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REPORT NO.: P 02/B810/00/0608/02 Annexure B

GROOT LETABA RIVER WATER DEVELOPMENT PROJECT (GLeWaP)

Environmental Impact Assessment

(DEAT Ref No 12/12/20/978)

ANNEXURE B: TERRESTRIAL ECOLOGY SPECIALIST STUDY

MARCH 2010

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DECLARATION OF CONSULTANTS' INDEPENDENCE

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REPORT DETAILS PAGE

Project name:	***Groot Letaba River Water Development Project***
Report Title:	***Environmental Impact Assessment Appendix B: Terrestrial Ecology Specialist study***
Authors:	***Graham Deall, Warren McCleland & Peter Hawkes***
DWAF report reference no.:	***P 02/B810/00/0708 Volume 2 Annexure B***
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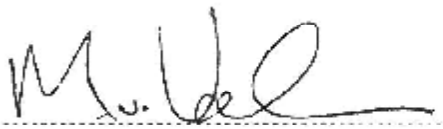

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EXECUTIVE SUMMARY

A desktop terrestrial ecology study of part of the Groot Letaba Catchment area was completed in August 2007. The objective of that study was to inform the Scoping Assessment being undertaken in support of an application by DWAF for a proposed new storage dam (Nwamitwa Dam), just below the confluence of the Groot Letaba and Nwanedzi Rivers, as well as Bulk water supply infrastructure from the dam to communities to the north. 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).

Potential impacts are summarised as follows:

Proposed Impact	***Nwamitwa Dam***	***Tzaneen Dam***
A.Flora		
Transformation and fragmentation of habitat for plants	*Medium*	*Low*
Increased harvesting pressure on vegetation	*Medium*	*Low*
Increased invasion by alien plants	*Medium*	*Not applicable*
Impoverishment of populations of important plants	*Medium*	*Low*
Dam acts as a barrier to seed dispersal	*Medium-Low*	*Not applicable*
Disruption of natural fire regime across river	*Low*	*Not applicable*
Increased soil erosion	*Medium*	*Not applicable*
B.Vertebrate Fauna		
Transformation and fragmentation of habitat for animals	*Medium*	*Low*
Increased poaching of animals	*Medium*	*Low*
Impoverishment of populations of important animals	*Medium*	*Low*
Dam acts as a barrier to terrestrial fauna movement along riparian corridor	*Medium*	*Not applicable*
C.Invertebrate Fauna		
Transformation and fragmentation of habitat for protected invertebrates	*High*	*Low*
Death of populations or individuals of protected invertebrate species	*High*	*Low*

Suggested measures to mitigate impacts are as follows:

Impact	***Proposed Mitigation Measures***
A.Flora	
Transformation and fragmentation of habitat for plants	*All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats.*
	Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits).
	Rehabilitate borrow pits and construction camp according to DWAF's Integrated Environmental Management Series No.6: Environmental Best Practice Specifications (Construction).
Increased harvesting pressure on vegetation	*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.*
	Allow local communities access to plant resources below full supply level, but not before plant rescue has been completed.
	All pipeline routes through untransformed vegetation should be regarded as last resorts; routes should whenever possible traverse transformed habitats.

Increased invasion by alien plants	*Once dam construction is completed, control measures targeting alien plants within the construction areas and surrounding disturbed sites should be implemented, preferably using Working for Water teams.*
	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.
	Rehabilitate disturbed sites through ripping of soil surface and hydroseeding with a seed mix slurry of relevant indigenous grasses.
Impoverishment of populations of important plants	*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).
	All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats.
Dam acts as a barrier to seed dispersal	*No suitable mitigation.*

Increased soil erosion	*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.*
	Topsoil should also be stored in such a way that does not compromise its plant-support capacity.
	Protect topsoil in order to avoid erosion loss on steep slopes (notably on drainage crossings).
	Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and industrial waste.
	Construct adequate erosion-control measures at stream crossings below dam wall (eg. gabions).
	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.
B.Vertebrate Fauna	
Transformation and fragmentation of habitat for animals	*A major trapping and relocation operation should be implemented within the dam basin, 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.

Increased poaching of animals	*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 and poachers should be prosecuted under relevant provincial legislation.*
Impoverishment of populations of important animals	*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.
	Dense vegetation should be allowed to re-grow along parts of the dam shoreline in order to regain habitat for certain Red Data bird species, viz. African Finfoot and White-backed Night Heron.
Dam acts as a barrier to terrestrial fauna movement along riparian corridor	*Dense vegetation should be allowed to re-grow along most of the dam shoreline in order to regain a functional riparian corridor.*
C.Invertebrate Fauna	
Transformation and fragmentation of habitat for protected invertebrates	*Consider an alternative design incorporating a lower dam wall; this would reduce area to be flooded, leaving more untransformed habitat and enhancing survival of remaining populations.*

Death of populations or individuals of protected invertebrate species	*Initial flooding of habitat to be done as slowly as possible and to be carried out during active season of adult stage of tiger beetes (Oct-Jan) to allow them to escape drowning; larvae will not be able to escape.*
	Consider an alternative design incorporating a lower dam wall; this would reduce area to be flooded, leaving more untransformed habitat and enhancing survival of remaining populations.
	Where pipeline routes and reservoir sites have alternative routes / sites over rocky outcrops, these alternatives should be avoided wherever possible.

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ABBREVIATIONS

DWAF	Department of Water Affairs and Forestry
GLeWaP	Groot Letaba River Water Development Project
LEMA	Limpopo Environmental Management Act (No.7 of 2003)
NEMBA	National Environmental Management: Biodiversity Act (No.10 of 2004)
NFA	National Forests Act (No.38 of 1998)
SACNASP	South African Council of Natural Scientific Professions

1. STUDY INTRODUCTION

1.1 BACKGROUND TO PROJECT

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, pipelines, pump stations, off-takes and reservoirs) in the Limpopo province. The EIA is being undertaken by ILISO Consulting 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.

ILISO Consulting has appointed ECOREX Consulting Ecologists CC to undertake the Terrestrial Ecology Impact Assessment as part of the EIA.

1.2 STRUCTURE OF THIS REPORT

This specialist study will be undertaken in compliance with regulation 33(2) of GN 385. **Table 1.1** indicates how Regulation 33 of GN385 has been fulfilled in this report.

Table 1.1: Indication of compliance with Regulation 33 in this report

Regulatory Requirements	Section of Report
(a) The person who prepared the report; and the expertise of that person to carry out the specialist study or specialised process.	Chapter 2
(b) a declaration that the person is independent	Page i
(c) an indication of the scope of, and the purpose for which, the report was prepared	Chapter 3
(d) a description of the methodology adopted in preparing the report or carrying out the specialised process	Chapter 4
(e) a description of any assumptions made and any uncertainties or gaps in knowledge	Chapter 5
(f) a description of the findings and potential implications of such findings on the	Chapters 6 & 7

impact of the proposed activity, including identified alternatives, on the environment	
(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority	Chapter 8
(h) a description of any consultation process that was undertaken during the course of carrying out the study	Chapter 9
(i) a summary and copies of any comments that were received during any consultation process	Chapter 10
(j) any other information requested by the competent authority.	Chapter 11

2. PROJECT TEAM

Graham Deall of ECOREX Consulting Ecologists CC will undertake the Terrestrial Ecology Impact Assessment. He has a Masters degree in Botany, focussing on Vegetation Ecology. He specialises in Terrestrial Ecology Impact Assessments. He has completed Terrestrial Ecology Impact Assessments for developments such as dams, pipelines, townships, rail lines, and mines. He is a member of the South African Council of Natural Scientific Professions (SACNASP). Graham will be assisted by Warren McCleland, Peter Hawkes and Anthony Emery.

Warren McCleland has a diploma in Nature Conservation and is currently engaged in a BSc.Hons. (Biodiversity & Conservation Biology) through the University of the North-West (Potchefstroom Campus). He is a field ecologist specialising in flora and vertebrate fauna. Warren is co-author of "Field Guide to Trees of Mpumalanga & Kruger National Park". He was recently tasked by the Mpumalanga Parks Board to set the conservation targets for threatened bird species for the Mpumalanga Biodiversity Conservation Plan. Dr. Rob Palmer Pr.Sci.Nat. (Zoological Scientist) will review Warren's faunal input, and Graham Deall Pr.Sci.Nat (Botanical Scientist) will review his floral input.

Peter Hawkes is a professional entomologist with a B.Sc (Hons) degree. He is Director of his own company, AfriBugs CC. He specialises in Environmental Impact Assessment, Environmental Monitoring, and Insect Biodiversity Assessment. He is a member of the South African Council of Natural Scientific Professions (SACNASP), the SA Chapter of International Association for Impact Assessment (IAIA-sa), the Entomological Society of Southern Africa, and the Botanical Society of South Africa.

Anthony Emery is a professional conservation biologist with an M.Sc degree. He is a director of his own company, Emross Consulting (Pty) Ltd. He specialises in GIS mapping and wetland delineation. He a member of the South African Council of Natural Scientific Professions (SACNASP) and GISSA – Mpumalanga.

3. PURPOSE OF REPORT AND SCOPE OF WORK

The Terms of Reference are based on the terrestrial-ecology issues and potential impacts identified in the Scoping Phase of the EIA (ILISO, 2007).

3.1 BASELINE SURVEYS

Site-specific[1] ecological field surveys were undertaken from November 2007 to January 2008 before development commences. Thus all of the conservation-important plant and animal species potentially present in the project area were screened, making assessment of ecological sensitivity at farm scale more objective. Crucial aspects to be included in field surveys are outlined for each biotic group as follows:

Plants

The nine most significantly threatened Red Data plant species potentially present in the project area were carefully searched for during field surveys, viz. *Aloe monotropa, Borassus aethiopica, Encephalartos transvenosus, Ensete ventricosum, Melinis tenuissima, Mondia whitei, Oberonia disticha, Siphonochilus aethiopicus, Xylopia parviflora*. In addition, a checklist of confirmed species per vegetation type was compiled, with Threatened, Endemic, Utility[2], and Protected species highlighted. Threatened species were based on the South African Biodiversity Institute's (2007) interim Red Data list. Protected species were based on the schedules contained in the Limpopo Environmental Management Act (No. 7 of 2003) or the National Forests Act (Act 84 of 1998). Endemic species were defined as those whose distribution in South Africa is confined to Limpopo Province or to recognised centres of endemism that occur partially in Limpopo Province (e.g. the Wolkberg Centre). Utility species were those indicated by local herbalists.

Mammals

Attempts to confirm the presence of Red Data mammals potentially present in untransformed areas of proposed development were made. The following strategy was adopted:

[1] Only untransformed designated development areas will be surveyed
[2] Those plant species utilised by local communities

- Rocky outcrops were searched for bat roosts, elephant shrews.
- Nocturnal surveys were conducted to search for hedgehogs, rodents, shrews.
- Drift fence / pitfall traps used in the reptile surveys were checked for small mammals as well.
- Walk-in traps (e.g. Sherman traps) were laid in transects through representative habitats.

Birds

Attempts to confirm the presence of threatened Red Data birds potentially present in untransformed areas of proposed development were made. The following strategy was adopted:

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

Reptiles and Amphibians

Attempts to confirm the presence of Red Data, endemic and protected reptiles and amphibians potentially present in untransformed areas of proposed development were made. The following strategy was adopted:

- A proportional number of drift fences combined with pit-fall traps were constructed in each major vegetation type.
- Nocturnal searches between November and January (calling season of *Pyxicephalus adspersus*) were conducted.
- Likely reptile habitat, such as large rock slabs, was surveyed during the day for resting reptiles.

Invertebrates

The invertebrate survey was designed to confirm the presence/absence of rare and/or protected invertebrate species within the untransformed areas of the proposed development. Field surveys for invertebrates included:

- night-time searches with ultraviolet light for the protected scorpions, especially the three predicted *Hadogenes* species, as presence/absence of *Hadogenes* can only

be reliably ascertained by using this technique. Daytime searches for these and all other protected scorpion species were also carried out.

- A combination of pitfall trapping and day-time searches was used to confirm presence/absence of the protected beetle and spider species; surveys were carried out during the wet summer months (November-Jan).
- Baseline assessments of selected indicator taxa (e.g. *Dromica* spp.) were undertaken in case an invertebrate biodiversity-monitoring programme is required in the EMP.

3.2 IMPACT ASSESSMENT REPORTING AND MAPPING

All information collected during fieldwork was integrated with the desktop baseline information and collated in report format with updated ecological sensitivity maps and species checklists. Proposed infrastructure was overlaid on the maps to facilitate the identification and assessment of impacts. Mitigation measures for identified impacts were recommended.

4. METHODOLOGY

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

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

The following criteria are used to evaluate significance:

Nature
The nature of the impact is classified as positive or negative, and direct or indirect.

Extent and location
The magnitude of the impact in terms of its spatial influence 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 based on the level of knowledge/information, the environmental impact practitioner or a specialist had in his/her judgement, and is rated as:

- **Low**: the judgement is based on intuition and not on knowledge or information.
- **Medium**: common sense and general knowledge informs the decision.
- **High**: Scientific and or proven information has been used to give such a judgement.

Significance

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

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

Cumulative Impacts

The possible cumulative impacts will also be considered.

Mitigation

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

5. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

5.1 FLORA

- Sampling was restricted to areas of untransformed vegetation where the likelihood of finding conservation-important plants was highest. However, the vast area covered by the bulk supply routes together with difficulties in accessing some of these areas within the given time frames meant that surveys were not exhaustive, but limited to sampling of selected areas. Nevertheless, since much of the vegetation is homogenous in species composition, the sampling is believed to have been representative. However, it is possible that certain inconspicuous conservation-important plant species may have been overlooked.
- Road re-alignments were not adequately surveyed due to late addition of these features to the project layout when fieldwork had already been planned. Nevertheless surveys of the Nwamitwa Dam basin area are considered to be adequately representative of the road re-alignment areas.
- No field surveys took place around the Tzaneen Dam shoreline. Impact assessment is therefore based on detailed study of high resolution aerial photographs supplied by Iliso. Such a study shows most of the shoreline to be transformed and/or degraded, and no habitat representative of Tzaneen Sour Bushveld appears to be present. Field surveys are not likely to add value to the assessment.

5.2 VERTEBRATE FAUNA

- No significant rainfall took place during mid-summer fieldwork, possibly affecting vocalisation of some frog species.
- Only three pitfall traps (with approximately 60 metres of drift fencing) and 25 Willan traps were set out Time restrictions did not allow for more extensive trapping, so most time was spent on active searches.

5.3 INVERTEBRATE FAUNA

- The huge and largely undocumented diversity of invertebrates means that any assessment of this group must be based on a small subset of the total

community, determined largely by the current level of knowledge of taxonomy, abundance and distribution within the various taxa. Thus while an informed assessment of the conservation-important impacts of the proposed development on the key taxa investigated may be achievable, it must be borne in mind that for other invertebrate taxa a different conclusion might have been reached if sufficient information for an assessment was available. The extrapolation of sensitivity assessments on a subgroup on invertebrate taxa to the invertebrate community as a whole may therefore not be entirely appropriate, but is the best that can currently be achieved given the constraints of time and available information.

- The very dispersed nature of the GLeWaP study area, difficulties in accessing some of the sites, exacerbated by the late addition of several road, pipeline and reservoir options after the survey had already been planned, resulted in our having to sub-sample some of the pipeline sections (surveying in detail e.g. only 1km of a 4km untransformed section). Assessment of some pipeline options and the road alignments which were not specifically surveyed in detail had to be done entirely on the basis of assuming that sensitivity will be similar to that of similar habitats that we did survey thoroughly survey. Thus while all 10 reservoir site options were visited and surveyed, some minor sections of untransformed pipeline routes as well as the road alignments were not covered.
- Time of day proved to be a significant factor influencing activity of most of the Dromica species (which are probably the most significant group in terms of sensitivity in the project area), and sampling was most effective during the late afternoon (4-6pm). To sample at this time of day in each reservoir and untransformed pipeline section and the road alignment routes, as well as several areas within the proposed impoundment, would have meant spending approximately 40-50 days in the field, which was not feasible in terms of available time & budget. So while we attempted to cover what we felt were the most important areas at this time of day, this was not always possible and many areas surveyed earlier in the day may end up being incorrectly assessed as of somewhat lower sensitivity than they should be. The design of any monitoring programme to be instituted must take this into account to ensure that successive active sampling events are carried out at the same time of day, as pitfall trapping (which is carried out over a long period and thus not influenced by daily activity patterns) did not prove very effective for sampling Dromica species.

- Despite these limitations, we feel that the samples and data obtained were sufficient to enable prediction of the significance of the potential impacts of the project with sufficient confidence for the purposes of this study.

6. EXISTING ENVIRONMENT

6.1 DESKTOP STUDY (SUMMARY OF SCOPING REPORT, ILISO 2007)

The project area covers two different vegetation types with a wide range in ecosystem status (**Table 6.1**).

Table 6.1: Vegetation Types of the Project Area

Vegetation Type	Ecosystem Status	Untransformed Vegetation to be Impacted	Transformed Areas to be Impacted	Proportion of National land cover of vegetation type
Granite Lowveld	Vulnerable	1 291 ha	2 118 ha	0.17%
Tsende Mopaneveld	Least Threatened	765 ha	1 166 ha	0.31%

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. Table 6.1 indicates the significance of the proposed Nwamitwa Dam and associated infrastructure in terms of loss of untransformed areas of Granite Lowveld and Tsende Mopaneveld.

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

Vegetation types were ranked and assigned importance ratings ranging from Low to Very High. Areas designated of high conservation importance for a particular biotic group were considered 'sensitive' to development because of the potential impacts of such development on that particular group. **Table 6.2** summarizes the levels of conservation importance of each vegetation type in terms of the conservation-important biota potentially represented there. It also attempts to rank the vegetation types on the basis of their 'intrinsic biodiversity' reflected in the integration of all the component

importance values. Thus some idea of intrinsic biodiversity value or 'ecological sensitivity' is realized.

Table 6.2: Conservation-importance values and Intrinsic Biodiversity values per vegetation type

Biota	Granite Lowveld	Tsende Mopaneveld
Plants	High	High
Mammals	High	High
Birds	High	High
Reptiles & Amphibians	Med	Med
Invertebrates	Very High	Very High
RANK	**1**	**1**
Intrinsic Biodiversity Value	High	High

Vegetation types with the highest percentage area intact, with the highest biodiversity values, and that are the most threatened are those that are likely to present the greatest constraints to development. Conversely, those with the lowest percentage area intact, with the lowest biodiversity values, and that are the least threatened are those that are likely to present the greatest opportunities for development.

On this basis, it is apparent from **Table 6.3** that both Granite Lowveld and Tsende Mopaneveld have High biodiversity values and are significantly threatened. Untransformed areas where these vegetation types are represented would therefore be potentially 'sensitive' to development.

Table 6.3: Vegetation Types most susceptible to development impacts

Vegetation Type	Ecosystem Status	Protection Status	Intrinsic Biodiversity Value
Granite Lowveld	Vulnerable	Moderately Protected	HIGH
Tsende Mopaneveld	Least Threatened	Well Protected	HIGH

Therefore, site-specific ecological field surveys and impact assessments were recommended before development commences. It was recommended that on site surveys of flora and fauna be undertaken in summer from October to February. Thus it would be possible to screen all of the conservation-important plant and animal species

potentially present in the project area, making assessment of ecological sensitivity at farm scale more objective. In this way potential impacts of the proposed development would be more clearly identified, and mitigation measures to reduce impacts could be more accurately defined.

6.2 FIELD SURVEYS AND BASELINE ASSESSMENT

6.2.1 Flora

Methodology

Preliminary vegetation communities were mapped and potential Red Data species identified during the Scoping Phase of the GLeWAP project (Iliso, 2007). The boundary line between Granite Lowveld and Tsende Mopaneveld appeared to be very arbitrary and much of the area is transitional between the two vegetation types. Thus, all untransformed vegetation was ordered into three broad units or communities based on major physiographical zones and dominant species in each zone. Several meandering transects were placed within the proposed Nwamitwa Dam basin area and within proposed borrow pit areas and reservoir sites. Transects were also walked along proposed pipeline routes through untransformed areas. Plant species were listed per vegetation community and the following abundance classes were assigned to each plant species based on estimated canopy cover (after Kent & Coker, 1992):

Value	Braun-Blanquet cover
+	< 1%
1	1 – 5%
2	6 – 25%
3	26 – 50 %
4	51 – 75%
5	76 – 100%

Potential conservation-important plant species listed in Iliso (2007) were targeted in each transect. The floristic importance assessment of each vegetation community was based on an Associated Flora Index (AFI), after Deall (2003), modified to recognise higher values for the threat categories of Vulnerable, Endangered and Critically Endangered (**Table 6.4**). This index is derived from the summation of the

species-status scores of constituent species. Such scores are assigned to plant species of conservation importance and are weighted in relation to local abundance and levels of importance. The latter are based on criteria such as protection status, endemic status, and Red Data status in terms of the Limpopo Environmental Management Act (No.7 of 2003), the National Forests Act (No. 84 of 1998) and the latest update of the National Red Data plant list (www.sanbi.org/biodiversity/reddata.htm).

The higher the AF Index of a particular vegetation community, the higher the floristic importance of that community (**Table 6.5**). Thus an objective basis for assessing the significance of impacts on different vegetation communities at the local scale is derived.

Table 6.4: Species-status scores in relation to conservation importance and local abundance of flora

Conservation Importance	Local abundance[3]		
	Rare (+)	Frequent (1)	Abundant (2)
Red Data species (Critically Endangered)	6	7	8
Red Data species (Endangered)	5	6	7
Red Data species (Vulnerable)	4	5	6
Red Data species (DD, NT, LC)	3	4	5
Endemic species (En)	2	3	4
Protected species (Pr)	1	2	3

Table 6.5: AFI Scores in relation to Floristic Importance

AFI Score	Floristic Importance
>30	High
26-30	High-Medium
21-25	Medium-High
16-20	Medium
11-15	Medium-Low
6-10	Low-Medium
0-5	Low

[3] Based on the Braun-Blanquet cover-abundance scale

In order to determine the perceived value and level of usage of traditional medicinal and / or useful plants within the project area, a local traditional healer was employed for a morning field visit to point out the most widely used plants. The proposed Nwamitwa Dam basin area was targeted as this is the area most likely to be negatively impacted.

Description of Vegetation Communities

Two vegetation types were represented in the area covered by the proposed Nwamitwa Dam basin and associated infrastructure, namely Granite Lowveld and Tsende Mopaneveld[4]. Both are characteristic of the undulating plains of the Lowveld and comprise medium-high to tall shrubby savannah.

At a finer scale, three vegetation communities were identified during fieldwork:

i. *Acacia – Combretum* Riparian Woodland (**Appendix B9**)

This tall, closed-canopy woodland is confined to banks of perennial waterways in the project area, particularly the Groot Letaba and Nwanetsi Rivers (**Figure 6.1**). Vegetation height varies from 6 to 12 metres. *Acacia polyacantha* subsp. *campylacantha* and *Combretum erythrophyllum* are the dominant canopy tree species. Other common trees and woody shrubs include *Ficus sycomorus, Diospyros mespiliformis, Grewia flavescens* and *Trichilia emetica*. Invasive species dominate in certain areas, particularly *Lantana camara*, *Chromolaena trifida, Aristolochia elegans* and *Argemone ochraleuca*. *Panicum maximum* is very common on edges and in clearings, while *Phragmites australis* dominates open areas of the river line. A total of 109 species was recorded in this community during fieldwork, of which five have conservation importance (Appendix 4a, 4b). These species are protected, either under the National Forests Act (No.38 of 1998) or the Limpopo Environmental Management Act (No.7 of 2003). No Red Data species were recorded.

ii. *Colophospermum – Dichrostachys* Plains Woodland (**Appendix B9**)
This medium-high to tall, mid-dense woodland is the most widespread of the untransformed vegetation communities, occurring throughout the GLeWaP

[4] Mucina & Rutherford, 2006

project area (**Figure 6.1**). It is the dominant community within the proposed Nwamitwa Dam basin and, along with Riparian Woodland, is the community most likely to be impacted by the proposed dam. Canopy height varies from 5 – 10 metres. The most common trees in the canopy are *Colophospermum mopane, Acacia nigrescens, Combretum apiculatum* and *Sclerocarya birrea* subsp. *cafra*, while a wide variety of less frequently encountered species included *Acacia exuvialis, Acacia gerrardii, Acacia grandicornuta, Albizia harveyi, Bridelia mollis, Dalbergia melanoxylon* and *Ozoroa paniculosa*. The undergrowth is dominated by woody shrubs, particularly *Dichrostachys cinerea* subsp. *nyassana*. Other common shrubs are *Gymnosporia glaucophylla, Grewia monticola, Grewia flavescens, Flueggea virosa, Euclea divinorum* and *Cordia sinensis*. The herb layer is also quite diverse and includes a variety of forbs and grasses, of which the most common are *Justicia flava, Kyphocarpha angustifolia*, *Tephrosia polystachya, Clerodendrum ternatum, Ocimum americanum, Abutilon sonneratium, Panicum maximum, Themeda triandra* and *Urochloa mossambica*. A total of 159 species was recorded in this community during fieldwork, of which nine species have conservation importance (**Appendix B1, B2**). One species has a National Red Data status of Least Concern (Declining), namely *Ansellia africana* and the rest are protected under the National Forests Act (No.38 of 1998) or the Limpopo Environmental Management Act (No.7 of 2003).

iii. *Combretum - Bridelia* Rocky Outcrop Woodland (**Appendix B9**)

This shrubby savannah community is confined to low rocky ridges and isolated rock outcrops, mostly in the northern and western parts of the project area (**Figure 6.1**). Canopy height varies from 3 to 6 metres, with occasional emergent trees as tall as 10 metres. *Combretum apiculatum* is the dominant tree, with other co-dominants including *Kirkia acuminata, Bridelia mollis* and *Combretum zeyheri*. Other common trees and shrubs are *Vangueria infausta, Pappea capensis, Ficus glumosa, Pterocarpus angolensis* and *Combretum molle*. The vegetation on the hills around Hlohlokwe village, in the north-western part of the study area, was more closed and had a high proportion of succulent trees, particularly *Aloe marlothii, Euphorbia ingens* and *Euphorbia cooperi*. This is also the area in which one of the initial target Red Data species, *Xylopia parviflora*, was located. This species has subsequently been removed from the National Red Data list (October 2007 assessment on

www.sanbi.org/biodiversity). A total of 176 species was recorded in this community during fieldwork, of which ten species have conservation importance (**Appendix B1, B2**). Two species that were found in this community have been evaluated as Least Concern (Declining) in the National Red Data list, namely *Ansellia africana* and *Elaeodendron transvaalense*. The rest are protected under the National Forests Act (No.38 of 1998) or the Limpopo Environmental Management Act (No.7 of 2003).

