AFRICAN GRASS OWL HABITAT ASSESSMENT ON PORTION 62 OF THE FARM WITPOORTJIE 177-IR, GAUTENG PROVINCE

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DETAILS OF SPECIALIST

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Appointment of specialist

Clayton Cook was commissioned by Enviroguard to provide specialist consulting services for an African Grass Owl habitat assessment for portions 62 of the Farm Witpoortjie 177 IR. The habitat assessment was based primarily on a desktop survey as well as a habitat assessment conducted on the 17th of November 2018.

Summary of expertise

Clayton Cook:

- Registered professional member of The South African Council for Natural Scientific Professions (Zoological Science), registration number 400084/04.
- Faunal and Specialist Herpetological consultant since 1997.
- Conducted over 150 preliminary faunal surveys and 50 specialist herpetological surveys.
- Regional Organiser for Gauteng Province for the South African Frog Atlas Project 1999-2003.
- Published a scientific paper on *Pyxicephalus adspersus*, 8 scientific conference presentations, co-wrote the species accounts for the genus *Pyxicephalus* for the Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland South African Red as well as W.R.C Report No. 1258/1/06 on "A Biophysical framework for The Sustainable Management Of Wetlands In Limpopo Province With Nylsvley as a Reference Model".
- Attended 5 national and international herpetological congresses & 3 expert workshops, lectured zoology and botanical science at University of Limpopo (2001-2004).
- Lead researcher of a 3 year W.R.C. project on the status of frog species in the Kruger National Park as well as the impacts of water quality on tadpoles (2009-2012).
- PhD candidate on the amphibian diversity and ecology of eight geologically distinct pans with the Tshokwane area of the Southern portion of the Kruger National Park (2010-2012) University of Johannesburg.

Independence

Clayton Cook has no connection with Enviroguard or the proposed developer and is not a subsidiary, legally or financially, of the proponents, remuneration for services by the proponent in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. The percentage work received directly or indirectly from the proponent in the last twelve months is approximately 0% of turnover.

Scope and purpose of report

The scope and purpose of the report are reflected in the “Terms of reference” section of this report below.

Indemnity and specific conditions relating to the report

The findings and recommendations in this report are based on best scientific practices, available information, professional experience and judgement. Due diligence has been observed throughout the preparation of the document. Clayton Cook accepts no liability for any claim, demand, cost or inconvenience arising from this report or its contents and by accepting this report recipients indemnify the author, contributors and collaborators from any such liability. This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

1. INTRODUCTION

This brief African Grass Owl habitat assessment was carried out on the basis of a single day site visit (7h00-14h00) carried out on the 17th of November 2018. It must be stressed that no comprehensive avifaunal surveys were conducted but merely a brief assessment of the habitat availability as well current ecological status of the proposed Witpoortjie site for African Grass Owls; as well as to provide management recommendations should they indeed occur on the site. The Gauteng Department of Agriculture and Rural Development (GDARD) Requirements for Biodiversity Assessments requires that surveys for African Grass Owls must be conducted in summer,; **but only once the vegetation layer has recovered sufficiently from winter fires** to allow for assessment of available habitat as well as sufficient rainfall. In this instance, the assessment was conducted in the early months of the current 2018-2019 wet season prior to adequate rainfall due to an El Nino event. **The vegetation of the site had recovered in certain areas to adequately assess the grassland habitats but not the hygrophilous vegetation within the seasonal pans. No surface water was present within the pans or western valley bottom wetland.**

1.1 Terms of Reference

Clayton Cook was commissioned by Enviroguard to provide specialist consulting services for the proposed medium-high density residential developments on portion 62 of the Farm Witpoortjie 177 IR (henceforth called the Witpoortjie site), situated adjacent to the M45 which forms the western boundary, bulk pipelines and a railway track on the southern boundary, R554 and Van Dyk Dam to the north and open grasslands and Dalpark to the east and degraded open grasslands to the south (see Figure 1). Major bulk pipelines occur on the southern boundary of the site.

1.2 Objectives of the Habitat Assessment

- A specialist habitat assessment for African Grass Owl with special emphasis on the current habitat availability and suitability on and immediately surrounding the proposed site.
- To provide management recommendations for the conservation of any threatened avifaunal species occurring or likely to occur on the site.

1.3 Scope of study

- A preliminary field assessment conducted on and around the proposed site recording sightings and/or evidence of African Grass Owls.
- An assessment of the ecological habitats occurring on the site using dominant vegetation, evaluating conservation importance and significance of the site with special emphasis on African Grass Owls.
- Literature investigations, previous surveys as well as personal species lists with which to augment field data were necessary.
- Documentation of the findings of the study in a report.

1.3 Constraints or limitations to the survey included:

- Limitation to a base-line ecological survey for only 4 hours during the summer months (November). No comprehensive avifaunal o surveys were conducted but merely a habitat assessment for African Grass Owls.
- Inadequate rainfall had resulted in no surface water as well as emergence of hygrophilous and hydrophilic vegetation within the wetlands on the site.
- Large proportions of suitable habitat for African Grass Owls occur to the south and east of the site on private properties with little or no access especially during nocturnal surveys (high risk areas).
- The majority of threatened faunal species especially the African Grass Owl and Giant Bullfrog are extremely secretive and difficult to observe even during intensive field surveys conducted over several seasons.
- The presence of threatened species on site is assessed mainly on habitat availability and suitability, desk top research (literature, personal records, previous surveys conducted in the Benoni-Brakpan areas between1999-2018) as well as actual observations of any threatened faunal species.

2.4 Gaps in the baseline data

- Little long-term, verified data of faunal species distribution on micro-habitat level in the Brakpan outlying areas.
- Limitation of historic data and available databases. Insufficient knowledge on the specific habitat requirements (migratory, foraging and breeding) of the majority of threatened species. Limited surveys for the actual site and immediately adjacent areas.
- Little long-term, verified data on impacts of previous gold mining as well as current residential developments to the west and north of the study area on fauna as well as water quality within the seasonally inundated wetlands due to leachate from slimes dams/mine dumps.

