigated and mitigation measures recommended.

The construction of the proposed new dam will inundate some existing roads. The preferred re- alignment is Alternative 4. The alternative is recommended due to the impacts on terrestrial ecology and heritage resources, cost of construction, technical aspects, traffic flow, distance travelled and community choice.

None of the of the alternative pipeline routes and reservoir alternatives were of high impact however all pipeline routes through untransformed vegetation should be regarded as least favourable option and routes should whenever possible traverse transformed habitats. In terms of this option C1 and D3 were selected are preferred options in terms of least environmental impact. However, C4 is preferred to C1 because it is closest to the existing Rampepe Reservoir and will enable the Rampepe Reservoir to be served by two sources of supply (the existing source from the Modjadji Dam as a backup and the proposed Nwamitwa Dam), which will increase the flexibility of supply to this sub-system.

All land owners whom would be re-located will receive compensation for their loss.

The EIA has found that the proposed project, together with supporting non-infrastructure components is the preferred option for providing improved water management to meet increased domestic, socio-economic development and ecological requirements in the catchment.

The EAP therefore recommends environmental authorisation of the raising of the Tzaneen Dam, the construction of the proposed dam at the site known as Nwamitwa and associated pre-construction activities, road re-alignments, flow gauging weir, water treatment works, pumpstations, pipelines and reservoirs, with the following conditions:

- Compilation of a Compensation and Development Plan that includes the prioritisation of the land acquisition process in accordance with the established legal procedures to minimise impacts on citrus farmers that require a lead time to re-establish their landuse, and the procedures to deal with the loss of rights of access to water;
- Labour procurement to be undertaken through a Labour Desk in accordance the Departments procedures and policies and gender and race targets to be set and measured as stated in the EMP;
- Continued liaison with directly affected landowners and occupiers in the pre-construction and construction phase;
- The implementation of general communication strategy for the implementation phase of the project;
- Continued liaison with authorities responsible for the implementation of water distribution to ensure that the domestic supply benefits are materialised;
- Multiple level outlets to be included in the dam design to mitigate downstream water quality impacts;
- Further investigation of fish genetics and habitat availability to confirm the potential impact on the loss of biodiversity as a result of the barrier that the proposed dam at the site know as Nwamitwa will cause, or the implementation of a fishway to mitigate the potential impact;
- Fauna and flora plant rescue programmes and a holding nursery to be established;
- Confirmation and detailed investigations of archaeological sites to be completed and the required excavation and documentation to be undertaken prior to the impact on the affected sections on the project;
- Implementation of a grave relocation programme in accordance with applicable legislation;
- Baseline studies should be undertaken to be completed as soon as possible before implementation commences in order to provide a benchmark against which

impacts resulting from the construction and operation of the project can be measured. Aspects to be included are social, economic, water quality, aquatic ecology, terrestrial ecology, air quality and noise.

- Finalisation and Implementation of the draft Pre-construction Environmental Management Plan (this includes monitoring mechanisms and specifications);
- Finalisation of construction and operation EMPs based on the generic EMP (this includes monitoring mechanisms and specifications).

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