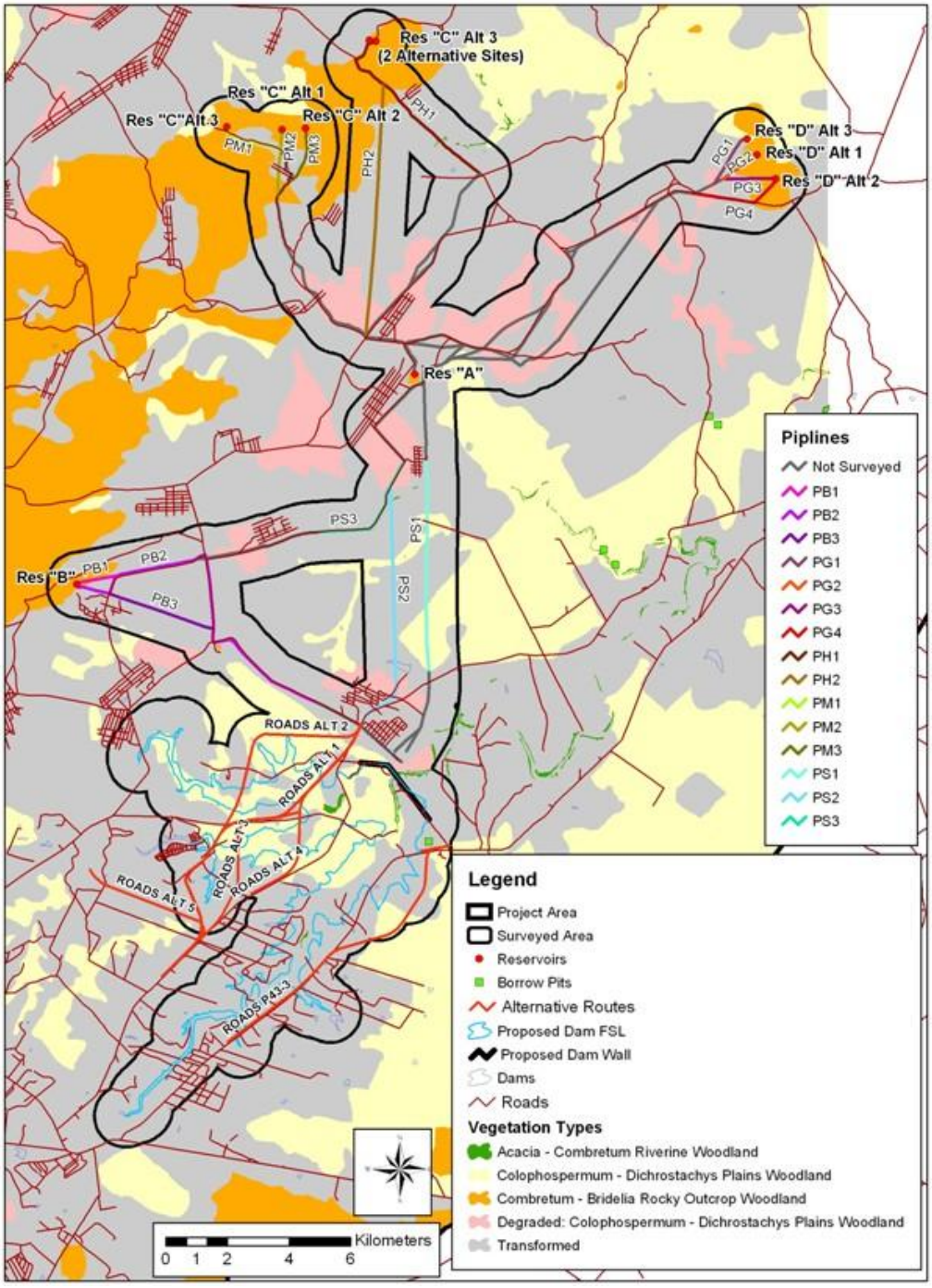

Figure 6.1: Vegetation Communities directly affected by proposed Nwamitwa Dam and associated infrastructure

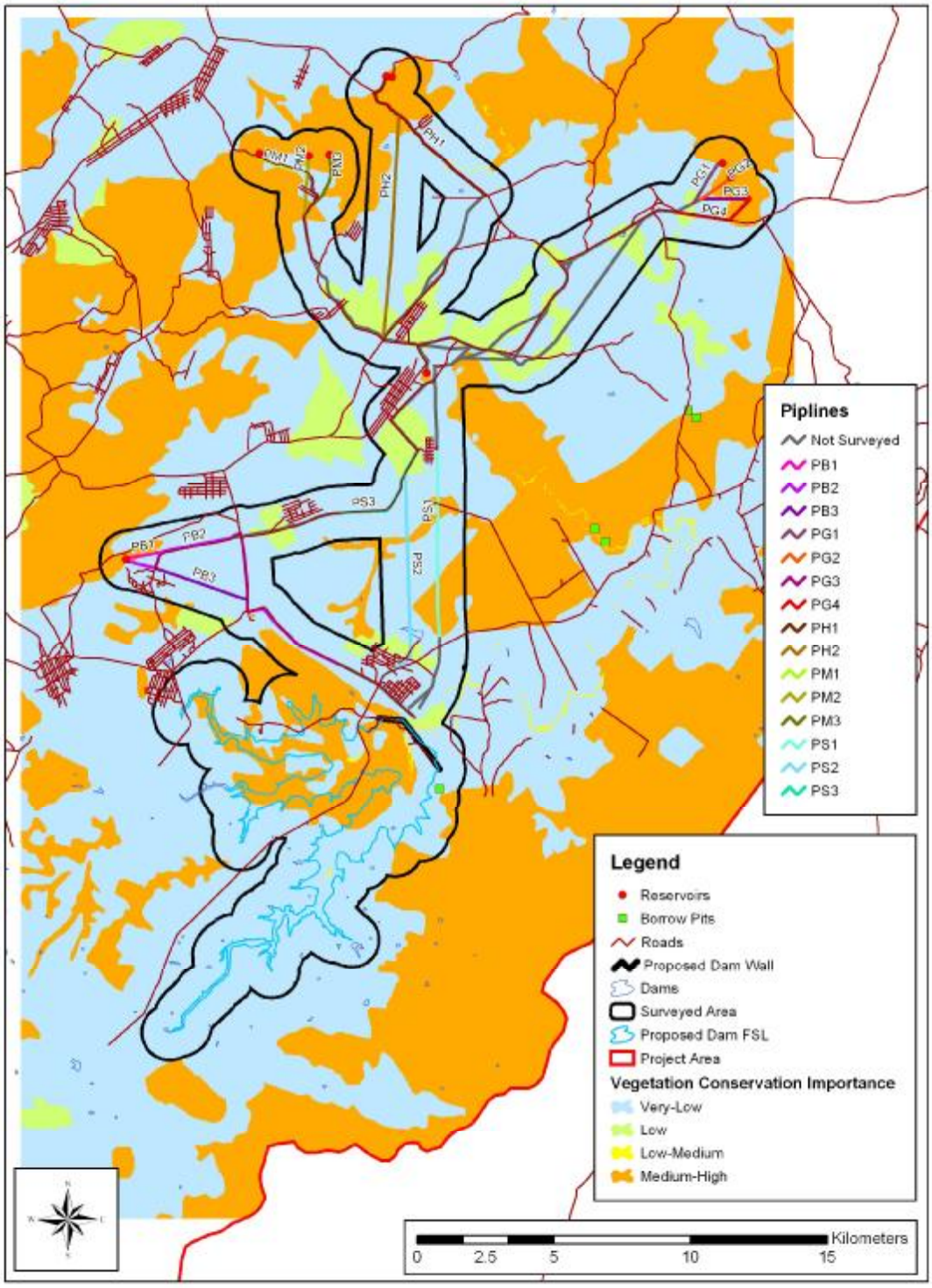

Figure 6.2: Conservation Importance of PLANTS in area to be directly affected by the Nwamitwa Dam and associated infrastructure

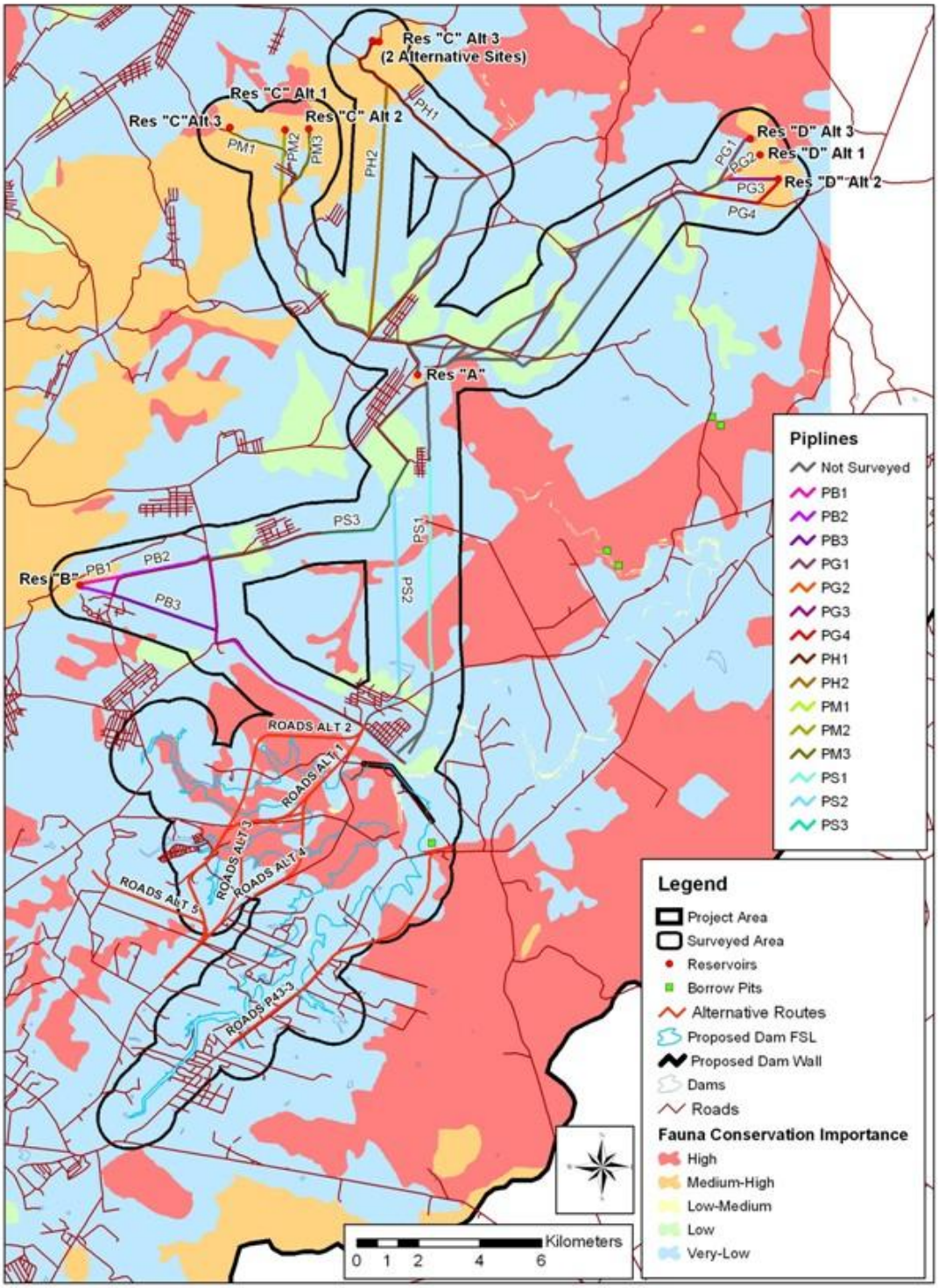

Figure 6.3: Conservation Importance of FAUNA in area to be directly affected by the Nwamitwa Dam and associated infrastructure.

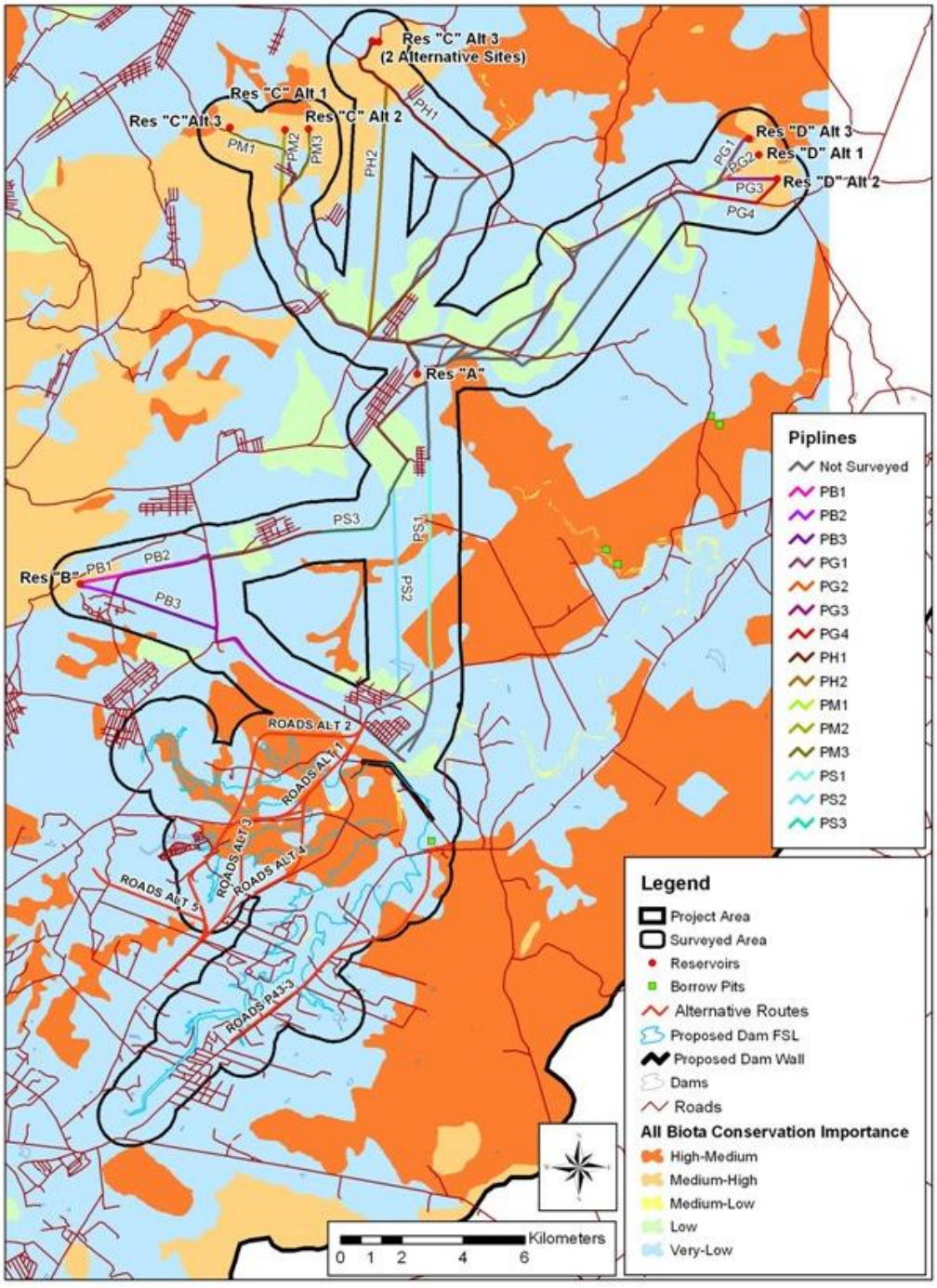

Figure 6.4: Conservation Importance of ALL BIOTA in area to be directly affected by the Nwamitwa Dam and associated infrastructure

Important Plant Taxa

Of the 271 conservation-important plant species potentially occurring within the entire GLeWaP study area (Iliso, 2007), a total of 30 species potentially occur within the area covered by the proposed Nwamitwa Dam and associated infrastructure (**Appendix B3**). Fifteen of these (50%) were confirmed to occur during fieldwork (**Table 6.7**). Two have been assessed in the National Red Data list (October 2007 assessment, www.sanbi.org) and have been given a status of Least Concern (Declining):

- *Ansellia africana* (Leopard Orchid)
- *Elaeodendron transvaalense (Bushveld Saffron)*

This status indicates that the species do not qualify for any of the IUCN Red Data categories but have declining populations and are thus included in this study.

Nine Red Data species were highlighted by Iliso (2007) as being key species to search for during the EIA phase of this project. However, the most current evaluation (October 2007) of the National Red Data plant list includes only four of these species (**Table 6.6**), none of which were located during fieldwork. Three of these are considered to have a low likelihood of occurring in the GLeWAP project area, while *Mondia whitei* has a Moderate likelihood of occurring.

Traditional Useful and / or Medicinal Plants

Thirty-one plants were identified within the Nwamitwa dam basin area as being widely used by local residents (**Appendix B4**). The majority of these species are widespread and common to abundant, and only three have any conservation importance (protected under the National Forest Act of 1998), although these are also widespread within the study area:

- *Combretum imberbe (Leadwood)*
- *Philenoptera violacea (Apple-leaf)*
- *Sclerocarya birrea subsp. cafra (Marula)*

Twenty-seven of the species pointed out are used medicinally, with 14 being exclusively used as such. Twelve species are used as a source of food, while five also have a utility value (e.g. building materials, sleeping mats). The relative abundance of most of the above species makes it unlikely that the GLeWaP development would have a significant impact on the availability of plant resources in the study area, particularly if an opportunity is given for harvesting to take place within the dam basin area prior to flooding.

Floristic Importance Assessment

Associated Flora Indices (AFIs) were calculated for the three untransformed vegetation communities using weighted Species-Status Scores (**Table 6.4**). Results in **Table 6.7** indicate that *Combretum – Bridelia* Rocky Outcrop Woodland (AFI = 22) scores highest, followed by *Colophospermum – Dichrostachys* Plains Woodland (AFI = 21), both scores indicating **Medium-High** importance for flora (**Table 6.5**). *Acacia - Combretum* Riverine Woodland only scores 9, which indicates **Low-Medium** importance (**Table 6.5**).

Table 6.6: Red Data Plant Species potentially occurring in the GLeWaP Area

Species	Family	Growth Form	Previous RD Status	Current RD Status	Habitat	Likelihood of Occurrence in Project Area	Reason
Aloe monotropa	Asphodelaceae	Succulent	VU	VU	Forest fringe on steep, rocky slopes	Low	Confined to vicinity of Dublin Mine Kloof
Mondia whitei	Apocynaceae	Climber	LC	NT	Closed woodland, forest	Moderate	
Oberonia disticha	Orchidaceae	Epiphyte	NT	CR	Moist riverine forest	Low	Unsuitable habitat
Siphonichilus aethiopicus	Zingiberaceae	Geophyte	VU	CR	Undergrowth of closed woodland, forest	Low	Proximity to high human population; very rare; highly utilised

VU = Vulnerable

NT = Near Threatened

CR = Critically Endangered

LC = Least Concern

Table 6.7: AFI per Vegetation Community based on Species-Status scores of Conservation-Important plant species found

SCIENTIFIC NAME	FAMILY	Growth Form	Interim National Red Data Status	Endemic	Protected	*Acacia - Combretum* Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland
Dicotyledons								
Sclerocarya birrea subsp.cafra	Anacardiaceae	tree			NFA	2	3	2
Xylopia parviflora	Annonaceae	tree			LEMA			1
Huernia sp.	Apocynaceae	succulent			LEMA		1	
Riocreuxia picta	Apocynaceae	climber			LEMA	2		
Balanites maughamii	Balanitaceae	tree			NFA		2	1
Eleaodendron transvaalense	Celastraceae	tree	LC(D)		NFA		4	6
Combretum imberbe	Combretaceae	tree			NFA		3	1
Spirostachys africana	Euphorbiaceae	tree			LEMA	2	2	
Philenoptera violacea	Fabaceae	tree			NFA	2	1	1
Pterocarpus angolensis	Fabaceae	tree			NFA			2
Breonadia salicina	Rubiaceae	tree			NFA	1		
Subtotal		11	1	0	11	9	16	14
Monocotyledons								
Boophane disticha	Amaryllidaceae	bulb			LEMA		1	2
Scadoxus sp.	Amaryllidaceae	bulb			LEMA			1
Aloe cryptopoda	Asphodelaceae	succulent			LEMA			1
Ansellia africana	Orchidaceae	epiphyte	LC(D)		LEMA		4	4
Subtotal		4	1	0	4	0	5	8
Total		15	2	0	15	9	21	22
					Floristic importance:	Low-Medium	Medium-High	Medium-High

LC (D) = Least Concern (Declining)
LEMA = Limpopo Environmental Management Act
NFA = National Forests Act

6.2.2 Vertebrate Fauna

a) Methodology

Lists of terrestrial mammals, birds, frogs and reptiles potentially occurring in the project area were derived from Iliso (2007), which included *inter alia* herpetological distribution data supplied by the Limpopo Department of Economic Development, Environment & Tourism (V.Egan *pers.comm*.). Potential occurrence of fauna in the various vegetation communities of the footprint was predicted based on knowledge of typical fauna of the area, and in some cases confirmed during fieldwork. All confirmed species were listed in **Appendices B5** and **B6.** Conservation-important fauna, i.e. South African endemics, protected species and/or Red Data species, were highlighted in the above lists and these were searched for during fieldwork. Survey methodology included:

- Pitfall traps with drift fences (**Appendix B10**).
- Live walk-in traps (Willan traps) baited with a mixture of oats, peanut butter and sunflower oil (**Appendix B10**).
- Active searching (transects, point counts) within 14 sample sites.

b) Mammals

Savannah / woodland habitats are recognised as supporting the highest mammal diversity in South Africa5. It is thus likely that mammal diversity would be high in untransformed areas within the GLeWaP project area, while transformed areas would support lower diversity. Iliso (2007) listed 64 conservation-important mammal species that potentially occur in the greater GLeWaP project area. Fifty of these species could occur within the proposed Nwamitwa Dam basin and associated pipeline routes (**Appendix B7**). Only one of these has urgent threat status, namely Ground Pangolin (Manis temminckii) (Vulnerable). This has a moderate likelihood of occurring in untransformed areas, particularly on private farms within the dam basin, since the density of people is much lower on these properties.

Live walk-in traps (Willan traps) were placed in transects in Colophospermum – Dichrostachys Plains Woodland on the farm La Motte 464 LT, within the proposed Nwamitwa Dam basin. The only rodent species caught in these traps in 46 trap-

5

nights was Aethomys ineptus. Active searches in vegetation transects revealed evidence of ten other mammal species (**Appendix B5** and **B6**). Two of these, Steenbok (Raphicerus campestris) and Hippopotamus (Hippopotamus amphibius), are protected under LEMA. An additional mammal species was discovered on a rocky outcrop by the team of entomologists, namely Short-snouted Elephant Shrew (Elephantulus brachyrhynchus), which has a Red Data status of Data Deficient (**Appendix B8**).

c) Birds

The area to be impacted by the Nwamitwa dam and associated infrastructure is in an area of high bird diversity. Over 340 bird species were recorded in this area during the first Southern African Bird Atlas Project[6]. While a high diversity of large birds of prey is included in this figure, most of these are only likely to be resident in large protected areas adjacent the project area. However, most of them are likely to forage over both transformed and untransformed areas. Iliso (2007) listed 62 conservation-important bird species that potentially occur in the greater GLeWaP project area. Thirty-three of these species could occur within the proposed Nwamitwa Dam basin and associated pipeline routes (**Appendix B7**). Fifteen species have an urgent threat status, one of which, Saddle-billed Stork (*Ephippiorhynchus senegalensis*), is considered Endangered. The rest have been assessed as Vulnerable and include nine birds of prey, none of which are likely to be resident in the project area. Potential nesting sites for raptors and storks were searched for during fieldwork but none found. Two Vulnerable species are likely to occur in Riverine Woodland where dense vegetation overhangs the river, namely African Finfoot (*Podica senegalensis*) and White-backed Night Heron (*Gorsachius leuconotus*). No early morning surveys along the rivers revealed either species, but the likelihood of occurrence is still considered Moderate (night heron) to High (finfoot).

A total of 186 bird species was recorded during fieldwork, which represents over 50% of the species list for the area (**Appendix B5, B6**). The highest species richness was in *Colophospermum – Dichrostachys* Plains Woodland (128 species), followed by *Acacia - Combretum* Riverine Woodland (97 species).

[6] Harrison, et al. 1994

Eleven species were recorded at 50% or more of the sample sites and can be considered the most widespread species in the project area (**Table 6.8**).