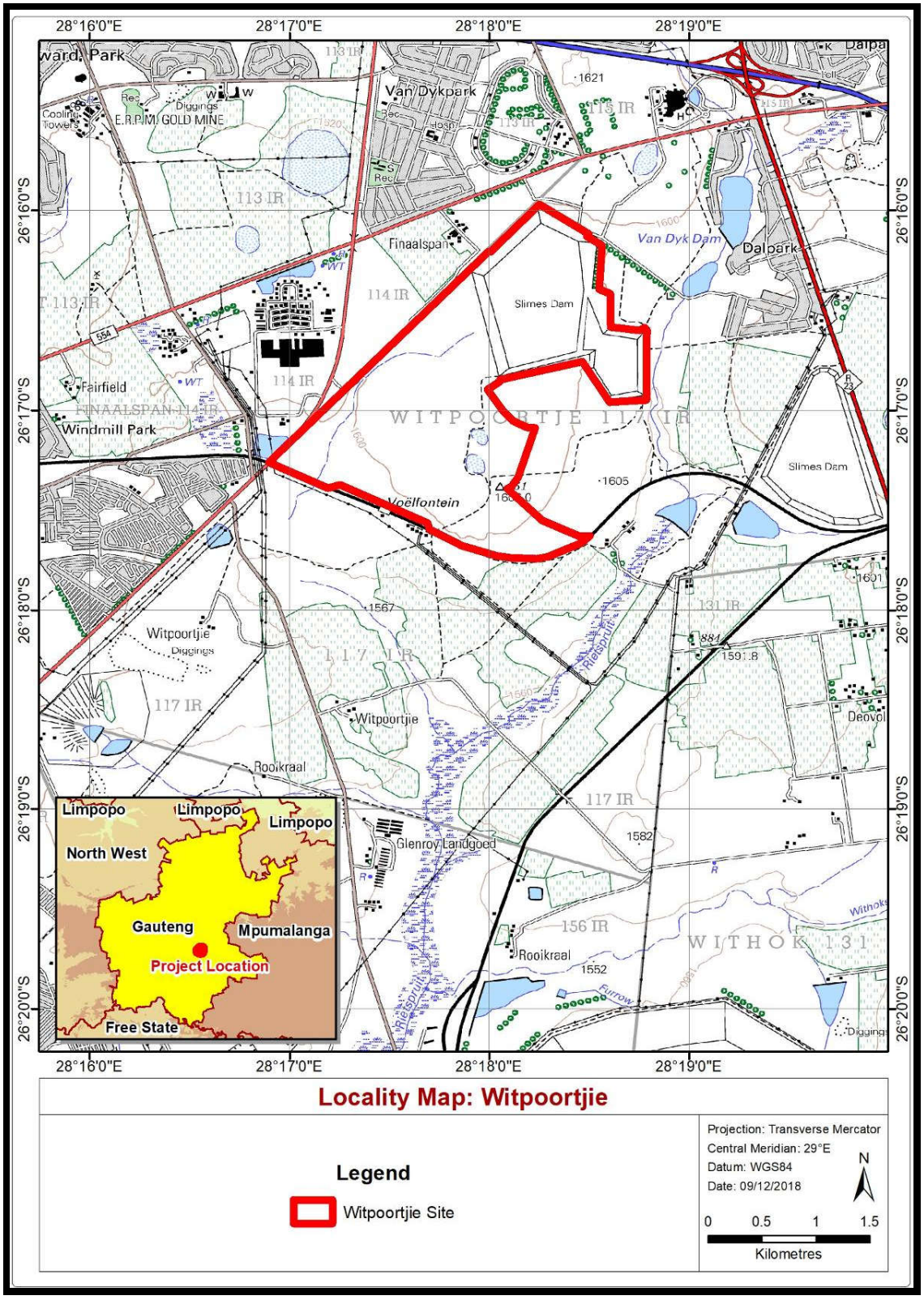

Figure 1. Locality map of the proposed Witpoortjie site.

Figure 2. The Witpoortjie site is dominated by Tsakane Clay Grassland in various stages of transformation and degradation. Situated within the lower-lying areas as well as shallow depressions are seasonally inundated pans. The adjacent open short grassland offer favourable foraging, dispersal and roosting sites for both Marsh and African Grass Owls. The rank *Imperata cylindrica* mosaic patches within the open grasslands and adjacent to the western valley bottom wetland as well as hygrophilous sedge and grass dominated vegetation within the eulittoral zones of the seasonally inundated pans and depressions offer suitable nesting habitat for Marsh Owls and possible African Grass Owls.

The Witpoortjie site is situated within the East Rand of Gauteng. The site is bordered to the west by the M43 (Sailfin), R554 and Van Dyk Dam to the north and open grasslands and Dalpark to the east and degraded open grasslands to the south (see Figure 1 above). Major bulk pipelines and railway track occur on the southern boundary of the site.

Figure3. An elevation profile of the site. The site has a gentle sloping topography from the north towards the east with an average slope of 1.3%. The major topographical features are the artificially created mine dumps (old slimes dam) on the northern portion of the site.

Vegetation composition in the area consists of Mesic Highveld Grasslands in various stages of transformation and degradation falling within the **Tsakane Clay Grassland (Gm 9)** vegetation unit (Mucina & Rutherford 2006; see Figure 4 below). The majority of grasslands have been historically transformed through agricultural activities as well as high-density residential developments and associated high levels of anthropogenic disturbances including extensive illegal dumping activities, littering, frequent fires (burning of waste) and harvesting of traditional medicinal plants. The grasslands to the south of the site comprise of degraded grassland with limited herb and forb diversity. Patches of primary *Themeda triandra* grassland were observed on the western, southern as well as central portions of the site. Several patches of the hydrophilic *Imperata cylindrica* was observed within a mosaic in areas with elevated soil moisture throughout the site.

One general habitat sensitivity scans were carried out mainly during daylight hours (9h00-14h00) on the 17th of November 2018. Emphasis was placed on the open Tsakane grasslands, seasonal pans and rank grasslands (*Imperata cylindrica* and *Hyparrhenia hirta*) occurring within the valley bottom wetland areas. Impacts on the sensitive hydrophilic grass and sedge dominated wetland patches was minimised in order to prevent possible disturbances to the associated fauna; especially as Marsh Owl nests have been observed during a previous survey (Lockwood 2008). The majority of the surveys were conducted on existing roads, livestock pathways as well as off-road vehicle and quad bike tracks within the grasslands. Due to the large size of the site little time was spent surveying the old slimes dam and mine dumps or degraded habitats

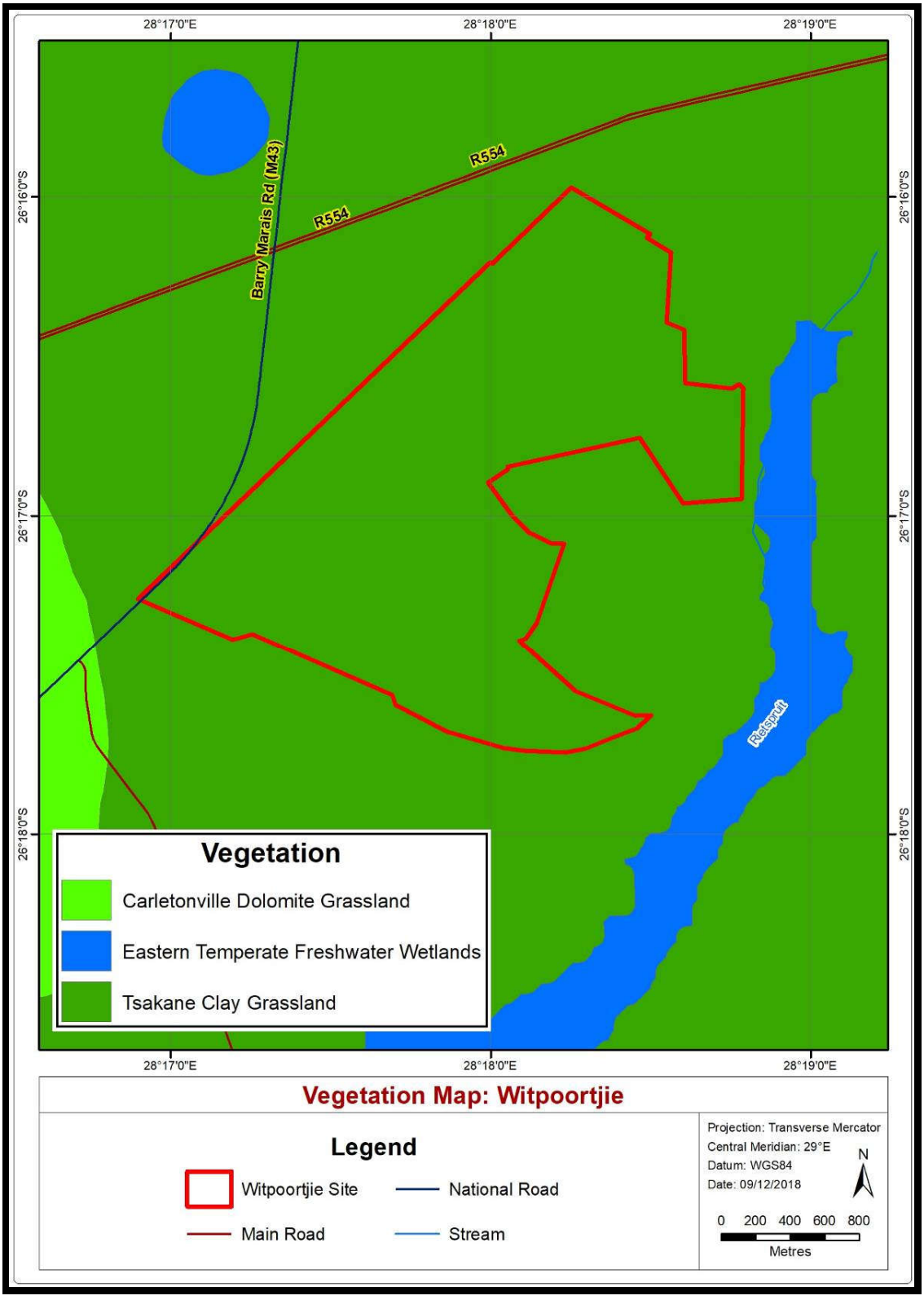

Figure 4. Vegetation map of the Witpoortjie site situated within Tsakane Clay Grassland (Gm9) (adapted from Mucina et al. 2006).

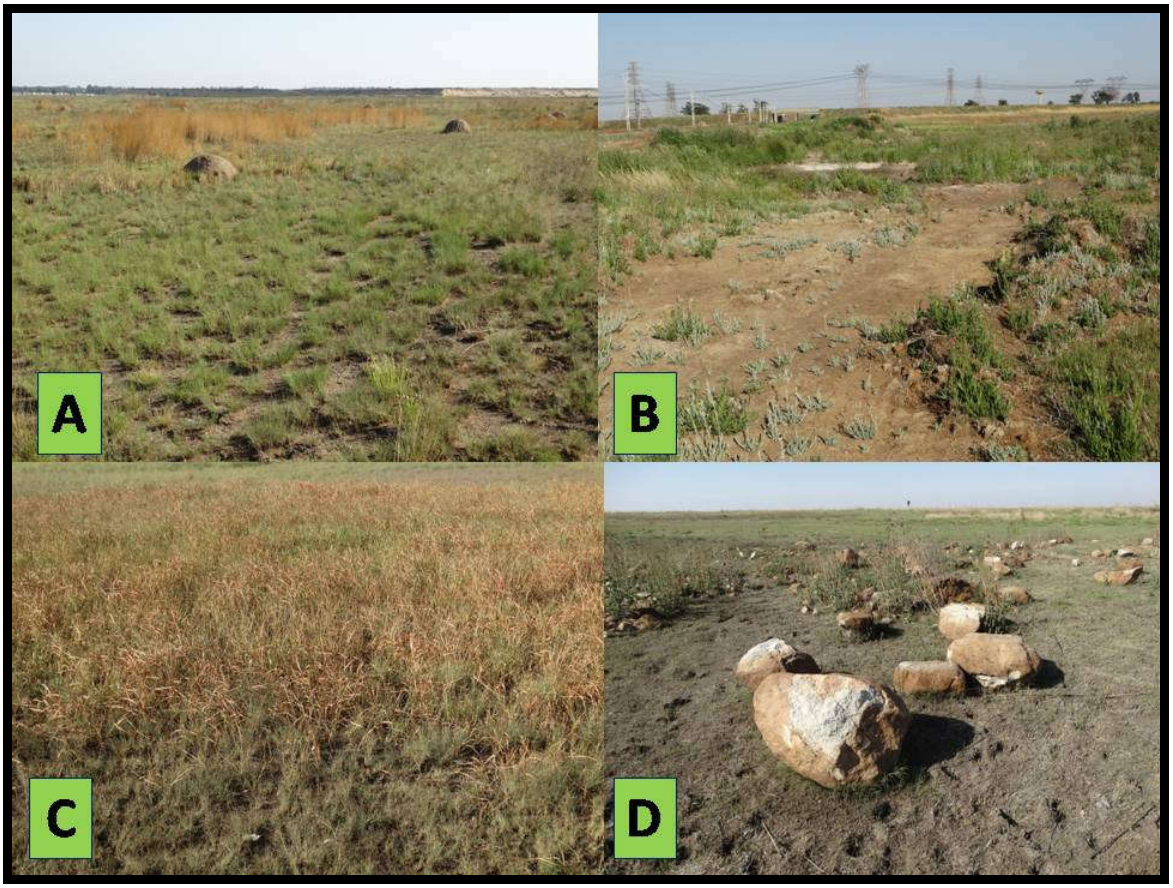

Figure 5. A collage of photographs displaying the major habitats observed within the proposed Witpoortjie site. A: The Witpoortjie site comprises of open Tsakane Clay Grassland in various stages of transformation and degradation. The previously disturbed areas on the site are dominated by patches of *Hyparrhenia hirta* and *Cynodon dactylon* secondary grasslands; Eucalyptus invaded areas, old slimes dam/mine dump, informal access roads and pedestrian pathways. **B**: Recent soil and vegetation clearance on the southern boundary of the site adjacent to the drainage line. **C:** A mosaic of temporary inundated *Imperata cylindrica* dominated patches were observed on the site. These areas are dominated by increased levels of soil moisture situated on a hard plinthite or ferricrete layer and offer suitable nesting as well as roosting habitats for both Marsh and African Grass Owls. **D:** Situated on the eastern portion of the site are seasonally inundated pans or depressions. These seasonal wetland habitats and rank hygrophilous sedge and grass dominated pans offer the most suitable nesting habitat for Marsh and possibly African Grass Owls. The un-controlled drinking and grazing of cattle within the pan restricts the suitability considerably. The cattle could trample nests as well as disturbing adults.

Mesic Highveld Grassland is found mainly in the eastern, precipitation-rich regions of the Highveld, extending as far as the Northern Escarpment. These are predominantly 'sour' grasslands and are dominated primarily by andropogonoid grasses. The different grassland units are distinguished on the basis of geology and other substrate properties, as well as elevation, topography and rainfall.

The vegetation of the site falls within the **Tsakane Clay Grassland (Gm 8)** vegetation unit (Mucina & Rutherford 2006). The vegetation on the site is transformed and does not reflect the natural species composition of the cool Highveld Grasslands.

Synonyms:
Cymbopogon-Themeda Veld (VT 48) (Acocks 1953) or **Moist Cool Highveld Grassland** (39) (Low & Rebelo 1995).

Locality & Physical Geography:
Mpumalanga and Gauteng Provinces: In patches extending in a narrow band from Soweto to Springs, broadening southwards to Nigel and towards Vereeniging, as well as north of the Vaal Dam and between Balfour and Standerton. Altitude is between 1 480-1 680 m.

Vegetation & Landscape Features: Flat to slightly undulating plains and low hills. Vegetation is short, dense grassland dominated by a mixture of common Highveld grasses such as *Themeda triandra*, *Heteropogon contortus, Elionurus muticus* and a number of *Eragrostis* species. Most prominent forbs are of the families Asteraceae, Rubiaceae, Lamiaceae and Fabaceae. Disturbances leads to an increase in the abundance of the grasses *Hyparrhenia hirta* and *Eragrostis chloromelas* (Mucina & Rutherford 2006).