Table 6.8: Most widespread bird species in GLeWaP area during fieldwork (Jan 2008)

Yellow-fronted Canary	*Crithagra mozambicus*	Dark-capped Bulbul	*Pycnonotus tricolor*
Cape Turtle-Dove	*Streptopelia capicola*	Barn Swallow	*Hirundo rustica*
Rattling Cisticola	*Cisticola chiniana*	Black-crowned Tchagra	*Tchagra senegalus*
White-browed Scrub-Robin	*Cercotrichas leucophrys*	Stierling's Wren-Warbler	*Calamonastes stierlingi*
Blue Waxbill	*Uraeginthus angolensis*	White-bellied Sunbird	*Cinnyris talatala*
Tawny-flanked Prinia	*Prinia subflava*		

Two Red Data bird species were recorded during fieldwork:

- Black Stork (*Ciconia nigra*) – an immature was found in heavily grazed savannah along the pipeline route south-east of Hlohlokwe village (Gamela 679 LT). This is a species that breeds on cliffs and forages in wetlands. This bird was probably in transit to suitable foraging habitat.
- Lanner Falcon (*Falco biarmicus*) - two adults were seen flying with two immatures over the proposed reservoir site at Serolorolo village (Sirulurul 427 LT). The proximity of high human density and lack of breeding habitat make it highly unlikely that these birds bred at the site. They were seen making several attempts at hunting feral pigeons in the village and this is probably what is attracting them to the site.

d) Reptiles

ILISO (2007) listed 43 conservation-important reptile species that potentially occur in the greater GLeWaP project area, although most are confined to higher lying grasslands and montane forests. Fourteen species could occur within the proposed Nwamitwa Dam basin and associated pipeline routes (**Appendix B7**). Five of these were confirmed to occur during fieldwork (**Table 6.9**). A total of 14 reptile species was confirmed in the field (**Appendix B5**, **B6**). The most significant find was Common Flat Lizard (*Platysaurus intermedius intermedius*), which is endemic to Limpopo Province and confined to rocky outcrops. A small population of this species was located along the proposed alternative pipeline route just south of Hlohlokwe (**Appendix B7**). Local residents confirmed the presence of one Red Data species, Nile Crocodile (*Crocodylus niloticus*), in the Groot Letaba

River. Another Red Data species, Southern African Python (*Python natalensis*), has a High likelihood of occurring, especially in the dam basin area.

e) Frogs

The GLeWaP project area falls within an area of high species diversity but low importance for conservation-important species[7]. Only two conservation-important frog species of those listed in Iliso (2007) potentially occur within the area to be impacted by the proposed Nwamitwa Dam and associated infrastructure, namely Giant Bullfrog (*Pyxicephalus adspersus*) and Edible Bullfrog (*Pyxicephalus edulis*). Neither of these species was heard calling during fieldwork, although only Edible Bullfrog has a significant likelihood of occurring. The presence of this species was confirmed when numerous young Edible Bullfrogs were caught in traps placed for insects within the Nwamitwa Dam Basin and Borrow Pits 3 and 4. Fourteen frog species were recorded during fieldwork, mostly through active searches and checking of pitfall traps (**Appendix B5, B6**). The traps proved particularly effective for *Hemisus marmoratus*, a cryptic fossorial species that is often overlooked. A single Russet-backed Sand Frog (*Tomopterna marmorata*) collected on the farm Janetsi 463 LT proved to be the first record for this species in the grid 2330 CD, representing a small range increase[8].

f) Vertebrate Faunal Importance Assessment

Ninety-nine of the conservation-important fauna species listed in Iliso (2007) could occur within the area of the proposed Nwamitwa Dam and associated bulk supply route (**Appendix B7**). Only twelve of these were confirmed to occur during fieldwork. Six were recorded in *Colophospermum - Dichrostachys* Plains Woodland and five each in *Acacia - Combretum* Riverine Woodland and *Combretum - Bridelia* Rocky Outcrop Woodland (**Table 6.9**).

[7] Minter, et al. 2004
[8] Minter, et.al., 2007

Table 6.9. Conservation-important Fauna recorded during fieldwork.

Common Name	Scientific Name	Red Data	Endemic	Protected	*Acacia - Combretum* Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland	Artificial Wetlands
Hippopotamus	*Hippopotamus amphibious*			LEMA	x			x
Steenbok	*Raphicerus campestris*			LEMA		x	x	
Short-snouted Elephant Shrew	*Elephantulus brachyrhynchus*	DD					x	
Black Stork	*Ciconia nigra*	NT				x		
Cape White-eye	*Zosterops virens*		SA		x	x	x	
Lanner Falcon	*Falco biarmicus*	NT					x	
Common Flap-neck Chamaeleon	*Chamaeleo dilepis*			NEMBA	x			
Common Flat Lizard	*Platysaurus intermedius*		LP				x	
Distant's Ground Agama	*Agama aculeata distanti*		SA			x		
Rock Monitor	*Varanus albigularis*			NEMBA		x		
Water Monitor	*Varanus niloticus*			NEMBA	x			x
Edible Bullfrog	*Pyxicephalus edulis*			NEMBA	x	x		
Total	12	3	3	6	5	6	5	2

LP = Limpopo Province endemic
SA = South African Endemic
NEMBA = National Environmental Management: Biodiversity Act
LEMA = Limpopo Environmental Management Act

A summary of the importance values of the potentially occurring fauna within the three vegetation communities identified in the study area (as well as Artificial Wetlands) is presented in **Table 6.10**. This indicates that *Colophospermum - Dichrostachys* Plains Woodland and *Acacia - Combretum* Riverine Woodland are the most important communities, followed by *Combretum - Bridelia* Rocky Outcrop Woodland. Artificial Wetlands, while important for a few species, have a low overall score.

Table 6.10: Vertebrate faunal value of Vegetation Communities

Importance Value	No.of conservation-important Fauna Species			
	Acacia - Combretum Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland	*Artificial Wetlands*
Very High	1	0	0	0
High	32	31	25	17
Medium	29	34	30	13
Low	8	10	13	1
RANK	**1**	**1**	**3**	**4**
Overall Importance	Medium	Medium	Medium	Low

6.2.3 Invertebrate Fauna

a) Methodology

Field surveys for invertebrates included pitfall trapping and day-time searches for beetles, spiders and scorpions, as well as night-time searches with ultraviolet light for protected scorpion species:

Surveys for ground beetles, scorpions, trapdoor and baboon spiders were carried out by pitfall trapping for four weeks in each of 4 habitat areas selected as being most likely to be permanently transformed by the project (the two proposed borrow pit areas and two areas, representing the two main habitat types, within the proposed dam impoundment), as well as by hand collecting by a team of 3 people during the first survey field visit (20-22 Dec 2007) and 4-5 people on different days during the second visit (17-24 January 2008). Each proposed reservoir site was searched for 1 - 1.5 hours depending on the number of personnel present, giving a total search effort of 5-6 person-hours per site. The borrow pit and dam impoundment areas received greater search effort, with each proposed borrow pit site being searched for at least 10-12 person-hours and the dam impoundment receiving a total of approximately 89 person-hours of daytime search effort. All except one of the ten main proposed pipeline sections identified as being within untransformed areas were also inspected, with a total of approximately 35 person-

hours search effort being allocated to these areas. An additional 10 person-hours of night-time search with ultraviolet light was carried out during the initial site visit (November 2007) and the second survey visit (January 2008).

- Scorpions were searched for actively during the daytime searches in all surveyed areas, as well as by night with the aid of ultraviolet light in two areas within the proposed dam impoundment. Pitfall trapping also yielded some specimens.
- Trapdoor and baboon spiders were searched for actively during the daytime searches in all surveyed areas, and pitfall trapping also yielded some specimens.
- Visual searches and netting would be required to survey dragonfly and damselfly populations. However, since both of the predicted Red Data Odonata species (Samways 2006, Samways and Taylor 2004) would only be likely to occur in the catchment area well to the west and upstream of the proposed dam, and hence would be highly unlikely to be impacted in any way surveys were not carried out for these species.
- No rare or threatened cicada species were predicted for the project area so no specific searches for this group were carried out; a few incidental collections of cicada specimens were however made and these will be sent to Dr Martin Villet (Rhodes University) for identification.
- Ground beetles formed the primary focus of the field assessments, since the majority of the rare and protected invertebrate species predicted for the project area fell into this group; with the exclusion of butterflies, damselflies and dragonflies from the survey, all of the remaining invertebrates of "High" importance value were ground beetles. Representative of the species considered most likely to be of significance were processed and submitted to Peter Schüle immediately after the January field visit, while representative specimens of the remainder will be submitted later.
- Visual searches and netting would be required to survey for the predicted Red Data butterfly species. However, non-overlap of flight periods of the butterflies (September-November for Wolkberg Widow and Lotana Blue, November-December for Stevenson's Copper, December-January for Wolkberg Zulu and February-March for Swanepoel's Brown) would lead to a requirement for at least three intensive surveys. Thus, since all five of the predicted Red Data butterfly species (Woodhall 2005) would only be likely to occur in the

catchment well to the west and upstream of the proposed dam, and hence would be highly unlikely to be impacted in any way, surveys were not carried out for these species.

b) Scorpions

At least six scorpion species were found in the project area and these included three protected species (*Hadogenes troglodytes*, *Opisophthalmus glabrifrons* and *Opistacanthus asper*). *H. troglodytes* were found in rocky outcrops along some of the proposed pipeline routes and at some proposed reservoir sites, *O. glabrifrons* were found along some of the pipeline routes and *O. asper* were found in trees within the proposed dam impoundment area, but it is probable that the latter two species are fairly widespread in all habitats in the region. *H. troglodytes* will however be restricted to areas of rocky outcrop with suitable cracks to provide refuge.

c) Trapdoor and Baboon Spiders

At least three baboon spider species were found in the project area, and these included the protected species *Augacephalus (Pterinochilus) junodi* and *Ceratogyrus bechuanicus*; other specimens of baboon and trapdoor spiders have not yet been identified.

d) Dragonflies and Damselflies

No Odonata of conservation concern were noted during the field surveys.

e) Cicadas

No cicadas of conservation concern were noted during the field surveys; the few specimens that were captured will be sent to Prof Martin Villet at Rhodes University for identification and to confirm their status.

f) Ground Beetles

Large numbers of ground beetles, including representatives of three protected genera (*Mantichora*, *Megacephala* and *Dromica*) as well as several non-protected genera, were collected during the field surveys. Final identification of some of the specimens remains to be carried out, but preliminary results indicate that at least eight protected species occur in the project area. The most significant finds were two populations of *Dromica oberprieleri* (identification confirmed by Peter Schüle)

on La Motte farm within the proposed dam impoundment area, where several specimens of this rare and localised species were collected.

g) Butterflies

No Lepidoptera of conservation concern were noted during the field surveys.

h) Identification of specimens

Specimens collected during the field surveys were identified mainly with the aid of the reference material lsted below and by consultation with relevant experts in the various taxonomic groups:
Scorpions - Leeming (2003), Prendini (2001, 2006), Ian Engebrecht (GDACE), pers comm.
Trapdoor & baboon spiders - Dippenaar-Schoeman (2002).
Dragonflies and damselflies - Tarboton & Tarboton (2002, 2005).
Beetles - Basilewsky (1977), Werner (2000), Peter Schüle, pers comm.
Butterflies - Woodhall (2005)

i) Invertebrate Faunal Importance Assessment

At least thirteen protected invertebrate species were located during the course of the field surveys (Appendix 4h), and this number may increase once the processing of specimens is completed. The protected beetle genus *Dromica* was particularly well represented in the project area and specimens were found in virtually every area surveyed. However, most of the *Dromica* specimens found were representatives of relatively widespread and common species; the main exception to this was *Dromica oberprieleri,* which was first discovered in the Hans Merensky Nature Reserve in 1981, and is known from only a few localised populations. The two areas of La Motte farm on which *D. oberprieleri* were located should thus be considered as very sensitive.

Another rare (although more widespread than *D. oberprieleri*) and protected ground beetle species, *Megacephala regalis vansoni*, was collected by pitfall trapping in the proposed dam impoundment area on La Motte. Both *D. oberprieleri* and *M. regalis vansoni* scored “high” importance ratings in the desktop study. *Mantichora scabra*, a protected giant tiger beetle, was found in both *Colophospermum – Dichrostachys* Plains Woodland and *Combretum – Bridelia* Rocky Outcrop Woodland in areas of suitable soft deep soil.

The protected baboon spider and scorpion species located within the project area are also all widespread (although the flat rock scorpion *Hadogenes troglodytes* has specific habitat requirements and would thus be more patchily distributed), and the two protected scorpion species with more limited distributions (combined also with specific habitat requirements) predicted for the greater project area would be most likely only to inhabit areas of higher altitude in the catchment area to the west. None of the protected baboon spider or scorpion species found appeared to be strongly linked to any habitat type and were apparently more dependant on substrate than vegetation type.

Although a final assessment cannot be made until specimen identifications are complete and all data analysed, it appeared that of the vegetation types surveyed, *Colophospermum – Dichrostachys* Plains Woodland has a higher density and variety of protected invertebrate species than *Combretum – Bridelia* Rocky Outcrop Woodland, both of which supported greater density and variety than *Acacia – Combretum* Riparian Woodland.

6.3 BIODIVERSITY AND CONSERVATION IMPORTANCE

Appendices 4a – 4h list the plant and animal species that were recorded or potentially occur within the area covered by the proposed Nwamitwa Dam and associated infrastructure. **Table 6.11** provides a summary of these. A total of 5 species of Red Data flora and fauna were recorded (2 plant, 1 mammal and 2 bird). Six endemic or near-endemic (locally or regionally) species were recorded (1 bird, 2 reptile, and 3 invertebrate). Thirty-two protected species were recorded (15 plant, 2 mammal, 3 reptile, 1 frog and 11 invertebrate).

This gives a total of 17 conservation-important plant species, 3 conservation-important mammal species, 3 conservation-important bird species, 5 conservation-important reptile species, 1 conservation-important frog species and 14 conservation-important invertebrate species. In all, 43 conservation important species of flora and fauna were recorded.

Table 6.11. Numbers of important biotic taxa recorded in the project area

Biotic group	Red Data	Endemic/Near-endemic[9]	Protected	Total
Plants	2	0	15	17
Mammals	1	0	2	3
Birds	2	1	0	3
Reptiles	0	2	3	5
Frogs	0	0	1	1
Invertebrates	0	3	11	14
Total:	**5**	**6**	**32**	**43**

The maps profiling conservation importance of the biota studied (**Figures 6.2 – 6.4**) are designed to inform the development planning process, and to provide a basis for impact assessment. Areas designated of high conservation importance for a particular biotic group would be considered 'sensitive' to development because of the potential impacts of such development on that particular group.

[9] Floristic endemism is determined at the scale of Limpopo Province, whilst faunal endemism is determined at a national (SA) or provincial (LIM) scale

Table 6-12 summarizes the levels of conservation importance of each vegetation type in terms of the conservation-important biota potentially represented there. It also attempts to rank the vegetation types on the basis of their 'intrinsic biodiversity' reflected in the integration of all the component importance values. Thus some idea of intrinsic biodiversity value or 'ecological sensitivity' is realized and mapped (**Figure 6.4**).

Table 6.12: Integration of importance values to derive Intrinsic Biodiversity values per vegetation type.

Biotic Group	Importance value		
	Acacia - Combretum Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland
Plants	Low-Medium	Medium-High	Medium-High
Vertebrate Fauna	Medium	Medium	Medium
Invertebrate Fauna	Low-Medium	High	Medium-High
Intrinsic Biodiversity Value	Medium-Low	High-Medium	Medium - High
RANK	**3**	**1**	**2**

7. ASSESSMENT OF POTENTIAL IMPACTS

7.1 FLORA

7.1.1 Nwamitwa Dam

Description of potential impact	**Transformation and fragmentation of habitat for plants.**	
Nature of impact	Negative. Direct.	
Legal requirements	National Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Permanent	Permanent
Intensity	Medium (Bulk supply routes, reservoirs) High (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Probability of occurrence	Medium (Bulk supply routes, reservoirs) High (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Confidence of assessment	High	High
Level of significance before mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Mitigation measures (EMP requirements)	1. 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. 2. Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits).	1. Maintain holding nursery of local plants suitable for re-planting rehabilitated areas.

Level of significance after mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Cumulative Impacts		Increased settlement around dam resulting in further fragmentation and loss of untransformed habitat
Comments or Discussion		

Description of potential impact	**Increased harvesting pressure on vegetation.**	
Nature of impact	Negative. Indirect.	
Legal requirements	Limpopo Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Indirect.	Negative. Indirect.
Extent of impact	Regional.	Regional.
Duration of impact	Long term	Long term
Intensity	Low (Bulk supply routes, reservoirs) Medium (Dam)	Low (Bulk supply routes, reservoirs) Medium (Dam)
Probability of occurrence	Low (Bulk supply routes, reservoirs) High (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Mitigation measures (EMP requirements)	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.	1. Not possible to mitigate for settlement of land adjacent dam, where harvesting impacts are likely to be highest.

	2. Allow local communities access to plant resources below full supply level, but not before plant rescue has been completed. 3. All pipeline routes through untransformed vegetation should be regarded as last resorts; routes should whenever possible traverse transformed habitats.	
Level of significance after mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Cumulative Impacts		Increased settlement around dam resulting in further harvesting of vegetation.
Comments or Discussion		

Description of potential impact	**Increased invasion by alien plants.**	
Nature of impact	Negative. Indirect.	
Legal requirements	Conservation of Agricultural Resources Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Indirect.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Long term	Long term
Intensity	Low (Bulk supply routes, reservoirs) Medium (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Probability of occurrence	Medium (Bulk supply routes, reservoirs) High (Dam)	Medium
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Medium (Dam)	High (Dam)

	Low (transformed habitats)	Low (transformed habitats)
Mitigation measures (EMP requirements)	1. Allow local communities access to plant resources below full supply level, but not before plant rescue has been completed.	1. Once dam construction is completed, control measures targeting alien plants within the construction areas and surrounding disturbed sites should be implemented, preferably using Working for Water teams. 2. Annual monitoring of levels of infestation of dam by alien plants; rapid response by teams removing plants.
Level of significance after mitigation	Medium (Dam) Low (transformed habitats)	Medium (Dam) Low (transformed habitats)
Cumulative Impacts		
Comments or Discussion :		

Description of potential impact	**Impoverishment of populations of important plants.**	
Nature of impact	Negative. Direct.	
Legal requirements	National Environmental Management: Biodiversity Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Permanent	Permanent
Intensity	Medium (Bulk supply routes, reservoirs) High (Dam)	Medium (Bulk supply routes, reservoirs) High (Dam)
Probability of occurrence	Medium (Bulk supply routes, reservoirs) High (Dam)	Medium (Bulk supply routes, reservoirs) High (Dam)

Confidence of assessment	High	High
Level of significance before mitigation	Medium (Dam) Low (transformed habitats)	Medium (Dam) Low (transformed habitats)
Mitigation measures (EMP requirements)	1. 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. 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.	1. Maintain holding nursery of local plants suitable for re-planting rehabilitated areas.
Level of significance after mitigation	Medium (Dam) Low (transformed habitats)	Medium (Dam) Low (transformed habitats)
Cumulative Impacts		Increased settlement around dam resulting in further impoverishment of populations of important species.
Comments or Discussion :		

Description of potential impact	**Dam acts as a barrier disrupting seed dispersal by water (along river) or animals (across river).**	
Nature of impact	Negative. Direct.	
Legal requirements	Not aware of any.	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.

Extent of impact	Regional.	Regional.
Duration of impact	Permanent	Permanent
Intensity	Medium	Medium
Probability of occurrence	Low	High
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Low	Medium
Mitigation measures (EMP requirements)	None	None
Level of significance after mitigation	Low	Medium
Cumulative Impacts		
Comments or Discussion :		

Description of potential impact	**Disruption of natural fire regime across river, affecting species composition and structure of vegetation communities.**	
Nature of impact	Negative. Indirect.	
Legal requirements	National Veld and Forest Fires Act of 1998	
Stage	Pre-Construction and Construction	Operation
Nature of Impact		Negative. Indirect.
Extent of impact		Regional.
Duration of impact		Permanent
Intensity		Medium
Probability of occurrence		High
Confidence of assessment		Low
Level of significance before		Medium

mitigation		
Mitigation measures (EMP requirements)		1. Ensure that areas on all sides of dam are burnt with equal frequency and timing. Not sure whose responsibility this should be?
Level of significance after mitigation		Medium
Cumulative Impacts		
Comments or Discussion :.		

Description of potential impact	**Increased soil erosion.**	
Nature of impact	Negative. Indirect.	
Legal requirements	Conservation of Agricultural Resources Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Indirect.	Negative. Indirect.
Extent of impact	Regional.	Regional.
Duration of impact	Short term	Short term
Intensity	Medium	Medium
Probability of occurrence	Medium	Medium
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Medium	Medium
Mitigation measures (EMP requirements)	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.	See Borrow Pit Rehabilitation notes and EMP (Appendix 4K)

	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.	
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion :		

7.1.2 Raising Tzaneen Dam

Description of potential impact	**Transformation and fragmentation of habitat for plants.**	
Nature of impact	Negative. Direct.	
Legal requirements	National Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Permanent	Permanent
Intensity	Medium	Medium
Probability of occurrence	High	High

Confidence of assessment	High	High
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)	1. A plant rescue operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species from any fragments of untransformed vegetation; scientific institutions should also be invited to collect live specimens.	
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion		

Description of potential impact	**Increased harvesting pressure on vegetation.**	
Nature of impact	Negative. Indirect.	
Legal requirements	Limpopo Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Indirect.	Negative. Indirect.
Extent of impact	Local	Local
Duration of impact	Long term	Long term
Intensity	Low	Low
Probability of occurrence	Medium	Medium
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)	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.	
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion		

Description of potential impact	**Impoverishment of populations of important plants.**	
Nature of impact	Negative. Direct.	
Legal requirements	National Environmental Management: Biodiversity Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Permanent	Permanent
Intensity	Low	Low
Probability of occurrence	Low	Medium
Confidence of assessment	High	High
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)	1. A plant rescue operation should be implemented, targeting the rescue and translocation of threatened, endemic and protected species from any fragments of untransformed vegetation; scientific institutions should also be invited to collect live specimens.	

Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion :		

7.2 VERTEBRATE FAUNA

7.2.1 Nwamitwa Dam

Description of potential impact	**Transformation and fragmentation of habitat for animals.**	
Nature of impact	Negative. Direct.	
Legal requirements	National Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Short term (Bulk supply routes) Permanent	Short term (Bulk supply routes) Permanent
Intensity	Medium (Bulk supply routes, reservoirs) High (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Probability of occurrence	Medium (Bulk supply routes, reservoirs) High (Dam)	Medium (Bulk supply routes, reservoirs) High (Dam)
Confidence of assessment	High	High
Level of significance before mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Mitigation measures (EMP requirements)	1. 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.	
Level of significance after mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Cumulative Impacts		Increased settlement around dam resulting in further fragmentation and loss of untransformed habitat
Comments or Discussion		

Description of potential impact	**Increased poaching of animals.**	
Nature of impact	Negative. Direct.	
Legal requirements	Limpopo Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Indirect.	Negative. Indirect.
Extent of impact	Local.	Local.
Duration of impact	Long term	Long term
Intensity	Medium (Bulk supply routes, reservoirs) High (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Probability of occurrence	High	High
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Mitigation measures (EMP requirements)	1. Construction teams should not be allowed access to areas of untransformed vegetation where	1. No suitable mitigation for increased poaching as a result of people settling around the shores of

	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 and poachers should be prosecuted under relevant provincial legislation.	the dam.
Level of significance after mitigation	Low	Medium (untransformed habitats) Low (transformed habitats)
Cumulative Impacts		Increased settlement around dam resulting in more poaching opportunities arising, particularly regarding Hippo, Nile Crocodile and Python.
Comments or Discussion		

Description of potential impact	**Impoverishment of populations of important animals.**	
Nature of impact	Negative. Direct.	
Legal requirements	Limpopo Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Short term (Bulk supply routes) Permanent	Short term (Bulk supply routes) Permanent
Intensity	Medium (Bulk supply routes, reservoirs) High (Dam)	Low (Bulk supply routes, reservoirs) High (Dam)
Probability of occurrence	Medium (Bulk supply routes, reservoirs) High (Dam)	Medium (Bulk supply routes, reservoirs) High (Dam)

Confidence of assessment	High	High
Level of significance before mitigation	Medium (untransformed habitats) Low (transformed habitats)	Medium (untransformed habitats) Low (transformed habitats)
Mitigation measures (EMP requirements)	1. 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.	1. Dense vegetation should be allowed to re-grow along parts of the dam shoreline in order to regain habitat for certain Red Data bird species, viz. African Finfoot and White-backed Night Heron.
Level of significance after mitigation	Low	Low
Cumulative Impacts		Increased settlement around dam resulting in further fragmentation and loss of untransformed habitat for important animals.
Comments or Discussion		

Description of potential impact	**Dam acts as a barrier to terrestrial animal movement, particularly reduction of riparian zone as a migration corridor.**	
Nature of impact	Negative. Direct.	
Legal requirements	Not aware of any.	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Regional.	Regional.
Duration of impact	Permanent (Dam)	Permanent (Dam)
Intensity	Medium (Dam)	High (Dam)
Probability of occurrence	High	High

Confidence of assessment	Medium	High
Level of significance before mitigation	Low	Medium
Mitigation measures (EMP requirements)		1. Dense vegetation should be allowed to re-grow along most of the dam shoreline in order to regain a functional riparian corridor.
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion		

7.2.2 Raising Tzaneen Dam

Description of potential impact	**Transformation and fragmentation of habitat for animals.**	
Nature of impact	Negative. Direct.	
Legal requirements	National Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Permanent	Permanent
Intensity	Low	Low
Probability of occurrence	High	High
Confidence of assessment	High	High
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)	None	None
Level of significance after mitigation	Low	Low

Cumulative Impacts		
Comments or Discussion		

Description of potential impact	**Increased poaching of animals.**	
Nature of impact	Negative. Direct.	
Legal requirements	Limpopo Environmental Management Act	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Negative. Indirect.	Negative. Indirect.
Extent of impact	Local.	Local.
Duration of impact	Long term	Long term
Intensity	Medium	Low
Probability of occurrence	Medium	Medium
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)		
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion		

Description of potential impact	**Impoverishment of populations of important animals.**	
Nature of impact	Negative. Direct.	
Legal requirements	Limpopo Environmental Management Act	
Stage	Pre-Construction and Construction	Operation

Nature of Impact	Negative. Direct.	Negative. Direct.
Extent of impact	Local.	Local.
Duration of impact	Permanent	Permanent
Intensity	Low	Low
Probability of occurrence	Medium	Medium
Confidence of assessment	High	High
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)		
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion		

7.3 INVERTEBRATE FAUNA

7.3.1 Nwamitwa Dam

The proposed dam and associated processing plant, as well as both proposed borrow pit sites and the reservoir site alternatives except for Command Reservoir "C" alternatives 1-3, all fall within areas of Granite Lowveld or Tsende Mopaneveld. Both of these vegetation types received a "very high" conservation importance value in the desktop assessment of the GLeWaP, and both proved to contain significant populations of protected invertebrate species. The *Colophospermum – Dichrostachys* Plains Woodland component of Granite Lowveld appears of particular importance as populations of a rare and protected beetle species (*Dromica oberprieleri*) with a limited distribution and another rare but less restricted species (*Megacephala regalis vansoni*) were found in this habitat type. It is therefore inevitable that the proposed developments will have a negative impact on conservation-important invertebrate populations; the likely impacts and proposed mitigation options are described below, but these assessments must be considered as preliminary until all specimen identification has been completed.

Description of potential impact	Transformation of habitat for protected invertebrate species	
Nature of impact	Direct and negative	
Legal requirements	NEMBA, LEMA	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Direct and negative	Direct and negative
Extent of impact	Local	Local
Duration of impact	Long-term / Permanent	Long-term / Permanent
Intensity	High	High
Probability of occurrence	High	High
Confidence of assessment	High	High
Level of significance before mitigation	High	High
Mitigation measures (EMP requirements)	None (see comments)	None (see comments)
Level of significance after mitigation	N/A	N/A
Cumulative Impacts	Probable, due to surrounding transformation of land for agriculture	Probable, due to surrounding transformation of land for agriculture
Comments or Discussion: Loss of habitat is inevitable if construction of the Nwamitwa dam proceeds; the only mitigation possible is to build a lower dam resulting in less inundation.		

Description of potential impact	Death of populations or individuals of protected invertebrate species	
Nature of impact	Direct and negative	
Legal requirements	NEMBA, LEMA	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Direct and negative	Direct and negative
Extent of impact	Local	Local

Duration of impact	Permanent	Permanent
Intensity	High	High
Probability of occurrence	High	High
Confidence of assessment	High	High
Level of significance before mitigation	High	High
Mitigation measures (EMP requirements)	• Initial flooding of habitat areas to be carried out during the active season of the adult stage of the beetle species to allow them to avoid drowning; larvae will not be able to escape	
Level of significance after mitigation	Medium if sufficient untransformed habitat remains after filling of dam to maintain viable populations	Medium if sufficient untransformed habitat remains after filling of dam to maintain viable populations
Cumulative Impacts	Probable, due to surrounding transformation of land for agriculture and use of pesticides	Probable, due to surrounding transformation of land for agriculture and use of pesticides
Comments or Discussion:		

7.3.2 Pipeline installation, Reservoir Construction, Borrow Pits, Road Re-alignments

Final information on specimen identifications is needed before data can be analysed to properly assess the above. Some recommendations regarding preferred alternatives and can however be made on the basis of an initial assessment during the field surveys:

1. The site chosen for Command Reservoir A appears very disturbed and overgrazed, with the insect community almost completely dominated by *Anoplolepis custodiens* (an ant which thrives in disturbed areas); there seems little reason to oppose development of this site.
2. In strong contrast, the site chosen for Command Reservoir B appears to be a very undisturbed and sensitive site; as there appears to be no alternative, great

care should be taken to minimise damage to the area surrounding the reservoir itself.

3. Alternative 1 appears the most suitable option for Command Reservoir C as it is the most disturbed, but care will be needed to position it so that the pipeline alignment does not need to traverse the wetland area and drainage line just below it. Of the alternative sites, both areas marked as Alternative 3 are moderately disturbed through wood collecting and overgrazing, while Alternative 2 is situated in a wetland and its associated pipeline route follows a drainage line.
4. Alternative 3 would be the preferred option for Command Reservoir D as it is the most disturbed of the three alternatives and would require the shortest length of pipeline through untransformed areas. Alternative 2 would be the next most favoured option from an invertebrate perspective, with alternative 1 being the most sensitive and hence not recommended.
5. In general it is recommended that pipeline alternatives within road reserves be used as those not following roads traverse some diverse, undisturbed and sensitive areas (including drainage lines and wetlands). In particular it is recommended that the pipeline from the water treatment plant (WTP) to Command Reservoir A should follow the more western of the two alternatives indicated.
6. Road re-alignments in the proposed Nwamitwa Dam area are all within the same vegetation community within Granite Lowveld, namely *Colophospermum – Dichrostachys* Plains Woodland, which was identified as the most sensitive in the project area from an invertebrate perspective, so the only criterion to distinguish between alternatives is the amount of untransformed land they traverse. Considering land to be inundated as effectively transformed (including parts that are currently not transformed) this gives an ordering (from lowest to highest negative impact from an invertebrate perspective) of: **1)** Alternative 4, **2)** Alternative 1 / Alternative 3 (there is no significant difference between these), **3)** Alternative 2, with Alternative 5 marginally reducing the impact of any of alternatives 1, 2 and 3 (Alternative 5 is clearly not an applicable option if Alternative 4 is followed). There is little difference in predicted impacts from an invertebrate perspective between Alternatives 1, 3 and 4, so cost would probably be the driving factor here, with the practical aspects of long spans of causeways being a major concern. Unfortunately, the only option that effectively avoids the need for long causeways is Alternative 2, which is option with the highest negative impact from an invertebrate perspective. However, it should also be

borne in mind that the impacts of the road realignments will be of far lower significance than those resulting from the dam impoundment. If Alternative 2 is followed, careful attention should be paid to mitigating the barrier effect that this would have, as it bisects a fairly large area of untransformed land; this could most effectively be done by including substantial underpasses to allow movement of small flightless animals.

7.3.3 Raising Tzaneen Dam

No invertebrate surveys of the area surrounding the existing Tzaneen dam were undertaken, so probable impacts can be estimated only on the basis of an assessment of the conservation value of the vegetation type (Tzaneen Sour Bushveld) within which it lies. Both the desktop assessment and the results of the field surveys in the project area suggest that Tzaneen Sour Bushveld is of lower invertebrate biodiversity value than the Granite Lowveld within which the proposed Nwamitwa dam lies. In combination with the fact that the same additional capacity could probably be achieved with a lower additional area of inundated land by raising the Tzaneen dam, and that much of the area surrounding the Tzaneen dam is already transformed (under cultivation or forest plantations) it is to be expected that this option would result in substantially lower negative impacts on invertebrate biodiversity. The possibility that there might be additional impacts arising from the need for further pipeline infrastructure must however also be taken into account.

Description of potential impact	Transformation of habitat for protected invertebrate species	
Nature of impact	Direct and negative	
Legal requirements	NEMBA, LEMA	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Direct and negative	Direct and negative
Extent of impact	Local	Local
Duration of impact	Long-term / Permanent	Long-term / Permanent
Intensity	Low	Low

Probability of occurrence	Low	Low
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)	None	None
Level of significance after mitigation	N/A	N/A
Cumulative Impacts		
Comments or Discussion:		

Description of potential impact	Death of populations or individuals of protected invertebrate species	
Nature of impact	Direct and negative	
Legal requirements	NEMBA, LEMA	
Stage	Pre-Construction and Construction	Operation
Nature of Impact	Direct and negative	Direct and negative
Extent of impact	Local	Local
Duration of impact	Permanent	Permanent
Intensity	Low	Low
Probability of occurrence	Medium	Medium
Confidence of assessment	Medium	Medium
Level of significance before mitigation	Low	Low
Mitigation measures (EMP requirements)	None	None
Level of significance after mitigation	Low	Low
Cumulative Impacts		
Comments or Discussion:		

8. RECOMMENDED MITIGATION MEASURES

The recommended mitigation measures apply to the Pre-Construction, Construction and Operation Phases.

8.1 FLORA

8.1.1 Nwamitwa Dam

Objective

To minimise transformation and fragmentation of habitat for plants.

Targets

- Maintenance of viable corridors of natural habitat in the project area.
- Minimise impact on natural vegetation

Method Statements

- All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats.
- Establish a holding nursery for local plants suitable for re-planting on rehabilitated surfaces after closure (construction camp, borrow pits).
- Rehabilitate borrow pits and construction camp according to DWAF's Integrated Environmental Management Series No.6: Environmental Best Practice Specifications (Construction), which is summarised in Appendix 4K.

Objective

To minimise harvesting pressure on vegetation

Targets

- Maintenance of vegetation in natural condition surrounding infrastructure.

Method Statements

- 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.
- Allow local communities access to plant resources below full supply level, but not before plant rescue has been completed.
- All pipeline routes through untransformed vegetation should be regarded as last resorts; routes should whenever possible traverse transformed habitats.

Objective

To minimise invasion by alien plants

Targets

- Maintenance of vegetation in natural condition surrounding infrastructure.

Method Statements

- Restrict development footprint to absolute minimum area necessary.
- Conduct annual monitoring of dam surface for invasion by exotic aquatic plants.
- Rehabilitate disturbed sites through ripping of soil surface and hydroseeding with a seed mix slurry of relevant indigenous grasses.

Objective

To minimise the loss of conservation-important plant species

Targets

- Maintenance of viable populations of conservation-important plant species.

Method Statements

- 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)
- All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats.

Objective

To minimise the disruption of the natural fire regime on either side of proposed dam.

Targets

- Maintenance of equivalent fire regimes on both sides of the dam.

Method Statements

- Burns on both sides of dam should take place at similar frequency and at similar times.
- Not sure whose responsibility this would be.

Objective

To minimise the erosion and loss of topsoil from construction sites and borrow pits.

Targets

- Return soil surfaces to previous state after closure.

Method Statements

- Topsoil should be stockpiled separately from overburden; piles not to exceed 2 metres in height and not exceed a slope of 1:3.

- These stockpiles should not be stored for longer than 6 months and should be protected against erosion and weeds.
- See **Appendix 4K**.

8.1.2 Raising Tzaneen Dam

Objective

To minimise harvesting pressure on vegetation

Targets

- Maintenance of vegetation in natural condition surrounding infrastructure.

Method Statements

- 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.

Objective

To minimise invasion by alien plants

Targets

- Maintenance of vegetation in natural condition surrounding infrastructure.

Method Statements

- Restrict development footprint to absolute minimum area necessary
- Rip and hydroseed disturbed surfaces with indigenous grasses

Objective

To minimise the loss of conservation-important plant species

Targets

- Maintenance of viable populations of conservation-important plant species.

Method Statements

- 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.

8.2 VERTEBRATE FAUNA

8.2.1 Nwamitwa Dam

Objective

To minimise transformation and fragmentation of habitat for vertebrate fauna.

Targets

- Maintenance of viable corridors of natural habitat in the project area.
- Minimise impact on natural vegetation

Method Statements

- All pipeline routes through untransformed vegetation should be regarded as least favourable options; routes should whenever possible traverse transformed habitats.
- 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.
- Dense vegetation should be allowed to re-grow along most of the dam shoreline in order to regain a functional riparian corridor.

Objective

To minimise poaching of vertebrate fauna.

Targets

Maintenance of viable populations of vertebrate fauna

Method Statements

- 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 and poachers should be prosecuted under relevant provincial legislation.

Objective

To minimise loss of conservation-important vertebrate fauna.

Targets

Maintenance of viable populations of conservation-important vertebrate fauna

Method Statements

- 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.
- Dense vegetation should be allowed to re-grow along parts of the dam shoreline in order to regain habitat for certain Red Data bird species, viz. African Finfoot and White-backed Night Heron.

8.2.2 Raising Tzaneen Dam

None

8.3 INVERTEBRATE FAUNA

8.3.1 Nwamitwa Dam

Objectives

- **To minimise loss of individuals of rare and protected beetle species.**

- **To minimise loss of protected scorpion and baboon spider species.**

Targets

Viable populations of *Dromica oberprieleri* and *Megacephala regalis vansoni,* as well as other protected beetle species, remain after completion of construction activities.

- No impacts on populations of Flat Rock Scorpions (*Hadogenes troglodytes*) and minimal loss of individuals of protected baboon spiders and other protected scorpion species including *Opistophthalmus glabrifrons* and *Opistacanthus asper*.

Method Statements

- Filling of Nwamitwa Dam, if approved, should be done as slowly as feasible and as far as possible within the adult activity period of Dromica oberprieleri (October - January)
- Pipeline and reservoir construction should avoid areas with rocky outcrops suitable as habitat for H. troglodytes, area disturbed during construction should be minimised as far as is feasible so as to reduce impacts on baboon piders and other scorpion species.

8.3.2 Raising Tzaneen Dam

None

9. CONSULTATION PROCESS

Engagement with Interested and Affected Parties (I&APs) forms an integral component of the EIA process. I&APs have an opportunity at various stages throughout the EIA process to gain more knowledge about the proposed project, to provide input into the process and to verify that their issues and concerns have been addressed.

The proposed project was announced in July 2007 to elicit comment from and register I&Aps from as broad a spectrum of public as possible. The announcement was done by the following means:

- the distribution of Background Information Documents (BIDs) in four languages,
- placement of site notices in the project area,
- publishment of advertisements in regional and local newspapers,
- publishment of information on the DWAF web site,
- announcement on local and regional radio stations; and
- the hosting of five focus group meetings in the project area.

Comments received from stakeholders were captured in the Issues and Response Report (IRR) which formed part of the FINAL Scoping Report (DSR). The DSR was made available for public comment in October 2007. A summary of the DSR (translated into four languages) was distributed to all stakeholders and copies of the full report at public places. Two stakeholder meetings were held in October to present and discuss the DSR. The Final Scoping Report was made available to stakeholders in December 2007.

The availability of the FINAL Environmental Impact Assessment Report, its summary (translated in four languages), the various specialist studies, the Environmental Management Plans and Programmes will be announced by way of personalized letters to stakeholders and the placement of advertisements in regional and local newspapers. The FINAL documents will be made available to I&APs for the inputs and comments. Two stakeholder meetings are planned to present the contents of the documents and to discuss the findings of the study.

The Draft Environmental Impact Assessment Report, its summary (translated in four languages), the various specialist studies, the Environmental Management Plans and Programmes were made available for a period of thirty (30 days) for stakeholders to comment. Stakeholder comments were taken into consideration with the preparation of the final documents. The availability of the final documents will be announced prior to submission to the decision-making authority.

10. COMMENTS RECEIVED

ISSUES REALTED TO THE ECOLOGY (VEGETATION) AND CONSERVATION		
ISSUE	**RAISED BY**	**SOURCE**
a. That the proposed project should improve the ecology along the river and the new proposed dam and should also focus on the protection of rare and sensitive fauna and flora in the proposed dam basin.	Daniel Mathye, Thomas Mathebula, Stanley Baloyi, Samson Ngobeni (headman Valoyi Tribal Authority), Oris Mgobeni, Macson Hlahleni – resident Nwamitwa village. MK (Mick) Angliss, Limpopo Dept Economic Dev, Env & Tourism Ms CA (Chantal) Matthys, DWAF: WA&IU (Environment & Recreation). Isaac Makatu, DEAT (Mopani)	Written submission (BID comment sheet) and attendance at meeting at Nwamitwa Tribal office, 1 August 2007. Written submission (BID comment sheet). Written submission (BID comment sheet). Written submission (BID comment sheet).
b. That the possible increase of invader plants species that might crowd out the indigenous riverine plants, congesting the water place be investigated.	Maria Hendricks, Blue Sands Trading, Tzaneen.	Written submission (BID comment sheet).
c. That the impact of the proposed new project be investigated on the ecosystem and biodiversity, aquatic habitat, functioning of species.	CA (Chantal) Matthys, DWAF: WA&IU (Environment & Recreation).	Written submission (BID comment sheet).
d. That botanical and zoological surveys are carried out with reference to the latest publication on fauna and flora distribution, particularly the latest VegMap. Attention must be paid to the possible occurrence of biodiversity hotspots in the area.	Luke Perkins, Wildlife and Environment Society of SA (WESSA).	Written submission (BID comment sheet).
e. That the riverine bush – recovery of wood should be considered.	JS (Johan) Barnard, Landowner.	Written submission (BID comment sheet).
f. That indigenous knowledge on natural trees around the proposed project area be undertaken for record purposes.	Andrew Tshivhase, DWAF – Forestry, Limpopo Region, Louis Trichardt.	Written submission (BID comment sheet).

ISSUES REALTED TO THE ECOLOGY (VEGETATION) AND CONSERVATION		
g. That information is needed on whether the precious trees on the river bed will be utilised effectively?	Willie Muller, Landowner.	Attended meeting at Letaba Junction on 1 August 2007 and the meeting held at the offices of the Groot Letaba Water User Association on 31 July 2007.
h. That mitigation should receive a high priority when protected species are removed.	Andrew Tshivhase, DWAF – Forestry, Limpopo Region, Louis Trichardt.	Written submission (BID comment sheet).
i. That a license should be applied for to remove protected species in the proposed dam basin area.	Andrew Tshivhase, DWAF – Forestry, Limpopo Region, Louis Trichardt.	Written submission (BID comment sheet).
j. The Biodiversity offset mitigation measures for the Red Data, endemic and near endemic species that will be lost to the dam construction should be investigated.	DEAT: Biodiversity on conservation division	Scoping Report
k. The Mean Annual Runoff that can support the downstream ecology should be investigated as the conservation of the dam will alter the stream flow and mean Annual Runoff	DEAT: Biodiversity on conservation division	Scoping Report
l. Construction of the dam will have impact on aquatic species migratory routes and some might lose the spawning areas and habitat that support the critical stages of their life cycle e.g. the larval stage. Therefore migratory aquatic species should be investigated.	DEAT: Biodiversity on conservation division	Scoping Report
m. There is a need to study the effects of this dam to the ecological functions and character of the downstream in the Kruger National Park, especially the impacts on the protected wild flora and fauna that are entirely dependent on the river system for survival.	DEAT: Biodiversity on conservation division	Scoping Report

11. OTHER INFORMATION REQUESTED BY THE AUTHORITY

No other information was requested by the authority.

12. CONCLUSION

The proposed Nwamitwa Dam and associated bulk storage scheme is partially situated within a Vulnerable vegetation type, namely Granite Lowveld, while the raising of the Tzaneen Dam wall would potentially impact an Endangered vegetation type, namely Tzaneen Sour Bushveld. However, several intact portions of Granite Lowveld exist within the proposed dam basin, while all vegetation around the shoreline of the Tzaneen Dam appears to be transformed or degraded, and not representative of Tzaneen Sour Bushveld.

Of the three vegetation communities identified during fieldwork, *Colophospermum – Dichrostachys* Plains Woodland and *Combretum – Bridelia* Rocky Outcrop Woodland are the most important for flora. All three vegetation communities are of Medium importance to Vertebrate Fauna, while *Colophospermum – Dichrostachys* Plains Woodland has a high importance for Invertebrate Fauna, followed by *Combretum – Bridelia* Rocky Outcrop Woodland (Medium-High). Integration of these results show that *Colophospermum – Dichrostachys* Plains Woodland has the highest importance for terrestrial biota (High-Medium), followed by *Combretum – Bridelia* Rocky Outcrop Woodland (Medium-Low) and *Acacia - Combretum* Riparian Woodland (Low-Medium). Plains Woodland is also the vegetation community most likely to be impacted by the proposed Nwamitwa Dam and the pipelines of the bulk storage scheme.

At least two rare and localised protected beetle species are likely to be significantly impacted by the Nwamitwa Dam, as well as populations of numerous other protected but widespread beetle, scorpion and spider species. As the most significant of these impacts will result from inundation of the dam impoundment area, and hence cannot be effectively mitigated, consideration should be given to the alternative option of raising the Tzaneen Dam wall.

If the Nwamitwa Dam were to go ahead, then strict adherence to proposed mitigations should be followed. This would include *inter alia* timing of flooding of the basin, rescue operations prior to inundation, and locating of pipeline routes in currently transformed or degraded habitats only. An additional recommendation, although not a mitigation, would be for the EMP to 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.

13. ACKNOWLEDGEMENTS

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APPENDIX B 1: PLANT SPECIES RECORDED IN THREE VEGETATION COMMUNITIES OF THE PROJECT AREA

SCIENTIFIC NAME	FAMILY	Growth Form	Red Data	Endemic	Protected	*Acacia* - *Combretum* Riverine Woodland	*Colophospermum* - *Dichrostachys* Plains Woodland	*Combretum* - *Bridelia* Rocky Outcrop Woodland
Ferns								
Cheilanthes viridis	Pteridaceae	fern					+	+
Pellaea calomelanos	Pteridaceae	fern						1
Selaginella dregei	Selaginellaceae	fern					+	
Subtotal		3	0	0	0	0	2	2
Dicotyledons								
Barleria cf.ovata	Acanthaceae	dwarf shrub						+
Crabbea acaulis	Acanthaceae	herb					+	+
Dyschoriste sp. (no flowers)	Acanthaceae	herb					1	
Hypoestes sp.	Acanthaceae	herb				2		
Justicia flava	Acanthaceae	herb				1	1	
Ruellia cf.cordata	Acanthaceae	herb					+	
Ruellia cf.patula	Acanthaceae	herb					1	
Thunbergia sp. (climber)	Acanthaceae	climber					+	+
Achyranthes aspera *	Amaranthaceae	herb				1		+

Cyathula cylindrica	Amaranthaceae	herb				1		+
Kyphocarpa angustifolia	Amaranthaceae	herb				+	1	1
Pupalia lappacea	Amaranthaceae	herb				+	1	1
Lannea discolor	Anacardiaceae	tree					+	1
Lannea stuhlmannii	Anacardiaceae	dwarf shrub				1	2	
Ozoroa paniculosa	Anacardiaceae	tree					1	1
Ozoroa spherocarpa	Anacardiaceae	tree						+
Rhus gueinzii	Anacardiaceae	shrub					1	+
Rhus leptodictya	Anacardiaceae	tree						1
Sclerocarya birrea subsp.cafra	Anacardiaceae	tree			NFA	1	2	1
Annona senegalensis	Annonaceae	tree						+
Hexalobus monopetalus	Annonaceae	tree						+
Xylopia cf.parviflora	Annonaceae	tree						+
Steganotaenia araliacea	Apiaceae	tree						+
Asclepias physocarpa	Apocynaceae	herb					1	+
Asclepias sp. (photo)	Apocynaceae	herb					+	
Huernia sp.	Apocynaceae	succulent			LEMA		+	
Riocreuxia picta	Apocynaceae	climber			LEMA	1		
Sarcostemma viminale	Apocynaceae	climber				+	+	1
Secamone sp.	Apocynaceae	herb				1		
*Aristolochia elegans**	Aristolochiaceae	herb				2		
*Ageratum houstonianum **	Asteraceae	herb				1		
*Bidens pilosa**	Asteraceae	herb				1		1
*Schkuhria pinnata**	Asteraceae	herb					1	1
Senecio sp.1	Asteraceae	herb						+
*Tagetes minuta **	Asteraceae	herb						1
Vernonia myriacantha	Asteraceae	shrub				1		
Vernonia sp.	Asteraceae	shrub				+		
Xanthium strumarium	Asteraceae	herb				1		
Balanites maughamii	Balanitaceae	tree			NFA		1	+
Cordia sinensis	Boraginaceae	shrub					1	1
Ehretia amoena	Boraginaceae	tree					1	+

Ehretia obtusifolia	Boraginaceae	tree					+	
Ehretia rigida	Boraginaceae	tree				1		+
Commiphora africana	Burseraceae	tree					1	
Commiphora glandulosa	Burseraceae	tree					+	+
Commiphora mollis	Burseraceae	tree					+	1
Wahlenbergia sp.	Camapanulaceae	herb						+
Capparis cf.sepiaria	Capparaceae	shrub				1		
Eleaodendron transvaalense	Celastraceae	tree	LC		NFA		+	1
Gymnosporia glaucophylla	Celastraceae	tree					2	+
Gymnosporia senegalensis	Celastraceae	tree				1	+	+
Gymnosporya maranguense	Celastraceae	tree					+	
Maytenus undata	Celastraceae	tree						+
Combretum apiculatum	Combretaceae	tree					2	3
Combretum collinum gazense	Combretaceae	tree					+	
Combretum collinum suluense	Combretaceae	tree					1	1
Combretum erythrophyllem	Combretaceae	tree				3		
Combretum hereroense	Combretaceae	tree				1	1	+
Combretum imberbe	Combretaceae	tree			NFA		2	+
Combretum molle	Combretaceae	tree					+	1
Combretum mossambicense	Combretaceae	tree						+
Combretum zeyheri	Combretaceae	tree					1	2
Terminalia brachystemma	Combretaceae	tree					+	+
Terminalia sericea	Combretaceae	tree				+	1	+
Ipomoea albivenia	Convolvulaceae	creeper					+	1
Ipomoea sp.	Convolvulaceae	creeper						+
Kalanchoe aff.brachyloba	Crassulaceae	succulent				+		
Cucurbitaceae sp.1	Cucurbitaceae	creeper				+		
Cucurbitaceae sp.2	Cucurbitaceae	creeper				+		
Diospyros mespiliformis	Ebenaceae	tree				2	1	+
Euclea crispa	Ebenaceae	shrub						+
Euclea divinorum	Ebenaceae	tree				+	1	1
Euclea natalensis	Ebenaceae	tree				+		+