Patches of natural *Themeda triandra, Heteropogon contortus, Elionurus muticus* grassland was observed on the western as well as central portions of the site. Several large clumps of *Hypoxis hemerocallidea* were observed on the southern portions of the site as well as adjacent to the seasonal pans. The grasslands on the site have low levels of anthropogenic disturbances due to the presence of security gaurds who mpatrol during the daylight hours. Activities noted included low-levels of harvesting of *Hyparrhenia hirta* and *Ergagrostis chloromelas* for thatch, removal of medicinal plants, frequent burning of grassland vegetation, scraping of vegetation and soils on the southern boundary, illegal dumping of building, litter and invasion of alien invasive vegetation (*Eucalyptus camaldulensis, Verbena bonariensis, Campuloclinium macrocephalum*).

Geology and Soils: The most significant rock is the basaltic lava of the Klipriviersberg Group (Ventersdorp Supergroup), together with the sedimentary rock of the Madzaringwe Formation of the Karoo Supergroup Group. Soils are typical of the Ba and Bb land types. Soils on the site were sandy to sandy-clay-loams. A few large boulders have been placed within the seasonal pan. No major natural rocky extrusions or outcrops on the site. The predominating soils along the adjacent Rietspruit (1km to the east) are very clayey, black vertic or near vertic, mostly of montmorillonitic clays.

IMPORTANT TAXA

Graminoids (Grasses): *Brachiaria serrata*, *Cynodon dactylon, Cynodon hirsutus, Digitaria ternate, Elionurus muticus*, *Eragrostis chloromelas*, *E. patentipilosa, E. plana*, *E. racemosa*, *Heteropogon contortus*, *Hyparrhenia hirta*, *Michrochloa caffra*, *Setaria sphacelata*, Steraa *nigrirostris*, *Themeda triandra*, *Trachypogon spicatus*, *Andropogon schirensis, Aristida adscensionis, A. bipartita, A. congesta, A. junciformis* subsp. *galpinii, Cymbopogon caesius, Digitaria diagonalis, Diheteropogon amplectens, Eragrostis micrantha, E. superba, Melinis nerviglumis, Harpochloa falx, Microchloa caffra, Paspalum dilatatum.*

Herbs: Acanthospernum australe, Ajuga ophrydis, Eriosema salignum, *Euryops transvaalensis, Gerbera viridifolia, Helichrysum nudifolium* var. *nudifolium, H. rugulosum, Hermania depressa, Lotononis macrosepala, Nidorella hottentotica, Pentasia prunelloides subs. latifolia, Pseudanum caffrum, Rotheca hirsuta, Selago paniculata, Senecio coronatus, S. inornatus, Vernonia oligocephala.*

Geophytic Herbs: *Aspidoglossum ovalifolium, Hypoxis rigidula* var. *pillosissima.*

Semi-parasitic Herb: *Striga asiatica*.

Low Shrubs: *Anthospermum hispidulum, A. rigidum* subsp. *pumilum, Chaetacanthus setiger, Tephrosia capensis var. acutifolia.*

Semi-*parasitic Shrub: Thesium impeditum.*

Key Environmental Parameters*:*
This vegetation type is restricted to clayey soils of the high rainfall areas of southern Gauteng and southern Mpumalanga highveld.

Economic Uses*:*
The grasslands and soils are often ploughed as well as heavily utilised for grazing by cattle and sheep. The site is currently vacant and utilised for illegal dumping activities, pedestrian pathways, bush-toilets and limited grass harvesting.

Conservation Status*:*

Tsakane Clay grasslands are considered to be **Endangered**. The conservation target is 24%. Only 1.5% statutorily conserved (Suikerbosrand, Olifantsvlei, Klipriviersberg, Marievale) or privately conserved (Avalon Nature Reserves, Ian P. Coester, Andros). More than 60% of the area already transformed by cultivation, urban sprawl, mining, dam building of road infrastructure. Large portions of Alberton, Springs, Tsakane and part of Soweto were constructed in the area of this vegetation unit.

Urbanisation is increasing and further expansions especially in the southern suburbs of Johannesburg and towns on the East Rand (especially Boksburg and Brakpan) will bring further pressure on the remaining vegetation. Land invasion within open Tsakane Clay grassland is also a potential for further destruction of this Endangered vegetation unit. Erosion is generally very low (93%).

Existing impacts observed on the site during brief habitat assessment included:

- The vegetation of the site falls under the Tsakane Clay Grassland vegetation unit which is classified as Endangered as 60% is transformed and only 1.5% is conserved.
- Remaining open Tsakane Clay grasslands surrounding the site are mainly transformed into current residential and Finaalspan jail, mining activities or agricultural lands (maize) or are relic patches which are heavily impacted from previous agricultural and adjacent human activities as well as frequent fires, alien vegetation invasion, invasion of informal settlements, illegal dumping of rubble and waste products.
- The Tsakane Clay Grassland vegetation of the site has been previously impacted on by previous anthropogenic activities such as mining as well as agricultural activities such as overgrazing by cattle, frequent fires and poor grass and soil conservation.
- The remaining grasslands surrounding the site are severely fragmented due to several major road networks as well as increased residential developments.
- The northern portions of the site were previously excavated for gold mining activities and cleared of vegetation. Large poorly vegetated mine dumps and slimes dams occur.
- The majority of surrounding wetland habitats are severely degraded or contain altered hydrological patterns (seasonal pans to reed invaded permanent waterbodies).
- Several vagrants and informal settlements were observed adjacent to the site.
- Large scale dumping of solid and organic refuge in and alongside the adjacent open spaces especially along the informal dirt access roads adjacent to the residential areas. Low levels of previous dumping activities (building rubble) were observed on the south-western portion of the site.

- A high abundance of *Tagetes minuta* and *Pseudognaphalium luteo-album* were noted throughout the property especially in the old lands. Herbaceous weedy species, such as *Verbena bonariensis* and *Amaranthus hybridis* were also common, and the alien invasive Pom-Pom Weed (*Campuloclinium macrocephalum*) was observed adjacent to the seasonally inundated pan. A small plantation *Eucalyptus* spp. was observed in the central region of the site.
- Alien vegetation in and around open grassland areas and road reserves include Black Wattle *Acacia mearnsii*, *Eucalyptus* spp., Bugweed *Solanum mauritanium*, Pampas grass *Cortaderia selloana*, Blackjack *Bidens pilosa*, Tall khakiweed *Tagetes minuta*, *Verbena* sp, Kikuyu *Pennisetum clandestinum*, Large Cocklebur *xanthium spinosum,* White-flowered Mexican Poppy *Argemone ochroleuca*, Large Thorn-apple *Datura stramonium, Eucalyptus sp*., Purple Top *Verbena bonariensis*, Pom-Pom Weed *Campuloclinium macrocephalum*).
- Frequent burning of the open grassland destroys the natural vegetation and limits the amount of refuge areas and prey items (decrease in insect, reptile, amphibian and small mammal populations). The grassland on the site was burned prior to the site visit and grassland vegetation was starting to re-emerge. The natural hygrophilous and hydrophilic vegetation within the seasonal wetlands/pans had not emerged due to inadequate rainfall.
- Major road networks namely the M43 to the west, R554 to the north and R23 to the east restricts the natural migratory movements of remaining Giant Bullfrogs to the east, west and the north. These roads with high vehicular traffic result in major road fatalities of the majority of species especially Giant Bullfrogs and Owls.