Euclea schimperi	Ebenaceae	tree					+	+
Acalypha sp.	Euphorbiaceae	herb						+
Antidesma venosum	Euphorbiaceae	tree						+
Bridelia mollis	Euphorbiaceae	tree					1	2
Croton menyharti	Euphorbiaceae	tree						+
Delachampia capensis	Euphorbiaceae	herb						+
Euphorbia cooperi	Euphorbiaceae	succulent						+
Euphorbia ingens	Euphorbiaceae	succulent					+	1
Flueggea virosa	Euphorbiaceae	shrub				1	1	1
*Jatropha curcas**	Euphorbiaceae	shrub				+		
Phyllanthus reticulatus	Euphorbiaceae	shrub				1	1	+
Pseudolachnostylis maprouneifolia	Euphorbiaceae	shrub						1
*Ricinus communis**	Euphorbiaceae	herb				1		
Spirostachys africana	Euphorbiaceae	tree			LEMA	1	1	
Synadenium cupulare	Euphorbiaceae	tree						+
Tragia meyeriana	Euphorbiaceae	creeper					+	
Tragia sp.	Euphorbiaceae	herb					+	
Abrus laevigatus	Fabaceae	climber						+
Acacia caffra	Fabaceae	tree						+
Acacia erubescens	Fabaceae	tree					+	
Acacia exuvialis	Fabaceae	tree					1	1
Acacia gerrardii	Fabaceae	tree					1	
Acacia grandicornuta	Fabaceae	tree					1	+
Acacia karoo	Fabaceae	tree				+		
Acacia nigrescens	Fabaceae	tree				+	2	1
Acacia nilotica	Fabaceae	tree						1
Acacia polyacantha	Fabaceae	tree				3		
Acacia schweinfurthii	Fabaceae	climber/shrub				1		
Acacia tortilis	Fabaceae	tree					1	
Albizia harveyi	Fabaceae	tree					1	1
Albizia versicolor	Fabaceae	tree						+
Bauhinia galpinii	Fabaceae	climber/shrub				1	+	1

Bolusanthus speciosus	Fabaceae	tree				+	1	
Cassia abreviata	Fabaceae	shrub					+	
Chaemaecrista mimosoides	Fabaceae	herb					+	+
Colophospermum mopane	Fabaceae	tree				1	3	+
Crotalaria laburnifolia	Fabaceae	shrub					+	
Crotalaria sp.1	Fabaceae	dwarf shrub				1		
Dalbergia melanoxylon	Fabaceae	tree				+	1	+
Dichrostachys cinerea subsp. nyassana	Fabaceae	shrub				+	3	1
Indigofera hilaris	Fabaceae	herb						1
Indigofera sp.1	Fabaceae	shrub					+	
Mundulea sericea	Fabaceae	tree					+	1
Ormocarpum trichocarpum	Fabaceae	shrub					+	+
Peltophorum africanum	Fabaceae	tree				1	+	1
Philenoptera violacea	Fabaceae	tree			NFA	1	+	+
Piliostigma thonningii	Fabaceae	shrub						+
Pterocarpus angolensis	Fabaceae	tree			NFA			1
Pterocarpus rotundifolius	Fabaceae	tree				+		1
Rhynchosia caribea	Fabaceae	herb				+	+	
Rhynchosia totta	Fabaceae	herb				+	+	+
Schotia brachypetala	Fabaceae	tree				1	+	
*Senna bicapsularis**	Fabaceae	shrub				1		
Senna cf.pendulina	Fabaceae	shrub				1		
Senna italica	Fabaceae	shrub				+		
Senna petersiana	Fabaceae	tree				+	1	1
Sesbania sesban	Fabaceae	shrub				1		
Tephrosia cf.longipes	Fabaceae	herb						+
Tephrosia cf.rhodesiaca	Fabaceae	herb						+
Tephrosia polystachya	Fabaceae	shrub					1	1
Tephrosia sp.	Fabaceae	herb				+		+
Xanthocercis zambesiaca	Fabaceae	tree					+	
Zornia linearis	Fabaceae	herb						+

Scolopia zeyheri	Flacourtiaceae	tree					+	
Monsonia sp.	Geraniaceae	herb						+
Heteropyxis natalensis	Heteropyxidaceae	tree					+	+
Kirkia acuminata	Kirkiaceae	tree					+	2
Clerodendrum ternatum	Lamiaceae	dwarf shrub					1	1
Hemizygia cf.teucrifolia	Lamiaceae	herb						+
Hemizygia sp.1	Lamiaceae	herb					+	+
Leonotis intermedia	Lamiaceae	herb						+
Ocimum americanum	Lamiaceae	herb					1	+
Plectranthus spicatus	Lamiaceae	shrub					+	
Tinnea rhodesiana	Lamiaceae	shrub					+	
Cyphia stenopetala	Lobeliaceae	herb					+	
Tapinanthus rubromarginatus	Loranthaceae	parasite				+		
Tapinanthus sp.	Loranthaceae	parasite					+	
Galpinia transvaalica	Lythraceae	shrub				+		
Sphedamnocarpus pruriens	Malphigiaceae	climber						+
Abutilon sonneratianum	Malvaceae	shrub				1	1	
Dombeya rotundifolia	Malvaceae	tree						1
Gossypium herbaceum	Malvaceae	herb					+	+
Grewia bicolor	Malvaceae	tree				+	1	+
Grewia flavescens	Malvaceae	tree				1	1	1
Grewia hexamita	Malvaceae	tree					+	+
Grewia monticola	Malvaceae	tree				+	1	1
Hibiscus calyphyllus	Malvaceae	herb				1	1	
Hibiscus sp.	Malvaceae	herb				+		
Hibiscus sp.2 (red, photo)	Malvaceae	herb					+	+
Hibiscus vitifolius	Malvaceae	herb					+	+
Melhania didyma	Malvaceae	herb				1	1	
Melhania prostrata	Malvaceae	herb					+	
Melhania sp.	Malvaceae	shrub				+		
Sida cordifolia	Malvaceae	dwarf shrub					1	
Sida dregei	Malvaceae	dwarf shrub				1		

Waltheria indica	Malvaceae	herb				1	1	1
Trichilia emetica	Meliaceae	tree				1		
Ficus glumosa	Moraceae	tree						1
Ficus ingens	Moraceae	tree						+
Ficus salicifolia	Moraceae	tree						+
Ficus sycamorus	Moraceae	tree				2		
Olax dissitiflora	Olacaceae	tree					+	
Ximenia americana	Olacaceae	tree					+	
Ximenia caffra	Olacaceae	tree					1	
Jasmimum stenolobium	Oleaceae	climber					+	
Jasminum fluminense	Oleaceae	climber				1	1	
Oxalis obliquifolia	Oxalidaceae	herb				+	+	+
Argemone ochraleucha *	Papaveraceae	herb				1		
Adenia digitata	Passifloraceae	climber				1	1	
Ceratotheca triloba	Pedaliaceae	herb					+	+
Dicerocaryum senecioides	Pedaliaceae	creeper					+	+
Persicaria senegalensis	Polygalaceae	herb				1		
Berchemia discolor	Rhamnaceae	tree					+	
Berchemia zeyheri	Rhamnaceae	tree						1
Ziziphus mucronata	Rhamnaceae	tree				1	+	+
Breonadia salicina	Rubiaceae	tree			NFA	+		
Catunaregam spinosa	Rubiaceae	shrub						+
Gardenia volkensii	Rubiaceae	tree					+	+
Pavetta schumanniana	Rubiaceae	shrub					1	1
Psydrax livida	Rubiaceae	shrub					+	+
Kraussia floribunda	Rubiaceae	shrub						+
Vangueria infausta	Rubiaceae	tree					+	1
Dodonaea angustifolia	Sapindaceae	shrub						+
Pappea capensis	Sapindaceae	tree					+	1
Aptosimum procumbens	Scrophulariaceae	herb					+	
Manulea sp.	Scrophulariaceae	herb					+	+
Striga asiatica	Scrophulariaceae	herb						+

Solanum catombelense	Solanaceae	herb						+
*Solanum incanum**	Solanaceae	herb						+
*Solanum mauritianum **	Solanaceae	shrub				1		
Solanum panduriforme	Solanaceae	shrub				+	+	+
*Solanum seaforthianum **	Solanaceae	climber				1		
Sterculia rogersii	Sterculiaceae	tree						1
Strychnos spinosa	Strychnaceae	tree					1	1
Pouzolzia mixta	Urticaceae	shrub				+		+
Urera sp.	Urticaceae	herb				1		
*Lantana camara **	Verbenaceae	shrub				2	1	
Lantana rugosa	Verbenaceae	shrub				+	1	
Leucas capensis	Verbenaceae	herb				+	+	
Lippia javanica	Verbenaceae	herb						+
Lippia wilmsii	Verbenaceae	herb						1
Priva cordifolia	Verbenaceae	herb					+	
Viscum combreticola	Viscaceae	parasite						+
Cissus cactiformis	Vitaceae	climber				+		+
Cissus carnifolia	Vitaceae	climber				+	1	
Cyphostemma sp.	Vitaceae	creeper				+		
Cyphostemma woodii	Vitaceae	creeper					+	1
Rhoicissus revoilii	Vitaceae	climber						+
Rhoicissus tridentata	Vitaceae	climber/shrub					1	+
Subtotal		222	1	0	10	88	125	138
Monocotyledons								
Albuca sp.	Alliaceae	bulb						+
Boophane disticha	Amaryllidaceae	bulb			LEMA		+	1
Scadoxus sp.	Amaryllidaceae	bulb			LEMA			+
Chlorophytum sp.	Anthericaceae	bulb						+
Stylochaeton natalense	Araceae	bulb					+	+
Asparagus angusticladus	Asparagaceae	shrub					+	
Asparagus cf.buchananii	Asparagaceae	shrub					+	
Asparagus cooperi	Asparagaceae	shrub				+	1	1

Asparagus suaveolens	Asparagaceae	climber					1	1
Aloe cf.chabaudii	Asphodelaceae	succulent					+	
Aloe cryptopoda	Asphodelaceae	succulent			LEMA			+
Aloe greatheadii var.davyana	Asphodelaceae	succulent				+	+	+
Aloe marlothii	Asphodelaceae	succulent					+	+
Commelina africana	Commelinaceae	herb						+
Commelina benghalensis	Commelinaceae	herb				+		
Commelina cf.erecta	Commelinaceae	herb						+
Cyperus cf.rupestris	Cyperaceae	sedge					+	+
Cyperus leptocladus	Cyperaceae	sedge					1	
Cyperus sp.	Cyperaceae	sedge				+		
Kyllinga alba	Cyperaceae	sedge				+		
Sanseviera hyacinthoides	Dracaenaceae	bulb						+
Ledebouria cf.floribunda	Hyacinthaceae	bulb					+	1
Ansellia africana	Orchidaceae	epiphyte	LC		LEMA		+	+
Aristida congesta	Poaceae	grass				1	1	1
Aristida sciurus	Poaceae	grass				+	1	
Brachiaria serrata	Poaceae	grass					+	
Brachiaria sp.	Poaceae	grass					+	
Cymbopogon cf.excavatus	Poaceae	grass					1	
Cynodon dactylon	Poaceae	grass				1	1	+
Digitaria eriantha	Poaceae	grass					1	+
Enneapogon conchroides	Poaceae	grass				+	1	1
Eragrostis curvula	Poaceae	grass				1		+
Eragrostis gummiflua	Poaceae	grass				+		
Eragrostis superba	Poaceae	grass						+
Heteropogon contortus	Poaceae	grass				1	1	1
Hyperthelia dissoluta	Poaceae	grass				+	1	1
Melinis nerviglumis	Poaceae	grass						+
Melinis repens	Poaceae	grass				1	1	1
Panicum maximum	Poaceae	grass				2	2	1
Perotis patens	Poaceae	grass					+	+

Phragmites australis	Poaceae	grass				2		
Pogonarthria squarrosa	Poaceae	grass				1	1	+
Setaria megaphylla	Poaceae	grass				1		
Setaria sp.	Poaceae	grass						+
Setaria sphacelata	Poaceae	grass						+
Sorghum bicolor	Poaceae	grass				1		
Themeda triandra	Poaceae	grass					2	1
Tragus berteronianus	Poaceae	grass				1	1	1
Trichoneura grandiglumis	Poaceae	grass					1	+
Urochloa mossambica	Poaceae	grass				1	2	1
Xerophyta retinervis	Vellociaceae	geophyte					+	+
Subtotal		51	1	0	4	21	32	36
Total		276	2	0	14	109	159	176

APPENDIX B 2: PLANT SPECIES RECORDED IN PROPOSED INFRASTRUCTURE FOOTPRINTS OF THE PROJECT AREA

SCIENTIFIC NAME	FAMILY	Growth Form	Red Data	Endemic	Protected	DAM BASIN	BORROW PITS			RESERVOIRS							PIPELINES		
							5 (Near dam wall)	1 & 2	3 & 4	1	2	3	4	5	6 & 7	10	Hlohlokwe	Jasi	Gakomkgwathi
Ferns																			
Cheilanthes viridis	Pteridaceae	fern									x				x			x	
Pellaea calomelanos	Pteridaceae	fern													x				
Selaginella dregei	Selaginellaceae	fern																x	
Subtotal		3	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	2	0
Dicotyledons																			
Barleria cf.ovata	Acanthaceae	dwarf shrub												x					
Crabbea acaulis	Acanthaceae	herb												x	x			x	
Dyschoriste sp. (no flowers)	Acanthaceae	herb				x	x		x									x	
Hypoestes sp.	Acanthaceae	herb				x													
Justicia flava	Acanthaceae	herb				x	x											x	
Ruellia cf.cordata	Acanthaceae	herb																x	
Ruellia cf.patula	Acanthaceae	herb							x				x	x					
Thunbergia sp. (climber)	Acanthaceae	climber													x			x	
Achyranthes aspera *	Amaranthaceae	herb				x		x					x						
Cyathula cylindrica	Amaranthaceae	herb				x									x				
Kyphocarpa angustifolia	Amaranthaceae	herb				x	x	x	x		x		x		x		x	x	x
Pupalia lappacea	Amaranthaceae	herb					x		x				x		x			x	
Lannea discolor	Anacardiaceae	tree					x					x		x					
Lannea stuhlmannii	Anacardiaceae	dwarf shrub				x			x									x	

Ozoroa paniculosa	Anacardiaceae	tree					x		x	x		x			x	x	x	x	
Ozoroa spherocarpa	Anacardiaceae	tree								x									
Rhus gueinzii	Anacardiaceae	shrub													x			x	
Rhus leptodictya	Anacardiaceae	tree								x		x			x		x		
Sclerocarya birrea subsp.cafra	Anacardiaceae	tree			NFA		x	x	x	x	x	x	x		x	x	x	x	x
Annona senegalensis	Annonaceae	tree									x								
Hexalobus monopetalus	Annonaceae	tree													x				x
Xylopia cf.parviflora	Annonaceae	tree	LC								x								
Steganotaenia araliacea	Apiaceae	tree													x				
Asclepias physocarpa	Apocynaceae	herb						x			x		x						
Asclepias sp. (photo)	Apocynaceae	herb															x		
Huernia sp.	Apocynaceae	succulent			LEMA													x	
Riocreuxia picta	Apocynaceae	climber			LEMA			x											
Sarcostemma viminale	Apocynaceae	climber					x	x	x									x	
Secamone sp.	Apocynaceae	herb					x											x	
*Aristolochia elegans**	Aristolochiaceae	herb				x													
*Ageratum houstonianum **	Asteraceae	herb				x													
*Bidens pilosa**	Asteraceae	herb				x							x						
*Schkuhria pinnata**	Asteraceae	herb								x			x						
Senecio sp.1	Asteraceae	herb												x					
*Tagetes minuta **	Asteraceae	herb									x								
Vernonia myriacantha	Asteraceae	shrub				x													
Vernonia sp.	Asteraceae	shrub					x												
Xanthium strumarium	Asteraceae	herb				x		x											
Balanites maughamii	Balanitaceae	tree			NFA						x								x
Cordia sinensis	Boraginaceae	shrub								x			x		x		x	x	x
Ehretia amoena	Boraginaceae	tree							x	x			x		x	x		x	
Ehretia obtusifolia	Boraginaceae	tree															x	x	
Ehretia rigida	Boraginaceae	tree				x			x						x				
Commiphora africana	Burseraceae	tree				x	x	x	x									x	x
Commiphora mollis	Burseraceae	tree								x					x		x		x
Commiphora glandulosa	Burseraceae	tree							x						x				

Wahlenbergia sp.	Camapanulaceae	herb												x					
Capparis cf.sepiaria	Capparaceae	shrub						x											
Eleaodendron transvaalense	Celastraceae	tree	LC		NFA										x		x	x	
Gymnosporia glaucophylla	Celastraceae	tree				x	x			x							x	x	
Gymnosporia senegalensis	Celastraceae	tree					x	x				x				x		x	
Gymnosporya maranguense	Celastraceae	tree																x	
Maytenus undata	Celastraceae	tree															x		
Combretum apiculatum	Combretaceae	tree				x	x		x	x	x	x	x		x		x	x	x
Combretum collinum gazense	Combretaceae	tree					x				x	x				x			
Combretum collinum suluense	Combretaceae	tree								x					x		x	x	x
Combretum erythrophyllem	Combretaceae	tree				x													
Combretum hereroense	Combretaceae	tree				x	x	x	x								x	x	x
Combretum imberbe	Combretaceae	tree			NFA	x		x	x	x			x				x	x	x
Combretum molle	Combretaceae	tree												x	x				x
Combretum mossambicense	Combretaceae	tree													x				
Combretum zeyheri	Combretaceae	tree				x	x	x	x	x		x	x			x	x	x	
Terminalia brachystemma	Combretaceae	tree								x									
Terminalia sericea	Combretaceae	tree						x	x	x	x	x	x	x		x	x		
Ipomoea albivenia	Convolvulaceae	creeper					x												x
Ipomoea sp.	Convolvulaceae	creeper												x					
Kalanchoe aff.paniculata/ sexangularis	Crassulaceae	succulent	(LC)			x													
Cucurbitaceae sp.1	Cucurbitaceae	creeper				x	x												
Cucurbitaceae sp.2	Cucurbitaceae	creeper				x													
Diospyros mespiliformis	Ebenaceae	tree				x	x	x	x	x	x	x	x	x		x	x	x	
Euclea crispa	Ebenaceae	shrub									x					x			
Euclea divinorum	Ebenaceae	tree				x		x	x								x	x	x
Euclea natalensis	Ebenaceae	tree				x				x									
Euclea schimperi	Ebenaceae	tree											x				x		
Acalypha sp.	Euphorbiaceae	herb											x						
Antidesma venosum	Euphorbiaceae	tree										x							
Bridelia mollis	Euphorbiaceae	tree								x	x	x	x	x	x		x	x	x

Croton menyharti	Euphorbiaceae	tree										x							
Delachampia capensis	Euphorbiaceae	herb													x				
Euphorbia cooperi	Euphorbiaceae	succulent																	x
Euphorbia ingens	Euphorbiaceae	succulent									x						x		
Flueggea virosa	Euphorbiaceae	shrub				x	x		x	x	x		x		x		x	x	x
*Jatropha curcas**	Euphorbiaceae	shrub						x											
Phyllanthus reticulatus	Euphorbiaceae	shrub				x		x		x		x		x				x	
Pseudolachnostylis maprouneifolia	Euphorbiaceae	shrub								x			x				x		x
*Ricinus communis**	Euphorbiaceae	herb				x		x	x										
Spirostachys africana	Euphorbiaceae	tree			LEMA	x		x										x	x
Synadenium cupulare	Euphorbiaceae	tree													x				
Tragia meyeriana	Euphorbiaceae	creeper																x	
Tragia sp.	Euphorbiaceae	herb															x		
Abrus laevigatus	Fabaceae	climber												x					
Acacia caffra	Fabaceae	tree														x			
Acacia erubescens	Fabaceae	tree															x		
Acacia exuvialis	Fabaceae	tree											x		x	x		x	
Acacia gerrardii	Fabaceae	tree				x													x
Acacia grandicornuta	Fabaceae	tree														x	x		
Acacia karoo	Fabaceae	tree							x										
Acacia nigrescens	Fabaceae	tree				x	x	x	x	x		x	x		x			x	x
Acacia nilotica	Fabaceae	tree													x				x
Acacia polyacantha	Fabaceae	tree				x			x										
Acacia schweinfurthii	Fabaceae	climber/shrub				x		x											
Acacia tortilus	Fabaceae	tree					x												
Albizia harveyi	Fabaceae	tree							x	x					x			x	
Albizia versicolor	Fabaceae	tree														x	x		
Bauhinia galpinii	Fabaceae	climber/shrub							x					x			x		
Bolusanthus speciosus	Fabaceae	tree					x		x									x	
Cassia abreviata	Fabaceae	shrub															x		
Chaemaecrista mimosoides	Fabaceae	herb					x					x				x			

Colophospermum mopane	Fabaceae	tree				x	x	x	x								x	x	x
Crotalaria laburnifolia	Fabaceae	shrub															x		
Crotalaria sp.1	Fabaceae	dwarf shrub				x	x												
Dalbergia melanoxylon	Fabaceae	tree				x		x	x	x				x	x		x	x	
Dichrostachys cinerea subsp. nyassana	Fabaceae	shrub				x	x	x	x	x	x	x		x	x	x	x	x	x
Indigofera hilaris	Fabaceae	herb								x				x					
Indigofera sp.1	Fabaceae	shrub							x									x	
Mundulea sericea	Fabaceae	tree				x			x					x				x	
Ormocarpum trichocarpum	Fabaceae	shrub							x						x		x		
Peltophorum africanum	Fabaceae	tree				x	x	x							x		x	x	x
Philenoptera violacea	Fabaceae	tree			NFA	x		x	x	x			x					x	x
Piliostigma thonningii	Fabaceae	shrub								x		x							
Pterocarpus angolensis	Fabaceae	tree			NFA					x									
Pterocarpus rotundifolius	Fabaceae	tree					x			x		x		x					x
Rhynchosia caribea	Fabaceae	herb					x											x	
Rhynchosia totta	Fabaceae	herb							x		x			x		x		x	x
Schotia brachypetala	Fabaceae	tree						x		x							x	x	
*Senna bicapsularis**	Fabaceae	shrub						x											
Senna cf.pendulina	Fabaceae	shrub				x													
Senna italica	Fabaceae	shrub						x					x						
Senna petersiana	Fabaceae	tree							x	x	x	x	x	x		x	x		x
Sesbania sesben	Fabaceae	shrub				x													
Tephrosia cf.longipes	Fabaceae	herb														x			
Tephrosia cf.rhodesiaca	Fabaceae	herb												x					
Tephrosia polystachya	Fabaceae	shrub				x		x		x			x					x	
Tephrosia sp.	Fabaceae	herb					x				x								
Xanthocercis zambesiaca	Fabaceae	tree																x	
Zornia linearis	Fabaceae	herb								x									
Scolopia zeyheri	Flacourtiaceae	tree																	x
Monsonia sp.	Geraniaceae	herb								x									
Heteropyxis natalensis	Heteropyxidaceae	tree															x		x

Kirkia acuminata	Kirkiaceae	tree							x	x			x	x	x		x		x
Clerodendrum ternatum	Lamiaceae	dwarf shrub				x	x			x				x				x	x
Hemizygia cf.teucrifolia	Lamiaceae	herb									x								
Hemizygia sp.1	Lamiaceae	herb				x									x			x	
Leonotis intermedia	Lamiaceae	herb								x									
Ocimum americanum	Lamiaceae	herb				x	x	x	x	x	x		x		x		x	x	x
Plectranthus spicatus	Lamiaceae	shrub																x	
Tinnea rhodesiana	Lamiaceae	shrub															x		
Cyphia stenopetala	Lobeliaceae	herb															x		
Tapinanthus rubromarginatus	Loranthaceae	parasite					x												
Tapinanthus sp.	Loranthaceae	parasite																x	
Galpinia transvaalica	Lythraceae	shrub				x													
Sphedamnocarpus pruriens	Malphigiaceae	climber													x				
Abutilon sonneratianum	Malvaceae	shrub				x									x		x	x	
Dombeya rotundifolia	Malvaceae	tree									x	x	x	x		x	x		
Gossypium herbaceum	Malvaceae	herb	LC					x		x				x			x		
Grewia bicolor	Malvaceae	tree				x			x								x		x
Grewia flavescens	Malvaceae	tree				x	x		x				x		x		x	x	x
Grewia hexamita	Malvaceae	tree													x				
Grewia monticola	Malvaceae	tree				x	x	x	x	x		x		x			x	x	x
Hibiscus calyphyllus	Malvaceae	herb				x	x	x										x	
Hibiscus sp.	Malvaceae	herb					x											x	
Hibiscus sp.2 (red, photo)	Malvaceae	herb						x							x				
Hibiscus vitifolius	Malvaceae	herb								x								x	
Melhania didyma	Malvaceae	herb				x	x	x									x	x	
Melhania prostrata	Malvaceae	herb				x			x										
Melhania sp.	Malvaceae	shrub					x												
Sida cordifolia	Malvaceae	dwarf shrub																x	
Sida dregei	Malvaceae	dwarf shrub				x	x												
Waltheria indica	Malvaceae	herb				x	x	x	x	x		x			x	x	x	x	x
Trichilia emetica	Meliaceae	tree				x			x										
Ficus glumosa	Moraceae	tree									x	x							x

Ficus ingens	Moraceae	tree									x								
Ficus salicifolia	Moraceae	tree										x							
Ficus sycamorus	Moraceae	tree				x			x							x			
Olax dissitiflora	Olacaceae	tree															x		
Ximenia americana	Olacaceae	tree							x									x	
Ximenia caffra	Olacaceae	tree					x		x									x	
Jasmimum stenolobium	Oleaceae	climber																x	
Jasminum fluminense	Oleaceae	climber				x											x	x	x
Oxalis obliquifolia	Oxalidaceae	herb					x									x		x	
Argemone ochralencha	Papaveraceae	herb				x													
Adenia digitata	Passifloraceae	climber				x	x												
Ceratotheca triloba	Pedaliaceae	herb						x		x			x						x
Dicerocaryum senecioides	Pedaliaceae	herb					x									x			
Persicaria senegalensis	Polygalaceae	herb				x													
Berchemia discolor	Rhamnaceae	tree															x	x	
Berchemia zeyheri	Rhamnaceae	tree							x	x	x				x			x	x
Ziziphus mucronata	Rhamnaceae	tree				x		x									x	x	
Breonadia salicina	Rubiaceae	tree			NFA												x		
Catunaregum spinosa	Rubiaceae	shrub												x					x
Gardenia volkensii	Rubiaceae	tree				x					x	x						x	
Pavetta schumanniana	Rubiaceae	shrub									x		x	x	x			x	
Psydrax livida	Rubiaceae	shrub												x	x				
Kraussia floribunda	Rubiaceae	shrub													x				
Vangueria infausta	Rubiaceae	tree								x		x		x		x		x	x
Dodonaea angustifolia	Sapindaceae	shrub											x						
Pappea capensis	Sapindaceae	tree								x			x					x	
Aptosimum procumbens	Scrophulariaceae	herb																x	x
Manulea sp.	Scrophulariaceae	herb				x			x						x			x	
Striga asiatica	Scrophulariaceae	herb								x									
Solanum catombelense	Solanaceae	herb											x						
*Solanum incanum**	Solanaceae	herb											x						
*Solanum mauritianum **	Solanaceae	shrub				x													

Solanum panduriforme	Solanaceae	shrub						x			x					x	x	x	
Solanum seaforthianum *	Solanaceae	climber				x													
Sterculia rogersii	Sterculiaceae	tree											x		x				
Strychnos spinosa	Strychnaceae	tree										x	x	x					x
Pouzolzia mixta	Urticaceae	shrub							x								x		
Urera sp.	Urticaceae	herb				x	x												
Lantana camara *	Verbenaceae	shrub				x			x									x	
Lantana rugosa	Verbenaceae	shrub					x											x	
Leucas capensis	Verbenaceae	herb						x											
Lippia javanica	Verbenaceae	herb														x			
Lippia wilmsii	Verbenaceae	herb												x					
Priva cordifolia	Verbenaceae	herb																x	
Viscum combreticola	Viscaceae	parasite															x		
Cissus cactiformis	Vitaceae	climber				x									x				
Cissus carnifolia	Vitaceae	climber					x			x									x
Cyphostemma sp.	Vitaceae	creeper					x		x										
Cyphostemma woodii	Vitaceae	creeper								x	x			x					
Rhoicissus revoilii	Vitaceae	climber								x					x				
Rhoicissus tridentata	Vitaceae	climber/shrub													x	x	x	x	
Subtotal		222	4	0	10	71	51	42	52	51	29	28	38	34	51	27	60	83	47
Monocotyledons																			
Albuca sp.	Alliaceae	bulb																	
Boophane disticha	Amaryllidaceae	bulb			LEMA									x	x			x	
Scadoxus sp.	Amaryllidaceae	bulb			LEMA									x					
Chlorophytum sp.	Anthericaceae	bulb								x					x				
Stylochaeton natalense	Araceae	bulb													x			x	
Asparagus angusticladus	Asparagaceae	shrub															x		
Asparagus cf.buchananii	Asparagaceae	shrub																	x
Asparagus cooperi	Asparagaceae	shrub							x	x								x	
Asparagus suaveolens	Asparagaceae	climber					x	x			x							x	
Aloe cf.chabaudii	Asphodelaceae	succulent															x		
Aloe cryptopoda	Asphodelaceae	succulent			NEMA										x				

Aloe greatheadii var.davyana	Asphodelaceae	succulent	LC			x								x				x	
Aloe marlothii	Asphodelaceae	succulent									x						x		
Commelina africana	Commelinaceae	herb									x							x	
Commelina benghalensis	Commelinaceae	herb						x											
Commelina cf.erecta	Commelinaceae	herb																x	
Cyperus cf.rupestris	Cyperaceae	sedge				x													
Cyperus leptocladus	Cyperaceae	sedge				x													
Cyperus sp.	Cyperaceae	sedge					x				x								
Kyllinga alba	Cyperaceae	sedge				x												x	
Sanseviera hyacinthoides	Dracaenaceae	bulb													x				
Ledebouria cf.floribunda	Hyacinthaceae	bulb									x			x				x	
Ansellia (africana) gigantea	Orchidaceae	epiphyte	LC		LEMA						x						x		
Aristida congesta	Poaceae	grass				x	x	x	x	x	x	x		x	x	x	x	x	x
Aristida sciurus	Poaceae	grass					x				x		x	x			x	x	x
Brachiaria serrata	Poaceae	grass															x		
Brachiaria sp.	Poaceae	grass					x			x									
Cymbopogon cf.excavatus	Poaceae	grass					x												
Cynodon dactylon	Poaceae	grass						x			x								
Digitaria eriantha	Poaceae	grass					x			x	x	x		x		x		x	
Enneapogon conchroides	Poaceae	grass				x	x	x		x									
Eragrostis curvula	Poaceae	grass						x	x			x							
Eragrostis gummiflua	Poaceae	grass					x												
Eragrostis superba	Poaceae	grass													x				
Heteropogon contortus	Poaceae	grass				x	x		x	x	x	x	x	x	x		x		
Hyperthelia dissoluta	Poaceae	grass								x	x	x		x		x	x		
Melinis nerviglumis	Poaceae	grass												x					
Melinis repens	Poaceae	grass				x	x		x	x	x	x			x		x		
Panicum maximum	Poaceae	grass				x	x		x	x	x				x		x	x	x
Perotis patens	Poaceae	grass								x	x						x		
Phragmites australis	Poaceae	grass				x			x										
Pogonarthria squarrosa	Poaceae	grass				x	x	x	x	x	x	x		x		x	x	x	
Setaria megaphylla	Poaceae	grass				x													

Setaria sp.	Poaceae	grass									x								
Setaria sphacelata	Poaceae	grass								x									
Sorghum bicolor	Poaceae	grass				x													
Themeda triandra	Poaceae	grass				x	x		x						x			x	x
Tragus berteronianus	Poaceae	grass					x	x		x	x		x			x		x	
Trichoneura grandiglumis	Poaceae	grass								x				x		x			
Urochloa mossambica	Poaceae	grass				x	x	x	x	x		x	x		x	x		x	x
Xerophyta retinervis	Vellociaceae	geophyte							x	x				x	x			x	
Subtotal		51	2	0	4	15	16	9	11	17	18	8	4	13	13	7	13	18	6
Total		**276**	**6**	**0**	**14**	**86**	**67**	**51**	**63**	**68**	**48**	**36**	**42**	**47**	**66**	**34**	**73**	**103**	**53**

Protection Status
NFA = National Forests Act (Act 36 of 1998)
LEMA = Limpopo Environmental Management Act (No. 7 of 2003)
Endemic Status
LIM = Distribution in South Africa confined to Limpopo Province
Red Data Status
LC(D) = Least Concern (Declining); NT = Near Threatened

APPENDIX B 3. CONSERVATION-IMPORTANT PLANT SPECIES LIKELY TO OCCUR IN THE TWO VEGETATION TYPES ASSOCIATED WITH THE PROPOSED DEVELOPMENT FOOTPRINT

Plant Taxon	Interim National Red Data Status (SANBI, 2007)	Protection Status	Endemic Status	Granite Lowveld	Tsende Mopaneveld
Adansonia digitata		NFA		x	x
Afzelia quanzensis		NFA		x	x
Ansellia africana	LC (D)	LEMA		x	x
Balanites maughamii subsp. maughamii		NFA		x	x
Borassus aethiopum	NE	LEMA		x	x
Boscia albitrunca		NFA		x	x
Brachystelma brevipedicellatum		LEMA		x	
Breonadia salicina		NFA		x	x
Catha edulis		NFA		x	x
Ceropegia crassifolia var. crassifolia		LEMA		x	x
Combretum imberbe		NFA		x	x
Elaeodendron transvaalense	LC (D)	NFA		x	x
Eulophia hereroensis		LEMA		x	x
Harpagophytum zeyheri subsp. zeyheri	STBA			x	x
Melinis tenuissima		LEMA		x	x
Merwilla plumbea	LC (D)			x	x
Mondia whitei	NT	LEMA		x	
Nymphaea lotus		LEMA		x	
Orbea rogersii		LEMA			x

Orbeopsis lutea subsp. lutea			LEMA		x	
Philenoptera violacea			NFA		x	x
Pilotrichella pandurifolia			LEMA		x	x
Pittosporum viridiflorum			NFA		x	x
Pterocarpus angolensis			NFA		x	x
Sclerocarya birrea subsp. caffra			NFA		x	x
Sericanthe andongensis var. andongensis				LIM	x	x
Spirostachys africana			LEMA		x	x
Stapelia gettliffei			LEMA		x	x
Tavaresia meintjesii			LEMA		x	x
Xylopia parviflora			LEMA		x	x
TOTALS:	**27**	**6**	**27**	**1**	**29**	**26**

Protection Status
NFA = National Forests Act (Act 36 of 1998)
LEMA = Limpopo Environmental Management Act (No. 7 of 2003)
Endemic Status
LIM = Distribution in South Africa confined to Limpopo Province
Red Data Status
STBA = Status to be announced
LC(D) = Least Concern (Declining)
NE = Not Evaluated in Oct 2007
NT = Near Threatened

APPENDIX B 4. PLANT SPECIES USED BY LOCAL RESIDENTS OF THE PROJECT AREA

Scientific Name	Local Name	Use*	Plant Consumption	Plant Availability
Acacia nigrescens	Nkaya	Md, Ut	High	abundant
Acacia schweinfurthii	Renatlo	Md, Ut	Med	abundant
Berchemia discolor	Nyiri	Fd	High	moderate
Cassia abbreviata	Numanyama	Md	High	scarce
Colophospermum mopane	Xanatsi	Fd, Ut	High	abundant
Combretum hereroense	Xikhavi	Md	High	abundant
Combretum imberbe	Mondzo	Md	High	abundant
Cucumis sp.	Kaka	Md, Fd	High	abundant
Dalbergia melanoxylon	Nyatelo	Md	High	abundant
Dicrostachys cinerea	Ndzenga	Md, Ut	High	abundant
Diospyros mespiliformis	Ntoma	Md, Fd	High	abundant
Euphorbia tirucalli	Neta	Md	Med	abundant
Ficus sycamorus	Nkuwa	Md, Fd	High	abundant
Flueggea virosa	Sangasi	Md, Fd	High	abundant
Grewia flavescens	Nsihana	Md, Fd	High	abundant
Gymnosporya glaucophylla	Xihlangwa	Md	High	abundant
Juncus krausii	inHlanhla	Ut	High	abundant
Lantana camara	iTyabi abalungu	Md, Fd	High	abundant
Maytenus undata	eLum	Md	High	abundant
Philenoptera violacea	Mbhandzu	Md	High	abundant
Pupalea lapacea	erNawa	Md	High	abundant
Ricinus communis	Hlamfura	Md	Med	abundant
Schotia brachypetala	Chochelamandleni	Md, Fd	High	scarce

Sclerocarya birrea	Nkanyi	Fd	High	abundant
Spirostachys africana	Ndzopfori	Md	Med	abundant
Stephania abyssinica	Nyaka umThando	Md	High	moderate
Sterculia rogersii	Xpopa	Md	High	scarce
Strychnos spinosa	Nsala	Md, Fd	High	scarce
Trichilia emetica	Nkuhlu	Md	High	abundant
Ximenia americana	Ntsengele-lowu-ntsanana	Md, Fd	High	abundant
Ziziphus mucronata	Mphasamhala	Md, Fd	High	abundant

* Md = Medicinal, Fd = Food, Ut = Utility

Common Name	Scientific Name	Red Data	Endemic	Protected	*Acacia - Combretum* Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland	Artificial Wetlands
Mammals								
Cape Porcupine	*Hystrix africaeaustralis*					x		
Chacma Baboon	*Papio hamadryas*					x	x	
Common Warthog	*Phacochoerus africanus*				x			
Greater Kudu	*Tragelaphus strepsiceros*					x		
Grey Duiker	*Sylvicapra grimmia*				x	x		
Hippopotamus	*Hippopotamus amphibius*			LEMA	x			x

Red Veld Rat	*Aethomys ineptus*					x		
Scrub Hare	*Lepus saxatilis*					x		
Steenbok	*Raphicerus campestris*			LEMA		x	x	
Tree Squirrel	*Paraxerus cepapi*				x	x	x	
Vervet Monkey	*Cercopithecus pygerythrus*				x	x		
Subtotal	11	0	0	2	5	9	3	1
Birds								
Acacia Pied Barbet	*Tricholaema leucomelas*					x		
African Darter	*Anhinga rufa*							x
African Fish-Eagle	*Haliaeetus vocifer*				x			x
African Green-Pigeon	*Treron calvus*				x	x		
African Grey Hornbill	*Tockus nasutus*				x	x		
African Harrier-Hawk	*Polyboroides typus*				x			
African Hoopoe	*Upupa africana*					x		
African Jacana	*Actophilornis africanus*							x
African Paradise-Flycatcher	*Terpsiphone viridis*				x	x		
African Pied Wagtail	*Motacilla aguimp*							x
African Pygmy-Kingfisher	*Ispidina picta*				x	x		
Arrow-marked Babbler	*Turdoides jardineii*				x	x		
Ashy Flycatcher	*Muscicapa caerulescens*				x			
Barn Swallow	*Hirundo rustica*				x	x	x	x
Bearded Woodpecker	*Dendropicos namaquus*					x		
Black (Yellow-billed) Kite	*Milvus migrans*				x	x	x	x
Black Cuckoo	*Cuculus clamosus*					x		
Black Cuckooshrike	*Campephaga flava*				x	x		
Black Stork	*Ciconia nigra*	NT				x		

Black-backed Puffback	*Dryoscopus cubla*				x	x		
Black-collared Barbet	*Lybius torquatus*				x	x	x	
Black-crowned Tchagra	*Tchagra senegalus*				x	x	x	
Black-headed Heron	*Ardea melanocephala*					x		x
Black-headed Oriole	*Oriolus larvatus*				x	x	x	
Black-shouldered Kite	*Elanus caeruleus*					x		
Blacksmith Lapwing	*Vanellus armatus*							x
Blue Waxbill	*Uraeginthus angolensis*				x	x		
Blue-cheeked Bee-eater	*Merops persicus*				x			
Broad-billed Roller	*Eurystomus glaucurus*				x	x		
Bronze Mannikin	*Spermestes cucullatus*						x	
Brown Snake-Eagle	*Circaetus cinereus*				x	x		
Brown-backed Honeybird	*Prodotiscus regulus*					x	x	
Brown-crowned Tchagra	*Tchagra australis*					x	x	
Brown-headed Parrot	*Poicephalus cryptoxanthus*					x		
Brown-hooded Kingfisher	*Halcyon albiventris*				x	x	x	
Brubru	*Nilaus afer*					x	x	
Burchell's Coucal	*Centropus burchelli*					x		
Bushveld Pipit	*Anthus caffer*					x	x	
Cape Glossy Starling	*Lamprotornis nitens*				x	x	x	
Cape Turtle-Dove	*Streptopelia capicola*				x	x	x	
Cape White-eye	*Zosterops virens*		SA		x	x	x	
Cardinal Woodpecker	*Dendropicos fuscescens*					x	x	
Cattle Egret	*Bubulcus ibis*				x	x	x	x
Chestnut-backed Sparrowlark	*Eremopterix leucotis*					x		
Chinspot Batis	*Batis molitor*					x	x	

Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	

Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Common Scimitarbill	*Rhinopomastus cyanomelas*				x	x	x	
Common Waxbill	*Estrilda astrild*				x	x		
Crested Barbet	*Trachyphonus vaillantii*				x	x		
Crowned Lapwing	*Vanellus coronatus*				x			
Dark-capped Bulbul	*Pycnonotus tricolor*				x	x	x	
Diderick Cuckoo	*Chrysococcyx caprius*				x	x	x	x
Egyptian Goose	*Alopochen aegyptiaca*							x
Emerald-spotted Wood-Dove	*Turtur chalcospilos*				x	x	x	
Eurasian Golden Oriole	*Oriolus oriolus*					x		
European Bee-eater	*Merops apiaster*				x	x	x	x
European Roller	*Coracias garrulus*					x		
Fiery-necked Nightjar	*Caprimulgus pectoralis*					x		
Flappet Lark	*Mirafra rufocinnamomea*					x	x	
Fork-tailed Drongo	*Dicrurus adsimilis*				x	x		
Garden Warbler	*Sylvia borin*					x		
Giant Kingfisher	*Megaceryle maximus*				x			x

Golden-breasted Bunting	*Emberiza flaviventris*					x	x	
Golden-tailed Woodpecker	*Campethera abingoni*				x	x	x	
Great Egret	*Egretta alba*							x
Greater Honeyguide	*Indicator indicator*					x	x	
Green Wood-Hoopoe	*Phoeniculus purpureus*				x	x		
Green-backed Heron	*Butorides striata*							x
Green-winged Pytilia	*Pytilia melba*					x		
Grey Go-away-bird	*Corythaixoides concolor*					x		
Grey Heron	*Ardea cinerea*							x
Grey Penduline-Tit	*Anthoscopus caroli*					x		
Grey Tit-Flycatcher	*Myioparus plumbeus*				x			
Grey-backed Camaroptera	*Camaroptera brevicaudata*				x	x		
Grey-headed Bush-Shrike	*Malaconotus blanchoti*				x	x		
Hadeda Ibis	*Bostrychia hagedash*					x		
Hamerkop	*Scopus umbretta*							x
Helmeted Guineafowl	*Numida meleagris*				x	x		
House Sparrow	*Passer domesticus*					x		
Jacobin Cuckoo	*Clamator jacobinus*					x		
Jameson's Firefinch	*Lagonosticta rhodopareia*					x		
Klaas's Cuckoo	*Chrysococcyx klaas*				x	x	x	
Kurrichane Buttonquail	*Turnix sylvaticus*						x	
Kurrichane Thrush	*Turdus libonyanus*					x		
Lanner Falcon	*Falco biarmicus*	NT					x	
Laughing Dove	*Streptopelia senegalensis*				x	x	x	
Lesser Honeyguide	*Indicator minor*					x		

Lesser Masked-Weaver	*Ploceus intermedius*				x	x		x
Lesser Striped Swallow	*Hirundo abyssinica*				x	x	x	x
Lesser Swamp-Warbler	*Acrocephalus gracilirostris*							x
Levaillant's Cuckoo	*Clamator levaillantii*					x		
Lilac-breasted Roller	*Coracias caudatus*					x		
Little Bee-eater	*Merops pusillus*				x		x	
Little Egret	*Egretta garzetta*							x
Little Grebe	*Tachybaptus ruficollis*							x
Little Rush-Warbler	*Bradypterus baboecala*							x
Little Sparrowhawk	*Accipiter minullus*				x			
Little Swift	*Apus affinis*				x	x		x
Lizard Buzzard	*Kaupifalco monogrammicus*					x		
Long-billed Crombec	*Sylvietta rufescens*					x		
Long-tailed Paradise-Whydah	*Vidua paradisaea*					x	x	
Malachite Kingfisher	*Alcedo cristata*				x			x
Marsh Warbler	*Acrocephalus palustris*				x			
Namaqua Dove	*Oena capensis*					x		
Natal Francolin	*Pternistis natalensis*				x	x		
Neddicky	*Cisticola fulvicapilla*					x	x	
Orange-breasted Bush-Shrike	*Telophorus sulfureopectus*				x	x	x	
Orange-breasted Waxbill	*Sporaeginthus subflavus*							x
Osprey	*Pandion haliaetus*							x
Pale Flycatcher	*Bradornis pallidus*					x		
Pied Crow	*Corvus albus*					x	x	

Pied Kingfisher	*Ceryle rudis*				x			x
Pin-tailed Whydah	*Vidua macroura*				x	x		
Purple Heron	*Ardea purpurea*							x
Purple Indigobird	*Vidua purpurascens*					x		
Purple Roller	*Coracias naevius*					x		
Purple-crested Turaco	*Gallirex porphyreolophus*				x			
Rattling Cisticola	*Cisticola chiniana*				x	x	x	
Red-backed Shrike	*Lanius collurio*				x	x		
Red-billed Firefinch	*Lagonosticta senegala*				x	x		
Red-billed Hornbill	*Tockus erythrorhynchus*					x		
Red-billed Quelea	*Quelea quelea*				x			x
Red-breasted Swallow	*Hirundo semirufa*				x			
Red-capped Robin-Chat	*Cossypha natalensis*				x			
Red-chested Cuckoo	*Cuculus solitarius*				x	x		
Red-collared Widowbird	*Euplectes ardens*						x	
Red-eyed Dove	*Streptopelia semitorquata*				x	x	x	
Red-faced Cisticola	*Cisticola erythrops*				x			
Red-faced Mousebird	*Urocolius indicus*					x		
Red-headed Weaver	*Anaplectes melanotis*				x	x		
Reed Cormorant	*Phalacrocorax africanus*							x
Rufous-naped Lark	*Mirafra africana*					x		
Sabota Lark	*Calendulauda sabota*						x	
Scarlet-chested Sunbird	*Chalcomitra senegalensis*				x	x	x	
Shikra	*Accipiter badius*				x			
Sombre Greenbul	*Andropadus importunus*				x	x		
Southern Black Flycatcher	*Melaenornis pammelaina*					x		
Southern Black Tit	*Parus niger*					x		

Southern Boubou	*Laniarius ferrugineus*				x	x		
Southern Carmine Bee-eater	*Merops nubicoides*				x	x		
Southern Grey-headed Sparrow	*Passer diffusus*				x	x	x	
Southern Masked-Weaver	*Ploceus velatus*							x
Southern Red Bishop	*Euplectes orix*							x
Southern White-crowned Shrike	*Eurocephalus anguitimens*					x		
Southern Yellow-billed Hornbill	*Tockus leucomelas*					x		
Speckled Mousebird	*Colius striatus*				x	x		
Spectacled Weaver	*Ploceus ocularis*				x			
Spotted Flycatcher	*Muscicapa striata*					x		
Steppe Buzzard	*Buteo vulpinus*					x		
Stierling's Wren-Warbler	*Calamonastes stierlingi*				x	x	x	
Streaky-headed Seedeater	*Crithagra gularis*						x	
Striped Kingfisher	*Halcyon chelicuti*					x	x	
Swainson's Spurfowl	*Pternistis swainsonii*				x			
Tambourine Dove	*Turtur tympanistria*				x			
Tawny-flanked Prinia	*Prinia subflava*				x	x	x	
Terrestrial Brownbul	*Phyllastrephus terrestris*				x	x		
Thick-billed Weaver	*Amblyospiza albifrons*				x			x
Three-banded Plover	*Charadrius tricollaris*							x
Village Indigobird	*Vidua chalybeata*				x	x		
Violet-backed Starling	*Cinnyricinclus leucogaster*				x	x	x	
Violet-eared Waxbill	*Granatina granatina*					x		
Wahlberg's Eagle	*Aquila wahlbergi*				x			
White-bellied Sunbird	*Cinnyris talatala*				x	x	x	
White-breasted Cormorant	*Phalacrocorax lucidus*							x
White-browed Robin-Chat	*Cossypha heuglini*				x			
White-browed Scrub-Robin	*Cercotrichas leucophrys*				x	x	x	

White-crested Helmet-Shrike	*Prionops plumatus*				x	x	x	
White-faced Duck	*Dendrocygna viduata*							x
White-fronted Bee-eater	*Merops bullockoides*				x			
White-throated Robin-Chat	*Cossypha humeralis*				x	x		
White-winged Widowbird	*Euplectes albonotatus*							x
Willow Warbler	*Phylloscopus trochilus*				x	x		
Wire-tailed Swallow	*Hirundo smithii*				x			x
Wood Sandpiper	*Tringa glareola*							x
Woodland Kingfisher	*Halcyon senegalensis*				x	x		
Yellow-billed Kite	*Milvus aegyptius*				x	x		
Yellow-bellied Eremomela	*Eremomela icteropygialis*					x		
Yellow-bellied Greenbul	*Chlorocichla flaviventris*				x	x		
Yellow-breasted Apalis	*Apalis flavida*				x	x		
Yellow-fronted Canary	*Crithagra mozambicus*				x	x	x	
Yellow-fronted Tinkerbird	*Pogoniulus chrysoconus*					x	x	
Yellow-throated Longclaw	*Macronyx croceus*					x	x	
Yellow-throated Petronia	*Petronia superciliaris*					x		
Subtotal	186	2	1	0	97	128	54	41