The seasonal wetlands including the seasonal drainage line or valley bottom wetland on the western portion of the site have been severely impacted by local and surrounding activities including:

- The wetlands on the site have been affected severely by the encroachment of historic mining activities and agricultural activities in the past and present. This has led to altered surface areas of the wetlands as well as impacts on the sensitive wetland associated vegetation and hydromorphic soils.
- This feature is likely to significantly affect the integrity of the ecology of the seasonal pans and possibly the wetland habitats further down the gradient of the site.
- Hardened surfaces including roofs, roads, buildings as well as stormwater pipes and channels have disrupted the natural hydrological flow regime towards the western valley bottom wetland. Large amounts of water enter directly into the valley bottom wetland from the M43 during heavy downpours.
- The M43 on the western boundary affects the hydrological patterns of the seasonal drainage line or valley bottom wetland. Water is channelled through a concrete culvert.
- The creation of several artificial drainage channels directing water away from certain wetland habitats. Drainage channels were observed adjacent to the valley bottom wetland on the western boundary.
- Deterioration of water quality from surface runoff and possible leachate from surrounding poorly vegetated mine dumps.
- Informal dirt roads bisect the entire site as well as disrupt the natural hydrological regime towards the seasonal drainage line. The informal dirt road bisects the drainage line towards the northern boundary of the site.

3. RESULTS OF SPECIALIST HABITAT ASSESSMENT

Figure 6. Suitable rank hygrophytic grass (*Imperata cylindrica, Arundinella nepalensis*) and sedge (*Schoenoplectus sp*, Cyperus sp., *Carex sp.*, *Scirpus sp.* and *Juncus sp.*) vegetation occurs along the western valley bottom wetland as well as seasonal pans. **Photo taken from an adjacent wetland site to the south**. No hygrophilous vegetation had emerged on the site during the site visit.

3.1 AFRICAN GRASS OWL HABITAT ASSESSMENT

African Grass Owls are found exclusively in rank grass, typically, although not only, at fair altitudes. African Grass Owls are secretive and nomadic breeding in permanent and seasonal vleis or valley bottom wetlands which it vacates while hunting or post-breeding, although it will breed in any area of long grass and it is not necessarily associated with wetlands.

The species can also be found in shorter grass (40-50cm) in association with hydrophilic or hygrophilous sedges (*Juncus* sp., *Scirpus* sp and *Cyperus* sp.) and grasses (*Imperata cylindrica*) which forms impenetrable thickets which provide enough substrate for the owls' characteristic "tunnel" nests as well as favourable roosting habitat (pers.obs). The conditions described above are normally associated with pristine, well managed grasslands usually in close proximity of water, hence the threatened status of the species, as these grasslands are extremely rare in South Africa. However, the species is proving itself to be adaptable to such an extent that viable populations can exist in areas which are completely transformed, provided basic food and shelter requirements are met**.**

In marshlands it is usually outnumbered by the more common Marsh Owl (*Asio capensis*) 10:1(Tarboton *et al.* 1987). African Grass Owls nest on the ground within a system of tunnels constructed in mostly tall grass; peak-breeding activity (February-April) tends to coincide with maximum grass cover (Steyn 1982). African Grass Owls specialise in large rodent prey, particularly *Otomys* vlei rats, although a wide range of rodent prey species, including *Rhabdomys*, *Praomys*, *Mus*, and *Suncus,* are taken (Earle 1978). Some local and nomadic movements in response to fluctuating food supplies, fire and the availability of suitable habitat can be expected (Steyn 1982). The ecological requirements of this species make it susceptible to many land-use changes impacting contemporary South Africa. The Grass Owl appears to have undergone local population reductions because of habitat loss and fragmentation resulting from several factors. Agricultural transformation and intensive grazing have diminished its scarce and specialised habitats. Intense use of the grasslands in Gauteng and frequent burning (e.g. Ranger 1965), typically in densely settled areas, reduces rank cover for this species. It does not seem to adapt to transformation of its preferred rank grassland habitat into short grasslands, crop or grazing land. Its habit of nesting on the ground may make it susceptible to disturbances by people and livestock. The possibility that excessive accumulations of pesticide residues depress reproductive outputs should not be ignored (Brookes 1984).

African Grass Owls were recorded in 201 grid squares within South Africa (including Lesotho and Swaziland) during the South African Bird Atlas Project (Mendelsohn 1997), 21 of which occur fully or partially within Gauteng. This is roughly equivalent to 18 complete squares or 9% of the total range of this species in South Africa.

It would therefore appear that reporting rates do not give a realistic estimate of the relative abundance of African Grass Owls. Under reporting is probably largely attributable to the preference of African Grass Owls for tall, dense grass, their nocturnal habits and the difficulties of obtaining access to remaining pockets of suitable habitat largely on private farmland (Whittington-Jones 2003).

The main threats to this species within Gauteng relate to habitat destruction and transformation, nest disturbance and road mortalities. The African Grass Owl Project of the Raptor Conservation Group of the Endangered Wildlife Trust are currently exploring solutions to the road related mortalities, but additional work is required to ensure protection and appropriate management of remaining areas of suitable habitat (Whittington-Jones 2003).

Mendelsohn (1989) estimated an average home range of one African Grass Owl per 314ha on the Springbok Flats, while Tarboton (2002) suggested 50-100ha per pair as an extremely rough guesstimate in excellent African Grass Owl habitat. The study by Ansara near Nigel in Eastern Gauteng is a classical example of how tenacious the species is. She discovered a locally abundant population of African Grass-Owls nesting in a drainage ditch of only 1.5 hectares in size, which was the only suitable habitat in the vicinity. Vegetation in the ditch is highly degraded with an abundance of weeds, it is located within 200m of the N17 toll road and within 20m of farm roads. Within this very small area six active nests were recorded and an additional 13 roosting sites. Active nests were recorded an average of 40 metres apart. This proves that the bird can persist and even flourish in highly transformed habitats, provided patches of suitable habitat remains and a ready food supply is available in the surrounding area. For the purposes of the initial target setting exercise, an estimate of 100ha per pair was adopted by GDARD **(**Whittington-Jones 2003).

No African Grass Owls or Marsh Owls were flushed in the rank grass vegetation (*Imperata cylindrica*) occurring within the western portion adjacent to the poorly defined, mainly un-channelled valley bottom wetland. No evidence of any recent nesting, roosting sites or pellets were observed within the Imperta cylindrica areas as well as around the seasonal pans. Three Marsh Owls (*Asio capensis*) were previously flushed from site as well as a confirmed nesting site was recorded during a previous avifaunal habitat assessment (Lockwood 2008). The valley bottom wetland and seasonally inundated depressions or pans and associated rank (*Themeda triandra- Imperata cylindrica, Carex sp. Juncus sp, Schoenoplectus sp.*) grassland and hygrophilous vegetation offers favourable roosting and possible nesting habitat for Marsh Owls as well as possibly African Grass Owls.. The surrounding open Tsakane Clay grasslands offer foraging areas especially adjacent to the valley bottom wetland where large colonies of burrowing rodents were observed. The trampling by cattle, disturbances by off-road vehicles and quad bikes and presence of dogs are immediate threats to African Grass Owls due to their ground nesting breeding strategy. Road fatalities on the M43 cannot be eliminated.