Reptiles								
Common Flap-neck Chamaeleon	*Chamaeleo dilepis*			NEMBA	x			
Common Flat Lizard	*Platysaurus intermedius*		LP				x	
Common Rough-scaled Lizard	*Ichnotropus squamulosa*						x	
Distant's Ground Agama	*Agama aculeata distanti*		SA			x		
Five-lined Skink	*Trachylepis margaritifer*				x	x	x	
Giant Plated Lizard	*Gerrhosaurus validus*						x	
Leopard Tortoise	*Geochelone pardalis*					x		
Peters' Thread Snake	*Leptotyphlops scutifrons*				x	x		
Puff Adder	*Bitis arietans*				x			
Rock Monitor	*Varanus albigularis*			NEMBA		x		
Speke's Hinged Tortoise	*Kinixys spekei*					x		
Variable Skink	*Trachylepis varia*				x	x	x	
Water Monitor	*Varanus niloticus*			NEMBA	x			x
Subtotal	13	0	2	3	6	7	5	1

Frogs								
Bubbling Kassina	*Kassina senegalensis*				x			x
Bushveld Rain Frog	*Breviceps adspersus*					x		
Common River Frog	*Afrana angolensis*				x			x
Dwarf Puddle Frog	*Phrynobatrachus mababiensis*				x	x		
Eastern Olive Toad	*Amietophrynus garmani*				x	x		
Guttural Toad	*Bufo gutteralis*							x
Mottled Shovel-nosed Frog	*Hemisus marmoratus*				x	x	x	
Russet-backed Sand Frog	*Tomopterna marmorata*				x			
Southern Foam Nest Frog	*Chiromantis xerampelina*				x	x		
Subtotal	9				7	4	0	3
Total		2	3	5	115		62	46

LP = Limpopo Province endemic
SA = South African Endemic
NEMBA = National Environmental Management: Biodiversity Act
LEMA = Limpopo Environmental Management Act

APPENDIX B 5. VERTEBRATE FAUNA SPECIES RECORDED IN FOUR VEGETATION COMMUNITIES OF THE PROJECT AREA

Common Name	Scientific Name	Red Data	Endemic	Protected	*Acacia - Combretum* Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland	Artificial Wetlands
Mammals								
Cape Porcupine	*Hystrix africaeaustralis*					x		
Chacma Baboon	*Papio hamadryas*					x	x	
Common Warthog	*Phacochoerus africanus*				x			
Greater Kudu	*Tragelaphus strepsiceros*					x		
Grey Duiker	*Sylvicapra grimmia*				x	x		
Hippopotamus	*Hippopotamus amphibius*			LEMA	x			x
Red Veld Rat	*Aethomys ineptus*					x		
Scrub Hare	*Lepus saxatilis*					x		
Short-snouted Elephant Shrew	*Elephantulus brachyrhynchus*	DD					x	
Steenbok	*Raphicerus campestris*			LEMA		x	x	
Tree Squirrel	*Paraxerus cepapi*				x	x	x	
Vervet Monkey	*Cercopithecus pygerythrus*				x	x		
Subtotal	12	1	0	2	5	9	4	1
Birds								
Acacia Pied Barbet	*Tricholaema leucomelas*					x		
African Darter	*Anhinga rufa*							x
African Fish-Eagle	*Haliaeetus vocifer*				x			x
African Green-Pigeon	*Treron calvus*				x	x		

African Grey Hornbill	*Tockus nasutus*				x	x		
African Harrier-Hawk	*Polyboroides typus*				x			
African Hoopoe	*Upupa africana*					x		
African Jacana	*Actophilornis africanus*							x
African Paradise-Flycatcher	*Terpsiphone viridis*				x	x		
African Pied Wagtail	*Motacilla aguimp*							x
African Pygmy-Kingfisher	*Ispidina picta*				x	x		
Arrow-marked Babbler	*Turdoides jardineii*				x	x		
Ashy Flycatcher	*Muscicapa caerulescens*				x			
Barn Swallow	*Hirundo rustica*				x	x	x	x
Bearded Woodpecker	*Dendropicos namaquus*					x		
Black (Yellow-billed) Kite	*Milvus migrans*				x	x	x	x
Black Cuckoo	*Cuculus clamosus*					x		
Black Cuckooshrike	*Campephaga flava*				x	x		
Black Stork	*Ciconia nigra*	NT				x		
Black-backed Puffback	*Dryoscopus cubla*				x	x		
Black-collared Barbet	*Lybius torquatus*				x	x	x	
Black-crowned Tchagra	*Tchagra senegalus*				x	x	x	
Black-headed Heron	*Ardea melanocephala*					x		x
Black-headed Oriole	*Oriolus larvatus*				x	x	x	
Black-shouldered Kite	*Elanus caeruleus*					x		
Blacksmith Lapwing	*Vanellus armatus*							x
Blue Waxbill	*Uraeginthus angolensis*				x	x		
Blue-cheeked Bee-eater	*Merops persicus*				x			
Broad-billed Roller	*Eurystomus glaucurus*				x	x		
Bronze Mannikin	*Spermestes cucullatus*						x	
Brown Snake-Eagle	*Circaetus cinereus*				x	x		
Brown-backed Honeybird	*Prodotiscus regulus*					x	x	
Brown-crowned Tchagra	*Tchagra australis*					x	x	
Brown-headed Parrot	*Poicephalus cryptoxanthus*					x		
Brown-hooded Kingfisher	*Halcyon albiventris*				x	x	x	
Brubru	*Nilaus afer*					x	x	

Burchell's Coucal	*Centropus burchelli*					x		
Bushveld Pipit	*Anthus caffer*					x	x	
Cape Glossy Starling	*Lamprotornis nitens*				x	x	x	
Cape Turtle-Dove	*Streptopelia capicola*				x	x	x	
Cape White-eye	*Zosterops virens*		SA		x	x	x	
Cardinal Woodpecker	*Dendropicos fuscescens*					x	x	
Cattle Egret	*Bubulcus ibis*				x	x	x	x
Chestnut-backed Sparrowlark	*Eremopterix leucotis*					x		
Chinspot Batis	*Batis molitor*					x	x	
Cinnamon-breasted Bunting	*Emberiza tahapisi*					x	x	
Collared Sunbird	*Hedydipna collaris*				x			
Common Fiscal	*Lanius collaris*					x		
Common Sandpiper	*Actitis hypoleucos*							x
Common Scimitarbill	*Rhinopomastus cyanomelas*				x	x	x	
Common Waxbill	*Estrilda astrild*				x	x		
Crested Barbet	*Trachyphonus vaillantii*				x	x		
Crowned Lapwing	*Vanellus coronatus*				x			
Dark-capped Bulbul	*Pycnonotus tricolor*				x	x	x	
Diderick Cuckoo	*Chrysococcyx caprius*				x	x	x	x
Egyptian Goose	*Alopochen aegyptiaca*							x
Emerald-spotted Wood-Dove	*Turtur chalcospilos*				x	x	x	
Eurasian Golden Oriole	*Oriolus oriolus*					x		
European Bee-eater	*Merops apiaster*				x	x	x	x
European Roller	*Coracias garrulus*					x		
Fiery-necked Nightjar	*Caprimulgus pectoralis*					x		
Flappet Lark	*Mirafra rufocinnamomea*					x	x	
Fork-tailed Drongo	*Dicrurus adsimilis*				x	x		
Garden Warbler	*Sylvia borin*					x		
Giant Kingfisher	*Megaceryle maximus*				x			x
Golden-breasted Bunting	*Emberiza flaviventris*					x	x	
Golden-tailed Woodpecker	*Campethera abingoni*				x	x	x	
Great Egret	*Egretta alba*							x

Greater Honeyguide	*Indicator indicator*					x	x	
Green Wood-Hoopoe	*Phoeniculus purpureus*				x	x		
Green-backed Heron	*Butorides striata*							x
Green-winged Pytilia	*Pytilia melba*					x		
Grey Go-away-bird	*Corythaixoides concolor*					x		
Grey Heron	*Ardea cinerea*							x
Grey Penduline-Tit	*Anthoscopus caroli*					x		
Grey Tit-Flycatcher	*Myioparus plumbeus*				x			
Grey-backed Camaroptera	*Camaroptera brevicaudata*				x	x		
Grey-headed Bush-Shrike	*Malaconotus blanchoti*				x	x		
Hadeda Ibis	*Bostrychia hagedash*					x		
Hamerkop	*Scopus umbretta*							x
Helmeted Guineafowl	*Numida meleagris*				x	x		
House Sparrow	*Passer domesticus*					x		
Jacobin Cuckoo	*Clamator jacobinus*					x		
Jameson's Firefinch	*Lagonosticta rhodopareia*					x		
Klaas's Cuckoo	*Chrysococcyx klaas*				x	x	x	
Kurrichane Buttonquail	*Turnix sylvaticus*						x	
Kurrichane Thrush	*Turdus libonyanus*					x		
Lanner Falcon	*Falco biarmicus*	NT					x	
Laughing Dove	*Streptopelia senegalensis*				x	x	x	
Lesser Honeyguide	*Indicator minor*					x		
Lesser Masked-Weaver	*Ploceus intermedius*				x	x		x
Lesser Striped Swallow	*Hirundo abyssinica*				x	x	x	x
Lesser Swamp-Warbler	*Acrocephalus gracilirostris*							x
Levaillant's Cuckoo	*Clamator levaillantii*					x		
Lilac-breasted Roller	*Coracias caudatus*					x		
Little Bee-eater	*Merops pusillus*				x		x	
Little Egret	*Egretta garzetta*							x
Little Grebe	*Tachybaptus ruficollis*							x
Little Rush-Warbler	*Bradypterus baboecala*							x
Little Sparrowhawk	*Accipiter minullus*				x			

Little Swift	*Apus affinis*				x	x		x
Lizard Buzzard	*Kaupifalco monogrammicus*					x		
Long-billed Crombec	*Sylvietta rufescens*					x		
Long-tailed Paradise-Whydah	*Vidua paradisaea*					x	x	
Malachite Kingfisher	*Alcedo cristata*				x			x
Marsh Warbler	*Acrocephalus palustris*				x			
Namaqua Dove	*Oena capensis*					x		
Natal Francolin	*Pternistis natalensis*				x	x		
Neddicky	*Cisticola fulvicapilla*					x	x	
Orange-breasted Bush-Shrike	*Telophorus sulfureopectus*				x	x	x	
Orange-breasted Waxbill	*Sporaeginthus subflavus*							x
Osprey	*Pandion haliaetus*							x
Pale Flycatcher	*Bradornis pallidus*					x		
Pied Crow	*Corvus albus*					x	x	
Pied Kingfisher	*Ceryle rudis*				x			x
Pin-tailed Whydah	*Vidua macroura*				x	x		
Purple Heron	*Ardea purpurea*							x
Purple Indigobird	*Vidua purpurascens*					x		
Purple Roller	*Coracias naevius*					x		
Purple-crested Turaco	*Gallirex porphyreolophus*				x			
Rattling Cisticola	*Cisticola chiniana*				x	x	x	
Red-backed Shrike	*Lanius collurio*				x	x		
Red-billed Firefinch	*Lagonosticta senegala*				x	x		
Red-billed Hornbill	*Tockus erythrorhynchus*					x		
Red-billed Quelea	*Quelea quelea*				x			x
Red-breasted Swallow	*Hirundo semirufa*				x			
Red-capped Robin-Chat	*Cossypha natalensis*				x			
Red-chested Cuckoo	*Cuculus solitarius*				x	x		
Red-collared Widowbird	*Euplectes ardens*						x	
Red-eyed Dove	*Streptopelia semitorquata*				x	x	x	
Red-faced Cisticola	*Cisticola erythrops*				x			
Red-faced Mousebird	*Urocolius indicus*					x		

Red-headed Weaver	*Anaplectes melanotis*				x	x		
Reed Cormorant	*Phalacrocorax africanus*							x
Rufous-naped Lark	*Mirafra africana*					x		
Sabota Lark	*Calendulauda sabota*						x	
Scarlet-chested Sunbird	*Chalcomitra senegalensis*				x	x	x	
Shikra	*Accipiter badius*				x			
Sombre Greenbul	*Andropadus importunus*				x	x		
Southern Black Flycatcher	*Melaenornis pammelaina*					x		
Southern Black Tit	*Parus niger*					x		
Southern Boubou	*Laniarius ferrugineus*				x	x		
Southern Carmine Bee-eater	*Merops nubicoides*				x	x		
Southern Grey-headed Sparrow	*Passer diffusus*				x	x	x	
Southern Masked-Weaver	*Ploceus velatus*							x
Southern Red Bishop	*Euplectes orix*							x
Southern White-crowned Shrike	*Eurocephalus anguitimens*					x		
Southern Yellow-billed Hornbill	*Tockus leucomelas*					x		
Speckled Mousebird	*Colius striatus*				x	x		
Spectacled Weaver	*Ploceus ocularis*				x			
Spotted Flycatcher	*Muscicapa striata*					x		
Steppe Buzzard	*Buteo vulpinus*					x		
Stierling's Wren-Warbler	*Calamonastes stierlingi*				x	x	x	
Streaky-headed Seedeater	*Crithagra gularis*						x	
Striped Kingfisher	*Halcyon chelicuti*					x	x	
Swainson's Spurfowl	*Pternistis swainsonii*				x			
Tambourine Dove	*Turtur tympanistria*				x			
Tawny-flanked Prinia	*Prinia subflava*				x	x	x	
Terrestrial Brownbul	*Phyllastrephus terrestris*				x	x		
Thick-billed Weaver	*Amblyospiza albifrons*				x			x
Three-banded Plover	*Charadrius tricollaris*							x
Village Indigobird	*Vidua chalybeata*				x	x		
Violet-backed Starling	*Cinnyricinclus leucogaster*				x	x	x	
Violet-eared Waxbill	*Granatina granatina*					x		

Wahlberg's Eagle	*Aquila wahlbergi*				x			
White-bellied Sunbird	*Cinnyris talatala*				x	x	x	
White-breasted Cormorant	*Phalacrocorax lucidus*							x
White-browed Robin-Chat	*Cossypha heuglini*				x			
White-browed Scrub-Robin	*Cercotrichas leucophrys*				x	x	x	
White-crested Helmet-Shrike	*Prionops plumatus*				x	x	x	
White-faced Duck	*Dendrocygna viduata*							x
White-fronted Bee-eater	*Merops bullockoides*				x			
White-throated Robin-Chat	*Cossypha humeralis*				x	x		
White-winged Widowbird	*Euplectes albonotatus*							x
Willow Warbler	*Phylloscopus trochilus*				x	x		
Wire-tailed Swallow	*Hirundo smithii*				x			x
Wood Sandpiper	*Tringa glareola*							x
Woodland Kingfisher	*Halcyon senegalensis*				x	x		
Yellow-billed Kite	*Milvus aegyptius*				x	x		
Yellow-bellied Eremomela	*Eremomela icteropygialis*					x		
Yellow-bellied Greenbul	*Chlorocichla flaviventris*				x	x		
Yellow-breasted Apalis	*Apalis flavida*				x	x		
Yellow-fronted Canary	*Crithagra mozambicus*				x	x	x	
Yellow-fronted Tinkerbird	*Pogoniulus chrysoconus*					x	x	
Yellow-throated Longclaw	*Macronyx croceus*					x	x	
Yellow-throated Petronia	*Petronia superciliaris*					x		
Subtotal	186	2	1	0	97	128	54	41
Reptiles								
Common Flap-neck Chamaeleon	*Chamaeleo dilepis*			NEMBA	x			
Common Flat Lizard	*Platysaurus intermedius*		LP				x	
Common Rough-scaled Lizard	*Ichnotropus squamulosa*						x	
Distant's Ground Agama	*Agama aculeata distanti*		SA			x		
Five-lined Skink	*Trachylepis margaritifer*				x	x	x	
Giant Plated Lizard	*Gerrhosaurus validus*						x	
Leopard Tortoise	*Geochelone pardalis*					x		
Peters' Thread Snake	*Leptotyphlops scutifrons*				x	x		

Puff Adder	*Bitis arietans*				x			
Rock Monitor	*Varanus albigularis*			NEMBA		x		
Speke's Hinged Tortoise	*Kinixys spekei*					x		
Stripe-bellied Sand Snake	*Psammophis subtaeniatus*					x		
Variable Skink	*Trachylepis varia*				x	x	x	
Water Monitor	*Varanus niloticus*			NEMBA	x			x
Subtotal	14	0	2	3	6	8	5	1
Frogs								
Bubbling Kassina	*Kassina senegalensis*				x			x
Bushveld Rain Frog	*Breviceps adspersus*					x		
Common River Frog	*Afrana angolensis*				x			x
Dwarf Puddle Frog	*Phrynobatrachus mababiensis*				x	x		
Eastern Olive Toad	*Amietophrynus garmani*				x	x		
Edible Bullfrog	*Pyxicephalus edulis*			NEMBA	x	x		
Flat-backed Toad	*Amietophrynus maculatus*				x	x		
Guttural Toad	*Amietophrynus gutturalis*							x
Mottled Shovel-nosed Frog	*Hemisus marmoratus*				x			
Raucous Toad	*Amietophrynus rangeri*				x	x		
Red Toad	*Schismaderma carens*				x	x		
Russet-backed Sand Frog	*Tomopterna marmorata*				x			
Southern Foam Nest Frog	*Chiromantis xerampelina*				x	x		
Tremolo Sand Frog	*Tomopterna cryptotis*					x		
Subtotal	14	0	0	1	11	9	0	3
Total		**3**	**3**	**6**	**119**	**154**	**63**	**46**
LP = Limpopo Province endemic								
SA = South African Endemic								
NEMBA = National Environmental Management: Biodiversity Act								
LEMA = Limpopo Environmental Management Act								

APPENDIX B 6: VERTEBRATE FAUNA SPECIES RECORDED IN PROPOSED INFRASTRUCTURE FOOTPRINTS OF THE PROJECT AREA

						BORROW PITS			RESERVOIRS							PIPELINES		
Common Name	Scientific Name	Red Data	Endemic	Protected	DAM BASIN	5	1 & 2	3 & 4	1	2	3	4	5	6 & 7	10	Hlohlokwe	Jasi	Gakomkgwathi
Mammals																		
Cape Porcupine	*Hystrix africaeaustralis*				x												x	
Chacma Baboon	*Papio hamadryas*															x		
Common Warthog	*Phacochoerus africanus*				x													
Greater Kudu	*Tragelaphus strepsiceros*				x													
Grey Duiker	*Sylvicapra grimmia*				x			x								x	x	
Hippopotamus	*Hippopotamus amphibius*			LEMA	x			x										
Red Veld Rat	*Aethomys chrysophilus*				x													
Scrub Hare	*Lepus saxatilis*				x													
Steenbok	*Raphicerus campestris*			LEMA														x
Tree Squirrel	*Paraxerus cepapi*				x													x
Vervet Monkey	*Cercopithecus pygerythrus*				x												x	
Subtotal	11	0	0	2	9	0	0	2	0	0	0	0	0	0	0	2	3	2
Birds																		
Acacia Pied Barbet	*Tricholaema leucomelas*												x					x
African Darter	*Anhinga rufa*				x													
African Fish-Eagle	*Haliaeetus vocifer*				x													
African Green-Pigeon	*Treron calvus*				x												x	
African Grey Hornbill	*Tockus nasutus*						x		x									x
African Harrier-Hawk	*Polyboroides typus*				x													
African Hoopoe	*Upupa africana*				x													

African Jacana	*Actophilornis africanus*				x													
African Paradise-Flycatcher	*Terpsiphone viridis*				x											x	x	x
African Pied Wagtail	*Motacilla aguimp*				x													
African Pygmy-Kingfisher	*Ispidina picta*				x											x		
Arrow-marked Babbler	*Turdoides jardineii*				x													
Ashy Flycatcher	*Muscicapa caerulescens*				x													
Barn Swallow	*Hirundo rustica*				x			x	x	x					x		x	x
Bearded Woodpecker	*Dendropicos namaquus*				x											x		
Black (Yellow-billed) Kite	*Milvus migrans*				x										x			
Black Cuckoo	*Cuculus clamosus*															x		
Black Cuckooshrike	*Campephaga flava*				x											x		x
Black Stork	*Ciconia nigra*	NT														x		
Black-backed Puffback	*Dryoscopus cubla*						x	x	x							x	x	x
Black-collared Barbet	*Lybius torquatus*				x				x							x	x	
Black-crowned Tchagra	*Tchagra senegalus*				x		x		x	x					x	x	x	
Black-headed Heron	*Ardea melanocephala*															x		
Black-headed Oriole	*Oriolus larvatus*				x			x	x				x				x	x
Black-shouldered Kite	*Elanus caeruleus*				x													
Blacksmith Lapwing	*Vanellus armatus*				x												x	
Blue Waxbill	*Uraeginthus angolensis*				x			x	x	x		x			x	x	x	x
Blue-cheeked Bee-eater	*Merops persicus*				x													
Broad-billed Roller	*Eurystomus glaucurus*				x												x	
Bronze Mannikin	*Spermestes cucullatus*												x					
Brown Snake-Eagle	*Circaetus cinereus*				x													
Brown-backed Honeybird	*Prodotiscus regulus*															x		
Brown-crowned Tchagra	*Tchagra australis*				x			x									x	x
Brown-headed Parrot	*Poicephalus cryptoxanthus*																	x
Brown-hooded Kingfisher	*Halcyon albiventris*				x				x								x	x
Brubru	*Nilaus afer*								x							x		
Burchell's Coucal	*Centropus burchelli*																x	
Bushveld Pipit	*Anthus caffer*				x				x				x					
Cape Glossy Starling	*Lamprotornis nitens*				x		x									x	x	

Cape Turtle-Dove	*Streptopelia capicola*				x		x	x	x	x		x			x	x	x	x
Cape White-eye	*Zosterops virens*		E		x			x					x				x	
Cardinal Woodpecker	*Dendropicos fuscescens*				x											x	x	
Cattle Egret	*Bubulcus ibis*				x		x										x	
Chestnut-backed Sparrowlark	*Eremopterix leucotis*																	x
Chinspot Batis	*Batis molitor*							x								x	x	x
Cinnamon-breasted Bunting	*Emberiza tahapisi*								x			x	x			x		x
Collared Sunbird	*Hedydipna collaris*				x													
Common Fiscal	*Lanius collaris*																	x
Common Sandpiper	*Actitis hypoleucos*																x	
Common Scimitarbill	*Rhinopomastus cyanomelas*				x				x									x
Common Waxbill	*Estrilda astrild*				x											x		
Crested Barbet	*Trachyphonus vaillantii*				x		x											x
Crowned Lapwing	*Vanellus coronatus*				x													
Dark-capped Bulbul	*Pycnonotus tricolor*						x	x	x	x			x		x	x	x	
Diderick Cuckoo	*Chrysococcyx caprius*				x		x	x				x	x				x	
Egyptian Goose	*Alopochen aegyptiaca*																x	
Emerald-spotted Wood-Dove	*Turtur chalcospilos*				x			x	x							x	x	x
Eurasian Golden Oriole	*Oriolus oriolus*				x													
European Bee-eater	*Merops apiaster*				x			x		x					x		x	x
European Roller	*Coracias garrulus*							x										
Fiery-necked Nightjar	*Caprimulgus pectoralis*																	x
Flappet Lark	*Mirafra rufocinnamomea*								x	x					x			x
Fork-tailed Drongo	*Dicrurus adsimilis*				x			x	x							x	x	x
Garden Warbler	*Sylvia borin*																	x
Giant Kingfisher	*Megaceryle maximus*				x													
Golden-breasted Bunting	*Emberiza flaviventris*				x			x	x							x		x
Golden-tailed Woodpecker	*Campethera abingoni*				x		x		x							x		
Great Egret	*Egretta alba*				x													
Greater Honeyguide	*Indicator indicator*				x								x					
Green Wood-Hoopoe	*Phoeniculus purpureus*				x													
Green-backed Heron	*Butorides striata*				x													

Green-winged Pytilia	*Pytilia melba*																	x
Grey Go-away-bird	*Corythaixoides concolor*																	x
Grey Heron	*Ardea cinerea*				x													
Grey Penduline-Tit	*Anthoscopus caroli*				x												x	
Grey Tit-Flycatcher	*Myioparus plumbeus*				x													
Grey-backed Camaroptera	*Camaroptera brevicaudata*				x											x	x	
Grey-headed Bush-Shrike	*Malaconotus blanchoti*				x													x
Hadeda Ibis	*Bostrychia hagedash*							x										
Hamerkop	*Scopus umbretta*				x													
Helmeted Guineafowl	*Numida meleagris*				x			x										
House Sparrow	*Passer domesticus*									x		x			x			
Jacobin Cuckoo	*Clamator jacobinus*				x													x
Jameson's Firefinch	*Lagonosticta rhodopareia*				x			x									x	x
Klaas's Cuckoo	*Chrysococcyx klaas*				x								x					x
Kurrichane Buttonquail	*Turnix sylvaticus*								x									
Kurrichane Thrush	*Turdus libonyanus*															x		
Lanner Falcon	*Falco biarmicus*	NT										x						
Laughing Dove	*Streptopelia senegalensis*						x	x	x									x
Lesser Honeyguide	*Indicator minor*																x	
Lesser Masked-Weaver	*Ploceus intermedius*				x												x	
Lesser Striped Swallow	*Hirundo abyssinica*				x		x	x	x									
Lesser Swamp-Warbler	*Acrocephalus gracilirostris*				x													
Levaillant's Cuckoo	*Clamator levaillantii*								x									x
Lilac-breasted Roller	*Coracias caudatus*				x													
Little Bee-eater	*Merops pusillus*				x								x					
Little Egret	*Egretta garzetta*				x					x					x			
Little Grebe	*Tachybaptus ruficollis*				x													
Little Rush-Warbler	*Bradypterus baboecala*				x													
Little Sparrowhawk	*Accipiter minullus*				x													
Little Swift	*Apus affinis*				x													x
Lizard Buzzard	*Kaupifalco monogrammicus*																	x
Long-billed Crombec	*Sylvietta rufescens*				x				x			x					x	x