More intensive surveys conducted over extended periods during the peak breeding period between February and April are required to ascertain the current population size of African Grass Owls on the site and immediate adjacent area.

4. AFRICAN GRASS OWL MANAGEMENT RECOMMENDATIONS

Ansara (2004) states the following factors as critical for habitat to be suitable for African Grass Owls:

- The grass density must be critical to shield nesting (and roosting) birds from the elements and potential predators. The owls always select the densest vegetation for nesting and roosting.
- The height of the grass must be at least 750mm or higher in order to hide nests and roosting birds from aerial predators.
- The habitat must not be regularly burnt or grazed, preferably rested for at least two years at a time to allow dense grass cover to develop.

In order to conserve suitable habitat for African Grass Owls on the site and immediate surrounding area it is imperative that sufficient rank grassland (*Imperata cylindrica*) habitat is conserved with the remaining sedge patches (*Carex spp. Scirpus spp*.) along the western valley bottom and eastern seasonal pans for nesting/roosting activities. The removal of the cattle will prevent possible trampling of the nests. It is also critical that sufficient areas of open shorter Tskane Clay grassland is maintained and conserved for foraging purposes as well as a sufficient grassland to the east and south of the site. Several disturbed areas along the valley bottom wetland and around the site are covered by dense stands of *Hyparrhenia hirta*. These areas offer limited suitable habitat for fauna and with correct management (cutting, slashing or natural fire regime) the natural species composition should return to the site. Bird, amphibian, reptiles and mammal abundance and species richness increased with foliage height diversity and the proportion of native grass cover.

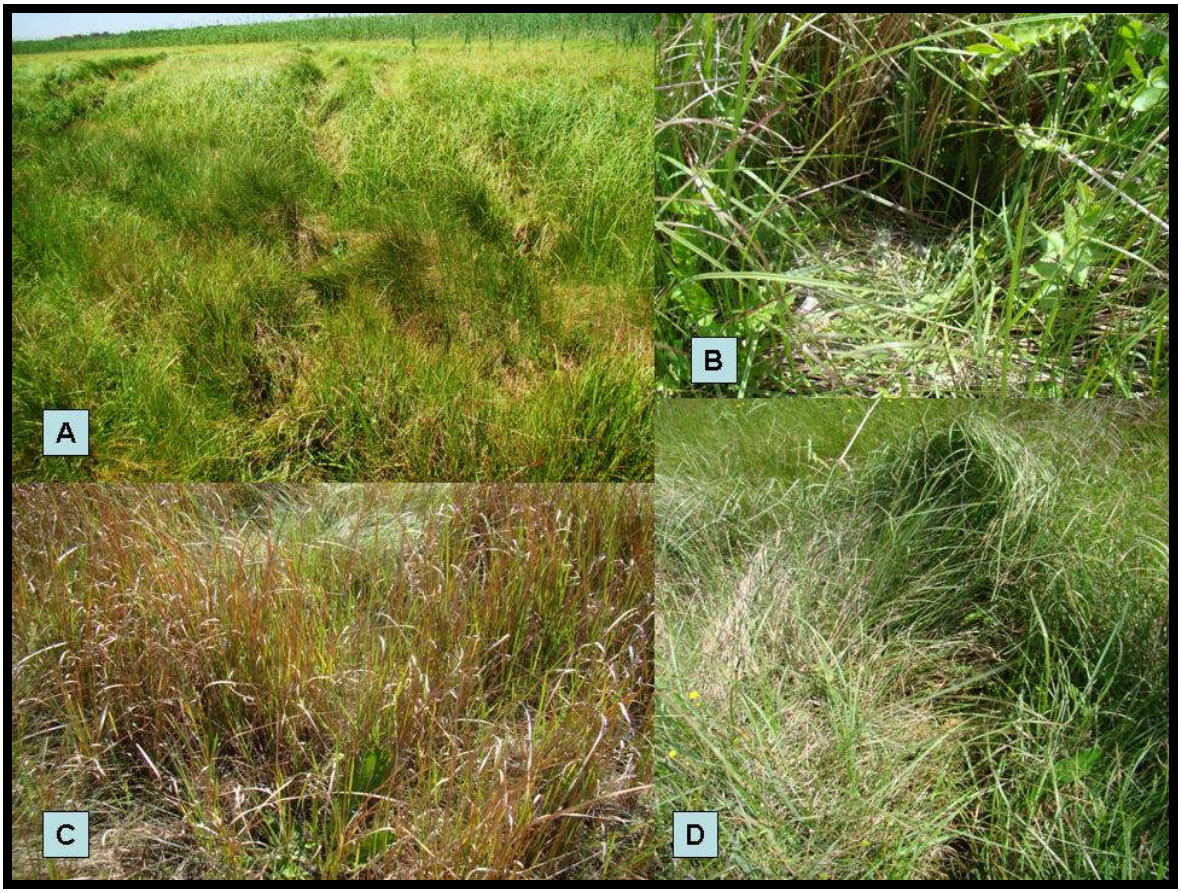

Figure 7. A conglomerate of photographs displaying the rank hygrophytic grass and sedge dominated vegetation observed along the valley bottom wetland and seasonal pans. A: The seasonally inundated wet zone of the valley bottom and eulittoral zone of the endorheic pans dominated by hygrophytic grasses and sedges offer favourable roosting and nesting habitat for Marsh Owls as well as possibly African Grass Owls; **B:** A roosting site of an African Grass Owl flushed during previous surveys**; C:** Patches of rank *Imperata cylindrica* and **D:** *Carex* sp. occur along the temporary wet zones of the valley bottom wetland and seasonal pans. Marsh Owls as well as African Grass Owls are often flushed from *Imperata cylindrica* and *Carex* patches (pers. obs.). Photos taken from previous surveys at a site 1.5km to the south (Badenhorst Estate)

The hygrophytic /hydrophilic sedge and grass dominated vegetation of the seepage areas (*Imperata cylindrica*) adjacent to the western valley bottom wetland as well as rank hygrophilous vegetation around the eulittoral zones of the pans offer favourable roosting and possible nesting habitat for Marsh and African Grass Owls as well as suitable foraging areas in the adjacent open Tsakane Clay Grassland.

GDARD also requires that an estimate is made of the amount of individuals or pairs that might be supported by the habitat in question (GDACE 2009). The territory requirements of African Grass-Owls are far from clear. Mendelsohn (1989 as quoted in Ansara 2004)) reported a density of 22 birds on the Springbok Flats in 69km² resulting in a territory size for one bird of 1: 314h. Territory sizes of 1:50h to 1:100h have also been suggested. This is sharply contrasted by the densities that Ansara found in her study area near Nigel, namely 15 birds in 1.5km², resulting in an average territory size of only 1: 0.1h. Kemp and Calburn (1987 as quoted in Ansara 2004)) mention as many as 50 pairs breeding in 50h of grassland when conditions are optimal, dispersing again when conditions deteriorate. This would give a territory size of 1: 0.5h, which compares favourable to what Ansara recorded on the East Rand. It seems therefore that African Grass-Owls, like many other birds that depend primarily on rodents, react to rodent population cycles, with territories contracting and expanding depending on the availability of food. It furthermore proves that the birds can tolerate each other in surprising densities for a raptorial bird of that size, as long as the basic requirements of food and shelter are met. At the Nigel study site, food is available in copious amounts in the form of granivorous rodents that feed on spilt grain on the edges of the N17 road. The prey remains of the African Grass-Owls in that area revealed that they feed mostly on these rodents, and not as much on the grass-eating *Otomys* sp. (Vlei Rat) that shares the owl's wetland habitat (Ansara 2004). This is an indication that the species sometimes leaves its roosting/nesting habitat to hunt over areas which are not likely to be used for those purposes, in order to capitalize on readily available food. Pairs of African Grass-Owl were recorded at two such sites, one in Modderfontein (2009), and two in Witpoortjie (pers. obs 2009). In the first instance the total area of suitable foraging and roosting habitat is approximately 250ha, and the second site is approximately 200ha. It would seem therefore that the buffered zone of approximately 100 ha in this instance would be suitable for at least one or possibly two individuals on the site and adjacent open grasslands to the east and south.

Activities within the remaining primary Tsakane Clay grassland and palustrine wetland habitats must be severely restricted especially during the operational phase of the project. Large sections of the valley bottom especially along the western portion and the seasonal pans on the eastern boundary should be maintained as exclusion areas to prevent the possible disturbance of nesting Marsh Owls as well as possible African Grass Owls. No vehicles or even footpaths should be allowed through the wetland habitats. Existing livestock paths should be utilised as walkways outside the wetland boundaries.

New paths could potentially result in increased predation of any Marsh or African Grass Owl chicks. An educational programme must be implemented for future property owners regarding the use of rat poison or rodenticides in order to minimise the potential impacts of poisoning the remaining owls (contact EWT Owl poisoning programme). Speed control measure must be implemented on all access roads within the property.

The entire private open space consisting of the valley bottom and eastern seasonal pans and 50m grassland buffer zone from the edge of the outer edge of the temporary wetland zones as well as any primary Tsakane Clay Grassland must be fenced off prior to construction activities (see vegetation, wetland and Giant Bullfrog sensitivity maps). **The grassland vegetation on the site must be assessed by a suitably qualified vegetation specialist**. The wetland specialist needs to delineate the palustrine wetlands including the valley bottom wetland, *Imperata cylindrica* mosaic and seasonal pans. The wetland specialist should ideally demarcate the boundaries and buffer zones using red painted pegs. The private open space must be fenced and remain fenced throughout all stages of the development including construction and operational phase. This will prevent possible further disturbances and damage to the Tsakane grasslands, seasonal pans and valley bottom wetland.

During the construction phase, workers must be limited to areas under construction and access to neighbouring undeveloped areas especially along the open grasslands, seasonal pans and valley bottom must be strictly regulated, preventing illegal dumping, uncontrolled hunting and poaching and gathering of firewood and medicinal plants. In this regard it is recommended that the open natural areas are fenced off prior to construction and maintained as “no-go areas”.

Construction should be limited, where practical, to the daylight hours preventing disturbances to the nocturnal activities of certain species and nearby human populations. As the site is situated adjacent to old weed invaded (*Tagetes minuta, Helichrysum acutatum, Datura strumarium, Campuloclinium macrocephalum*) agricultural lands it is imperative that an effective alien vegetation programme is implemented throughout the earth moving and construction phase. Weeds and invasive vegetation should be removed prior to construction activities preventing spreading into newly disturbed areas or areas cleared of vegetation. Alien vegetation removal will continue through all phases of the development especially in the conserved open space.

All temporary stockpile areas, litter and rubble piles must be removed on completion of construction. All dumped material must be taken to an approved dump site in the area. No illegal dumping must be permitted in the private open space. Heavy fines must be implemented as well as the rehabilitation of the dumped areas.

Future soil stockpiling areas must follow environmentally sensitive practices and be situated a sufficient distance away from any drainage areas towards the valley bottom wetland as well as seasonal pans. The careful position of soil piles, and runoff control, during all phases of development, and planting of some vegetative cover after completion (indigenous groundcover, grasses etc.) will limit the extent of erosion occurring on the site. Vegetation plays a critical role in the hydrological cycle by influencing both the quantity and quality of surface run-off. It influences the quantity of run-off by intercepting rainfall, promoting infiltration and thus decreasing run-off. Vegetation can influence water quality in two ways: by binding soils thus protecting the surface layer, and by intercepting surface run-off thus buffering the valley bottom wetland against suspended and dissolved substances. When the speed of the run-off is reduced, suspended particles can settle out and dissolve substances, such as nutrients, can be assimilated by plants. The vegetation has a filtering effect.

STORMWATER MANAGEMENT

It is imperative that the current hydrological patterns including the quality and quantity of water within the valley bottom wetland as well as seasonal pans are maintained or ideally improved. Artificially created seasonal stormwater attenuations ponds should be carefully positioned adjacent to the existing drainage areas or seepage areas and not directed into the seasonal pans or valley bottom wetland. The creation of an environmentally sensitive storm water retention dam with a variety of water depths and alternative habitats could potentially result in increased diversity and certain animal species (especially amphibians) occurring around the site. The retention ponds should contain a variety of water depths and be appropriately vegetated with indigenous grasses and sedges.

It is important that the stormwater attenuation pond are located outside the 50 m (from the outer edge of the temporary wetland zone) grassland buffer zones around the seasonal pans. Drainage and storm-water runoff from the housing estates should be directed away from the seasonal pans. Additionally, runoff from the housing estate should not directly enter into the valley bottom but into a large stormwater attenuation pond or several smaller ponds/pans. This will prevent the flooding of certain sensitive habitats such as the shallow seepage areas. Stormwater should be directed through sufficient natural grassland buffers to reduce the overall effects of nutrient enrichment or eutrification. The attenuation ponds should not be dams for the permanent storage of runoff but decrease water velocity and allow the water to slowly enter the valley bottom over a longer period. The attenuation dam/pond must allow seepage through the earthen walls into the grassland buffer and finally into the valley bottom. No further dams must be allowed along the valley bottom. No alien fish species should be introduced into the stormwater attenuation ponds. Alien fish such as Large Mouth Bass *Micropterus salmoides*, Carp *Cyprinus sp.* and Mosquitofish (*Gambusia affinis*) result in severe habitat degradation. Mosquitofish have been introduced widely in tropical and subtropical countries for mosquito control but has proved to be an aggressive invader species capable of restricting other fish populations by preying of fish larvae as well as amphibian larvae (tadpoles). Bass are primarily piscovorous (fish eating) but is extremely

opportunistic feeder takes virtually any animal food such as crabs, frogs, snakes, juvenile birds and even small mammals.

The rehabilitation of the old slimes dam and mine dump could potentially result in an improvement of habitat diversity and ultimately faunal species on the site. The removal of the cattle and alien invasive vegetation along the valley bottom and seasonal pans and the appropriate re-vegetation of eroded areas (access road) could improve the habitat availability along the valley bottom as well as water quality within the pans. The cattle increase the nutrient levels (eutrophication) of the water as well as increased levels of siltation and sedimentation from trampling of soils and disturbances to hygrophytic vegetation.

LANDSCAPING and HORTICULTURAL ACTIVITIES

Landscape architects, and the developer, have an opportunity to conserve certain faunal biodiversity present on the site and possibly increase the biodiversity of certain animal species (birds). Vegetation has been reported to be the single most important habitat component for all species of animals. Linked to this, is the preservation, maintenance and creation of tracts of natural and ornamental vegetation in all stages of ecological succession, interconnected by corridors or green belts for escape, foraging, breeding and exploratory movements.

Urban settings are all too frequently characterized by exotic trees, planted at the same time, at the same size and are spaced at regular centred settings. The resulting pattern and structure is one of limited vegetation diversity, trees of uniform size, even age stands and little or no under storey planting. Only a few species of animals (urban exploiters) will occupy these limited niches, leading to decreased faunal biodiversity.