Long-tailed Paradise-Whydah	*Vidua paradisaea*									x					x	x		x
Malachite Kingfisher	*Alcedo cristata*				x													
Marsh Warbler	*Acrocephalus palustris*				x		x		x							x	x	x
Namaqua Dove	*Oena capensis*																	x
Natal Francolin	*Pternistis natalensis*				x													x
Neddicky	*Cisticola fulvicapilla*								x	x			x		x			x
Orange-breasted Bush-Shrike	*Telophorus sulfureopectus*				x								x			x	x	x
Orange-breasted Waxbill	*Sporaeginthus subflavus*				x													
Osprey	*Pandion haliaetus*				x													
Pale Flycatcher	*Bradornis pallidus*															x		x
Pied Crow	*Corvus albus*											x						
Pied Kingfisher	*Ceryle rudis*				x												x	
Pin-tailed Whydah	*Vidua macroura*				x		x										x	
Purple Heron	*Ardea purpurea*				x													
Purple Indigobird	*Vidua purpurascens*				x													
Purple Roller	*Coracias naevius*							x										
Purple-crested Turaco	*Gallirex porphyreolophus*				x													
Rattling Cisticola	*Cisticola chiniana*				x		x	x	x	x			x		x	x	x	x
Red-backed Shrike	*Lanius collurio*				x			x	x									
Red-billed Firefinch	*Lagonosticta senegala*				x											x		x
Red-billed Hornbill	*Tockus erythrorhynchus*				x													
Red-billed Quelea	*Quelea quelea*				x											x		
Red-breasted Swallow	*Hirundo semirufa*				x													
Red-capped Robin-Chat	*Cossypha natalensis*				x													
Red-chested Cuckoo	*Cuculus solitarius*				x											x		
Red-collared Widowbird	*Euplectes ardens*												x					
Red-eyed Dove	*Streptopelia semitorquata*				x		x						x			x	x	
Red-faced Cisticola	*Cisticola erythrops*				x		x										x	
Red-faced Mousebird	*Urocolius indicus*															x	x	x
Red-headed Weaver	*Anaplectes melanotis*				x													
Reed Cormorant	*Phalacrocorax africanus*				x												x	
Rufous-naped Lark	*Mirafra africana*				x		x		x	x					x		x	

Sabota Lark	*Calendulauda sabota*								x									
Scarlet-chested Sunbird	*Chalcomitra senegalensis*				x				x				x			x	x	
Shikra	*Accipiter badius*				x													
Sombre Greenbul	*Andropadus importunus*				x											x	x	
Southern Black Flycatcher	*Melaenornis pammelaina*																x	x
Southern Black Tit	*Parus niger*				x											x	x	
Southern Boubou	*Laniarius ferrugineus*																x	x
Southern Carmine Bee-eater	*Merops nubicoides*				x												x	
Southern Grey-headed Sparrow	*Passer diffusus*				x		x	x	x								x	
Southern Masked-Weaver	*Ploceus velatus*						x		x									x
Southern Red Bishop	*Euplectes orix*				x		x											
Southern White-crowned Shrike	*Eurocephalus anguitimens*				x													
Southern Yellow-billed Hornbill	*Tockus leucomelas*						x	x										
Speckled Mousebird	*Colius striatus*				x													x
Spectacled Weaver	*Ploceus ocularis*				x		x											
Spotted Flycatcher	*Muscicapa striata*											x						x
Steppe Buzzard	*Buteo vulpinus*				x													
Stierling's Wren-Warbler	*Calamonastes stierlingi*				x			x	x				x			x	x	x
Streaky-headed Seedeater	*Crithagra gularis*									x					x	x		
Striped Kingfisher	*Halcyon chelicuti*												x			x		
Swainson's Spurfowl	*Pternistis swainsonii*						x											
Tambourine Dove	*Turtur tympanistria*				x		x										x	
Tawny-flanked Prinia	*Prinia subflava*				x		x	x	x			x	x			x	x	x
Terrestrial Brownbul	*Phyllastrephus terrestris*																x	x
Thick-billed Weaver	*Amblyospiza albifrons*				x													
Three-banded Plover	*Charadrius tricollaris*				x													
Village Indigobird	*Vidua chalybeata*				x			x								x	x	x
Violet-backed Starling	*Cinnyricinclus leucogaster*				x		x		x				x				x	
Violet-eared Waxbill	*Granatina granatina*				x													
Wahlberg's Eagle	*Aquila wahlbergi*				x													
White-bellied Sunbird	*Cinnyris talatala*				x			x	x			x				x	x	x
White-breasted Cormorant	*Phalacrocorax lucidus*				x													

White-browed Robin-Chat	*Cossypha heuglini*				x													
White-browed Scrub-Robin	*Cercotrichas leucophrys*				x		x	x	x	x			x		x	x	x	x
White-crested Helmet-Shrike	*Prionops plumatus*				x				x							x		
White-faced Duck	*Dendrocygna viduata*				x			x									x	
White-fronted Bee-eater	*Merops bullockoides*				x													
White-throated Robin-Chat	*Cossypha humeralis*				x												x	
White-winged Widowbird	*Euplectes albonotatus*				x													
Willow Warbler	*Phylloscopus trochilus*				x			x								x	x	x
Wire-tailed Swallow	*Hirundo smithii*				x													
Wood Sandpiper	*Tringa glareola*				x													
Woodland Kingfisher	*Halcyon senegalensis*							x									x	
Yellow-billed Kite	*Milvus aegyptius*				x													x
Yellow-bellied Eremomela	*Eremomela icteropygialis*				x											x		x
Yellow-bellied Greenbul	*Chlorocichla flaviventris*				x											x	x	
Yellow-breasted Apalis	*Apalis flavida*				x			x								x	x	
Yellow-fronted Canary	*Crithagra mozambicus*				x		x	x	x	x		x	x		x	x	x	x
Yellow-fronted Tinkerbird	*Pogoniulus chrysoconus*				x				x							x		
Yellow-throated Longclaw	*Macronyx croceus*									x					x			
Yellow-throated Petronia	*Petronia superciliaris*							x										
Subtotal	186	2	1	0	132	0	29	36	41	17	0	12	23	0	18	53	64	61
Reptiles																		
Common Flap-neck Chamaeleon	*Chamaeleo dilepis*			NEMBA	x													
Common Flat Lizard	*Platysaurus intermedius*															x		
Common Rough-scaled Lizard	*Ichnotropus squamulosa*												x					
Distant's Ground Agama	*Agama aculeata distanti*				x													
Five-lined Skink	*Trachylepis margaritifer*				x							x				x		
Giant Plated Lizard	*Gerrhosaurus validus*															x		
Leopard Tortoise	*Geochelone pardalis*				x													
Peters' Thread Snake	*Leptotyphlops scutifrons*				x													
Puff Adder	*Bitis arietans*				x													
Rock Monitor	*Varanus albigularis*			NEMBA	x			x										
Stripe-bellied Sand Snake	*Psammophis subtaeniatus*					x												

Speke's Hinged Tortoise	*Kinixys spekei*				x													x
Variable Skink	*Trachylepis varia*				x								x			x		
Water Monitor	*Varanus niloticus*			NEMBA	x													
Subtotal	14	0	0	3	10	1	0	1	0	0	0	1	2	0	0	4	0	1
Frogs																		
Bubbling Kassina	*Kassina senegalensis*				x													
Bushveld Rain Frog	*Breviceps adspersus*					x												
Common River Frog	*Afrana angolensis*				x													
Dwarf Puddle Frog	*Phrynobatrachus mababiensis*				x													
Eastern Olive Toad	*Amietophrynus garmani*				x													
Edible Bullfrog	*Pyxicephalus edulis*			NEMBA	x			x										
Flat-backed Toad	*Amietophrynus maculatus*				x	x												
Guttural Toad	*Amietophrynus gutturalis*				x													
Mottled Shovel-nosed Frog	*Hemisus marmoratus*				x													
Raucous Toad	*Amietophrynus rangeri*				x			x										
Red Toad	*Schismaderma carens*				x			x										
Russet-backed Sand Frog	*Tomopterna marmorata*				x													
Southern Foam Nest Frog	*Chiromantis xerampelina*				x													
Tremolo Sand Frog	*Tomopterna cryptotis*					x												
Subtotal	14	0	0	1	12	3	0	3	0	0	0	0	0	0	0	0	0	0
Total		2	1	6	163	4	29	42	41	17	0	13	25	0	18	59	67	64

APPENDIX B 7: CONSERVATION-IMPORTANT VERTEBRATE FAUNA SPECIES LIKELY TO OCCUR IN THE FOUR VEGETATION COMMUNITIES ASSOCIATED WITH THE PROPOSED DEVELOPMENT FOOTPRINT

Common Name	Scientific Name	Red Data Status	Endemic Status	Protected	*Acacia - Combretum* Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland	Artificial Wetlands
Mammals								
African Clawless Otter	*Aonyx capensis*			NEMBA	x			x
Southern African Hedgehog	*Atelerix frontalis*	NT		NEMBA		x	x	
African Civet	*Civettictis civetta*			LEMA	x	x	x	
Reddish-grey Musk Shrew	*Crocidura cyanea*	DD			x	x	x	
Tiny Musk Shrew	*Crocidura fuscomurina*	DD			x	x	x	
Lesser Red Musk Shrew	*Crocidura hirta*	DD			x	x	x	
Swamp Musk Shrew	*Crocidura mariquensis*	DD			x			x
Peters' Musk Shrew	*Crocidura silacea*	DD			x	x	x	
Spotted Hyaena	*Crocuta crocuta*	NT		NEMBA		x		
African Marsh Rat	*Dasymys incomtus*	NT			x			x
Nyika Climbing Mouse	*Dendromus nyikae*	NT			x	x	x	
Short-snouted Elephant-Shrew	*Elephantulus brachyrhynchus*	DD			x	x	x	
Gambian Epauletted Fruit Bat	*Epomophorus gambianus*	DD			x	x	x	
African Wild Cat	*Felis silvestris*			LEMA	x	x	x	
South African Galago	*Galago moholi*			LEMA	x	x		
Giraffe	*Giraffa camelopardalis*			LEMA		x		
Woodland Thicket Rat	*Grammomys dolichurus*	DD			x	x	x	
Rock Dormouse	*Graphiurus platyops*	DD					x	
Hippopotamus	*Hippopotamus amphibius*			LEMA	x			x

Sundevall's Leaf-nosed Bat	*Hipposideros caffer*	DD			x	x	x	x
Single-striped Grass-Mouse	*Lemniscomys rosalia*	DD				x		
Serval	*Leptailurus serval*	NT		NEMBA	x	x	x	
Spotted-necked Otter	*Lutra maculicollis*	NT		NEMBA	x			x
Ground Pangolin	*Manis temminckii*	VU		NEMBA	x	x	x	
Honey Badger	*Mellivora capensis*	NT		NEMBA	x	x	x	
Lesser Long-fingered Bat	*Miniopterus fraterculus*	NT			x	x	x	x
Schreibers' Long-fingered Bat	*Miniopterus schreibersii*	NT			x	x	x	x
Rufous Mouse-eared Bat	*Myotis bocagei*	DD			x	x	x	x
Temminck's Hairy Bat	*Myotis tricolor*	NT			x	x	x	x
Welwitsch's Hairy Bat	*Myotis welwitschii*	NT			x	x	x	x
Klipspringer	*Oreotragus oreotragus*			LEMA			x	
Aardvark	*Orycteropus afer*			LEMA	x	x	x	
Greater Galago	*Otolemur crassicaudatus*			LEMA	x	x		
Leopard	*Panthera pardus*			LEMA	x	x	x	
Selous's Mongoose	*Paracynictis selousi*	DD		LEMA	x	x		
Brown Hyaena	*Parahyaena brunnea*	NT		NEMBA		x	x	
Rusty Bat	*Pipistrellus rusticus*	NT			x	x	x	x
African Weasel	*Poecilogale albinucha*	DD			x	x	x	
Jameson's Rock Rabbit	*Pronolagus randensis*			LEMA			x	
Aardwolf	*Proteles cristatus*			LEMA	x	x	x	
Steenbok	*Raphicerus campestris*			LEMA	x	x	x	
Sharpe's Grysbok	*Raphicerus sharpei*			NEMBA	x	x		
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	NT			x	x	x	x
Darling's Horseshoe Bat	*Rhinolophus darlingi*	NT			x	x	x	x
Hildebrandt's Horseshoe Bat	*Rhinolophus hildebrandtii*	NT			x	x	x	x
Meller's Mongoose	*Rhynchogale melleri*	DD		LEMA	x	x	x	
Least Dwarf Shrew	*Suncus infinitesimus*	DD			x	x	x	
Greater Dwarf Shrew	*Suncus lixus*	DD			x	x	x	
Lesser Dwarf Shrew	*Suncus varilla*	DD			x	x	x	
Bushveld Gerbil	*Tatera leucogaster*	DD				x	x	
Subtotal	**50**	**36**	**0**	**23**	**44**	**45**	**40**	**15**

Birds								
White-headed Vulture	*Aegypius occipitalis*	VU		NEMBA	x	x	x	
Lappet-faced Vulture	*Aegypius tracheliotus*	VU		NEMBA	x	x	x	
Half-collared Kingfisher	*Alcedo semitorquata*	NT			x			x
African Openbill	*Anastomus lamelligerus*	NT			x			
Ayres's Hawk-Eagle	*Aquila ayresii*	NT					x	
Tawny Eagle	*Aquila rapax*	VU		NEMBA	x	x	x	
Southern Ground-Hornbill	*Bucorvus leadbeateri*	VU		NEMBA	x	x	x	
Red-billed Oxpecker	*Buphagus erythrorhynchus*	NT			x	x	x	
Woolly-necked Stork	*Ciconia episcopus*	NT			x			x
Black Stork	*Ciconia nigra*	NT		NEMBA	x	x	x	x
Corn Crake	*Crex crex*	VU		LEMA		x		
Saddle-billed Stork	*Ephippiorhynchus senegalensis*	EN		NEMBA	x			x
Lanner Falcon	*Falco biarmicus*	NT				x	x	
Lesser Kestrel	*Falco naumanni*	VU		NEMBA		x	x	
African Barred Owlet	*Glaucidium capense*			LEMA	x	x		
White-backed Night-Heron	*Gorsachius leuconotus*	VU		LEMA	x			x
White-backed Vulture	*Gyps africanus*	VU		NEMBA	x	x	x	
Cape Vulture	*Gyps coprotheres*	VU		NEMBA		x	x	
Marabou Stork	*Leptoptilos crumeniferus*	NT			x	x	x	x
Black-bellied Bustard	*Lissotis melanogaster*	NT				x		
Bat Hawk	*Macheiramphus alcinus*	NT		LEMA	x	x	x	x
Yellow-billed Stork	*Mycteria ibis*	NT						x
Hooded Vulture	*Necrosyrtes monachus*	VU		NEMBA	x	x	x	
African Pygmy-Goose	*Nettapus auritus*	NT		LEMA				x
African Finfoot	*Podica senegalensis*	VU		LEMA	x			x
Grey-headed Parrot	*Poicephalus fuscicollis*			LEMA	x	x	x	
Martial Eagle	*Polemaetus bellicosus*	VU		NEMBA	x	x	x	
Greater Painted Snipe	*Rostratula benghalensis*	NT						x
Secretarybird	*Sagittarius serpentarius*	NT				x		
Bateleur	*Terathopius ecaudatus*	VU		NEMBA	x	x	x	
African Grass-Owl	*Tyto capensis*	VU		NEMBA		x		

White-crowned Lapwing	*Vanellus albiceps*	NT		LEMA	x			
Cape White-eye	*Zosterops virens*		E		x	x	x	
Subtotal	**33**	**30**	**1**	**21**	**22**	**22**	**18**	**11**
Reptiles								
Distant's Ground Agama	*Agama (aculeata) distanti*		SA			x	x	
Southern Rock Agama	*Agama atra*		SA				x	
Flap-neck Chamaeleon	*Chamaeleo dilepis*			NEMBA	x	x	x	
Van Dam's Girdled Lizard	*Cordylus vandami*		SA			x	x	
Nile Crocodile	*Crocodylus niloticus*	VU		NEMBA	x			x
Distant's Thread Snake	*Leptotyphlops distanti*		SA		x	x	x	
Cape File Snake	*Mehelya capensis*			LEMA	x	x	x	
Black File Snake	*Mehelya nyassae*			LEMA	x	x	x	
Van Son's Thick-toed Gecko	*Pachydactylus vansoni*		SA				x	
Common Flat Lizard	*Platysaurus intermedius*		LP				x	
Southern African Python	*Python natalensis*	VU		NEMBA	x	x	x	x
Lowveld Dwarf Burrowing Skink	*Scelotes bidigittatus*		LP			x	x	
Rock Monitor	*Varanus albigularis*			LEMA	x	x	x	
Water Monitor	*Varanus niloticus*			LEMA	x			x
Subtotal	**14**	**2**	**7**	**5**	**6**	**8**	**11**	**2**
Frogs								
Giant Bullfrog	*Pyxicephalus adspersus*	NT		NEMBA		x		x
African Bullfrog	*Pyxicephalus edulis*			NEMBA		x		x
Subtotal	**2**	**1**	**0**	**2**	**0**	**2**	**0**	**2**
TOTAL	**99**	**69**	**8**	**51**	**72**	**77**	**69**	**30**

VU = Vulnerable
NT = Near Threatened
SA = South African endemic
LP = Limpopo Province endemic
NEMBA = National Environmental Management: Biodiversity Act
LEMA = Limpopo Environmental Management Act

APPENDIX B 8: IMPORTANCE VALUES OF CONSERVATION-IMPORTANT INVERTEBRATE SPECIES CONFIRMED TO DATE IN PROJECT AREA

COMMON NAME	SPECIES	IUCN Red List status	SA Red Data Status	Endemic status	Protection status	Importance value	*Acacia - Combretum* Riverine Woodland	*Colophospermum - Dichrostachys* Plains Woodland	*Combretum - Bridelia* Rocky Outcrop Woodland
Scorpions									
Flat Rock Scorpion	*Hadogenes troglodytes*	-	-	Widespread	NEMBA	Medium			X
Burrowing Scorpion	*Opistophthalmus glabrifrons*	-	-	Widespread	NEMBA	Medium		X	X
Creeping Scorpion	*Opistacanthus asper*	-	-	Widespread	NEMBA	Medium	X	X	X
Trapdoor and baboon spiders									
Horned Baboon Spider	*Ceratogyrus bechuanicus*	-	-	Widespread	NEMBA	Medium		X	X
Golden Baboon Spider	*Pterinochilus junodi*	-	-	Regional	NEMBA	Medium		X	X
Ground beetles[10]									
Giant Tiger Beetle	*Mantichora latipennis* [NR]	-	-	Widespread	NEMBA	Medium		X	X
Tiger Beetle	*Megacephala regalis vansoni* [VR]	-	-	Local	NEMBA	High		X	
Tiger Beetle	*Dromica oberprieleri* [ER]	-	-	Local	NEMBA	High		X	
Tiger Beetle	*Dromica quadricostata (= costata)* [R]	-	-	Regional	NEMBA	Medium		X	X
Tiger Beetle	*Dromica lepidula* [R]	-	-	Regional	NEMBA	Medium	X	X	X
Tiger Beetle	*Dromica tenella* [NR]	-	-	Widespread	NEMBA	Medium	X	X	X

[10] Rarity ***in collections*** (according to Werner 2000) is indicated in brackets: NR = not rare, R = rare, VR = very rare, ER = extremely rare; since many of these beetle species are fast-moving and difficult to capture, this does not necessarily indicate rarity in the field.

Tiger Beetle	*Dromica concinna* [R]	-	-	Widespread	NEMBA	Medium		X	
Tiger Beetle	*Dromica kolbei* [R]	-	-	Widespread	NEMBA	Medium	X	X	
TOTAL	**13**	**0**	**0**	**2**	**13**		**4**	**12**	**9**

1. IUCN categories (brackets indicate meets criteria, but formal evaluation still in progress): EN = Endangered VU = Vulnerable DD = Data Deficient LC = Least Concern	**2**. SA Red data categories: RE = Regionally Extinct CR = Critically Endangered NT = Near-threatened VU = Vulnerable	**3**. Degree of endemism: note that some of the beetle species may be locally rather than regionally endemic, but insufficient data is available at present to substantiate this; their importance values may thus be slightly underestimated here.	**4**. Protection status: **NEMBA** = Included on current list of threatened and protected species in terms of National Environmental Management: Biodiversity Act. Restricted activities involving species on this list will be regulated from 1 June 2007.	Probability of occurrence: - = none/very low X = low XX = medium XXX = high

* All species of concern predicted for this vegetation type would be expected to inhabit only the periphery of the wetlands.

Note that

- **additional species may be included once identifications have been completed; only those definitely confirmed have been listed.**

APPENDIX B 9. VEGETATION COMMUNITIES WITHIN THE GLEWAP PROJECT AREA

Photo 1. *Acacia – Combretum* Riparian Woodland (Janetsi 463 LT).

Photo 2. *Colophospermum* – *Dichrostachys* Plains Woodland (La Motte 464 LT)

Photo 3. *Combretum – Bridelia* Rocky Outcrop Woodland (Sirulurul 427 LT)

APPENDIX B 10. MISCELLANEOUS PHOTOGRAPHS WITHIN THE GLEWAP PROJECT AREA

Photo 4. Willan Walk-in Live Trap

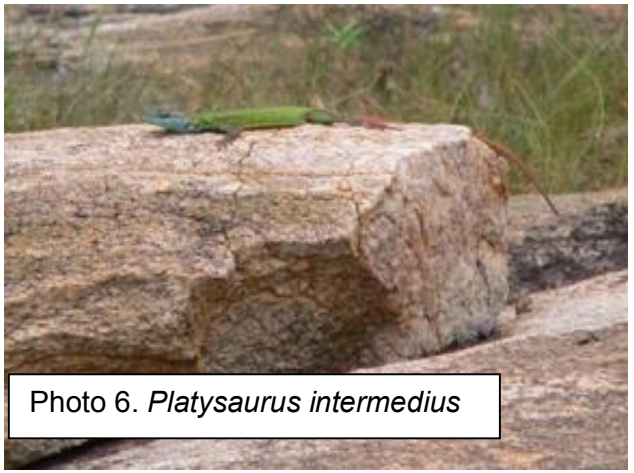

Photo 6. *Platysaurus intermedius*

Photo 5. Drift Fence and Pit-fall Trap

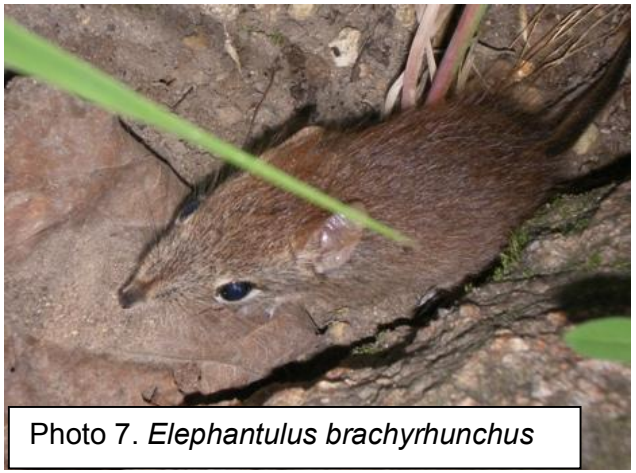

Photo 7. *Elephantulus brachyrhunchus*

APPENDIX B 11: REHABILITATION GUIDELINES FOR BORROW PITS AND CONSTRUCTION CAMPS

The following guidelines are based on the Department of Water Affairs & Forestry's *Integrated Environmental Management Series* 6: Environmental Best Practice Specifications for Construction Sites. However, it is not a comprehensive overview of the Department Guidelines. The Construction Contractor should have a copy of DWAF (2005) and should be assisted by an Environmental Control Officer in this regard.

Construction Phase

- Erect perimeter fence around borrow pits and construction camp, in order to prevent access into sensitive no-go areas.
- Any conservation-important species within the sites should be identified and removed to adjacent habitat.
- Plants should be placed in an on-site nursery where they can be tended until rehabilitation takes place. The nursery should be fenced and equipped with its own water supply. It should also be stocked with appropriate equipment, topsoil and compost. Trained staff should tend to plants delivered to nursery.
- Topsoil should be stockpiled separately from overburden; piles not to exceed 2 metres in height and not exceed a slope of 1:3. These stockpiles should not be stored for longer than 6 months and should be protected against erosion and weeds.
- Allow local communities to remove vegetation from affected areas prior to strip-clearing of vegetation.
- Minimise flow of surface water into borrow pits through use of earth berms or sandbags.

Closure Phase (Rehabilitation)

- Demolish and remove any infrastructure in construction camp.
- Backfill borrow pits with rubble and overburden. Shape all backfilled areas to appear similar to adjacent topography.
- Replace and redistribute stockpiled topsoil. Shape topsoil to blend in with surroundings.
- Rip and scarify topsoil within borrow pits as well disturbed surfaces within construction camp site.
- Suitably experienced contractor to transplant suitable plants from nursery, ensuring that plants are returned to applicable micro-habitats. Other areas to be planted through hydro-seeding with a seed mix slurry. Appropriate grasses and recommended application rates are:

GRASS SPECIES	COMMON NAME	APPLICATION RATE (KG/HA)
Anthephora pubescens	Wool grass	5
Cenchris ciliaris	Blue buffalo grass	4

Chloris gayana	Rhodes grass	4
Cynodon dactylon	Couch grass	5
Digitaria eriantha	Smutsfinger grass	8
Eragrostis curvula	Weeping lovegrass	4
Eragrostis tef	Teff	8
Panicum maximum	Guinea grass	6
Total		44

Rehabilitated areas should be maintained by experienced landscape contractors for up to a year after closure in order to ensure successful rehabilitation of vegetation