No horticultural activities (except alien vegetation removal and re-vegetation) allowed in the conserved private open space. No planting of trees, mowing of the grass, tilling of soils etc.

Residents should be encouraged to plant trees and gardens. Gardens or landscaped areas around the proposed residential development should be planted with indigenous (preferably using local plants from the area) plants and trees, which are water wise and require minimal horticultural practices (see attached lists). Different vegetation strata should be created with large trees, shrubs, creepers, forbs and creepers. It is important to remember that species of fauna utilise different levels for foraging, nesting and roosting.

The removal of all alien vegetation is a major priority. It's critical that once the alien vegetation is removed alternative indigenous vegetation is introduced. This will prevent further soil or bank erosion and seeding of problem plants. Large exotics (not Category 1 invasive) should be left until the introduced indigenous species are large enough to offer suitable habitat (nesting, roosting or refuge). Large exotics such as the *Eucalyptus* can be ringed barked and maintained as deadwood features. Several bird species will utilise the dead trunks and branches for nesting purposes.

Horticultural activities resulting in fertiliser, herbicide and pesticide runoff, increases in alien vegetation and weedy species, and dumping of refuse and building material must be prevented or strictly managed. Landscaping should be environmentally sensitive and should meet the following requirements:

- Strict fertiliser, pesticide and herbicide control (limited usage of biological friendly products).

- Reduction of weeds and erosion control by minimum tillage gardening practices (groundcovers and mulching).

- No dumping of any materials in conserved open areas and buffer strips (biological corridors) surrounding the site.

- Exotic tree species should be replaced with suitable indigenous tree or shrub species

- A rescue and recovery programme should be initiated for the removal of all indigenous plants especially remaining geophytes (*Hypoxis hemerocallidea*) or bulbous plant species as well as grass species occurring within the proposed development area. Bulbs can be replanted along the valley bottom and grassland buffer zones around the seasonal pans.

- It is important that a variety of trees and shrubs are planted ensuring fruiting and flowering at different times of the year and thus a constant supply of food. Avoid symmetry and vary the spacing and height of the plantings.

- Plant trees and shrubs close together to create a dense and private 'bush' this will increase the habitat diversity. Certain trees can be "bushed" by removing the main growing tip which will stimulate the tree o produce side branches. Only should be done once the tree has established enough.

- All introduced trees should have manure and a phosphate fertilizer or bonemeal added to the dug up square hole. As with the trees shrubs should also be planted as

close together to form a dense refuge area. Create as much species diversity as possible and select species that are well branched from the base rather than those with a clean stem and apex leaf cluster.

- Select shrubs of different sizes, planting the taller ones nearest the trees and the shorter ones in the foreground to create a height gradient.

- The planting of invasive exotic grasses (Kikuyu *Pennisetum clandestinum*) should be prevented and non-invasive indigenous grasses (*Cynodon dactylon*) should be used even if not indigenous to the area. This is especially pertinent to the residential ervens situated adjacent to the private open space.

- All kikuyu in the drainage areas and valley bottom must be removed and replaced with an appropriate to the area grass seed mix (approved by GDARD).

- The formation of basins around the lawns areas will increase the rainfall absorption as well as decrease the runoff directly into the spruit. Lawns should not be heavily spayed with insecticides as they provide refuge and habitat for large numbers of insect species which in turn provide an important food source to other wildlife species. Many of the 'problem' insects such as crickets etc. will be controlled by natural predators (birds-Hadeda ibis; frogs and especially toads).

- Dead trees and stumps should be kept as they provide valuable habitat and feeding areas for certain wildlife. Undesirable trees can be ring-barked in situ rather than cut down. Harwood species such as *Eucalyptus spp.* (Bluegum) will remain intact and are ideal 'deadwood' features. Dead or decaying wood piles should be included along the valley bottom will eventually be reduced to valuable compost by several animal species. Several smaller mammals, amphibians, reptiles and arthropods will use the stumps as refuge habitat. Dead trees and stumps will also be used for perching or hunting platforms for birds like the kingfisher.

- Leaf litter should also be maintained as this provided refuge and food supply for several insect species as well as mulching the surrounding ground.

- No rock material must be removed from the site or utilised for building purposes. Rock material may be used for erosion control purposes along the valley bottom as well as eroded drainage lines towards the valley bottom.

- Any remaining termite mounds in the private open space should be left intact as they provide important food and habitat for several animal species.

- Sparse infestations or occasional plants especially Pompom weed (*Campuloclinium macrocephalum*) along the valley bottom and seasonal pans are the real threat because they can mature, reproduce and increase in number, eventually becoming dense enough to have a negative impact on the natural vegetation. A practical objective for any area infested with alien plants is therefore to control or clear the plants starting with the least infested areas and working through the various degrees of infestation, starting with light and ending with dense

An appropriate fire management plan must be implemented by a suitably qualified botanist or grassland specialist. It is proposed that fire management and grazing by re-introduced small antelopes be investigated as management tool in order to maintain the remnant grassland vegetation in a specific form. Should a fire management plan be compiled as a management tool the plan should refer to fire frequency, fire intensity, season of burning and type of fire (with or against the wind, on the ground or in the tree canopy). The fire management plan must follow a fire regime developed for the appropriate grasslands by the Department of Agriculture as well as conforming to local by-laws and local municipal fire officer as well as GDARD.

Access into the private open spaces should ideally not be permitted or if allowed must be through a secured gate and only permitted during daylight hours. The use of existing human and cattle pathways in the Tsakane Clay Grassland. Access should be severely restricted along the edges of the valley bottom and seasonal pans and kept as a seclusion area for the African Grass Owls as well as Giant Bullfrogs. All walk ways in the wetland areas must be on raised broad-walks preventing disturbance to the hydrological patterns as well as hygrophytic vegetation. Signboards must be erected displaying the rules of the conserved open space including:

- No hunting or poaching or unnecessary disturbances to animals
- No removal of any plants or trees
- No grass harvesting
- No open fires
- No dumping or littering
- No fishing
- Access is restricted to existing pathways
- Fines shall be implemented for transgressions into the “no-go” areas.

Lighting is a potential negative impact on certain animal species. Numerous species will be attracted towards the light sources and this will result in the disruption of natural cycles, such as the reproductive cycle and foraging behaviour. The lights may destabilise insect populations, which may alter the prey base, diet and ultimately the well being of nocturnal insectivorous fauna. The lights may attract certain nocturnal species to the area, which would not normally occur there, leading to competition between sensitive and the more common species.

Artificial lighting should be directed away from the remaining private open areas in order to minimize the potential negative effects of the lights on the natural nocturnal activities of certain animals. Where lighting is required for safety or security reasons, this should be targeted at the areas requiring attention. Residents should be encouraged to use energy efficient CFL bulbs. Yellow sodium lights should be prescribed for street lamps as they do not attract invertebrates at night and will limit the disturbance to the remaining wildlife. Sodium lamps require a third less energy than conventional light bulbs.

Residents in the newly established housing development should ideally be restricted from keeping cats and dogs. If pets are allowed they should be enclosed in the residential area and be sterilised (spayed or neutered). The introduction of exotic ducks, cats, dogs, reptiles, rabbits and birds (mynas) should be prevented as they have negative impacts on remaining animal species. Dogs will have a negative impact on all ground nesting bird species including Marsh and African Grass Owls. All exotic animals should be removed as humanely as possible from the private open space.

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