



agriculture and rural development

Department: Agriculture and Rural Development
GAUTENG PROVINCE

**DEPARTMENT OF AGRICULTURE AND RURAL
DEVELOPMENT**

**DIRECTORATE OF NATURE
CONSERVATION**

GDARD REQUIREMENTS FOR BIODIVERSITY ASSESSMENTS VERSION 2

ENQUIRIES: Phuti.Matlamela@gauteng.gov.za
TECHNOLOGICAL SERVICES

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Directorate of Nature Conservation

Glencairn Building, Corner Eloff and Market Street, JOHANNESBURG
Postal Address: P.O. Box 8769, JOHANNESBURG, 2000
Tel (011) 355-1563 & Fax (011) 355-1000
Enquiries: Phuti.matlamela@gauteng.gov.za

ACCEPTED FORMAT FOR BIODIVERSITY ASSESSMENTS

A biodiversity assessment must contain the following:

1. Details describing the location of the application site, including the farm number and portion as well as a figure clearly indicating the location on a 1:50 000 topocadastral map. A shapefile (see Appendix 1 for shapefile requirements) of the application site must be e-mailed to GDARD_BiodiversityInfo@gauteng.gov.za, the e-mail clearly indicating the project reference number. In the case of a linear feature (pipeline / road / railway / powerline), a shapefile (see Appendix 1 for shapefile requirements) of the proposed and alternative routes must be provided.
2. A brief description of the proposed activity, the size of the application site, the current use of the application site and surrounding land uses.
3. Photographic record of the site characteristics, including major vegetation units and all sensitive areas.
4. A list of specialist studies conducted, summarized in the format of a table as follows:

ASPECT INVESTIGATED	SPECIALIST	QUALIFICATIONS & SACNASP registration number	DATES OF FIELD SURVEYS
E.g. Birds	John Smith	MSc. (Zoology) SACNASP no = xxx	1 st – 3 rd February 2006

NB Biodiversity assessments that do not include all required specialist studies will be returned to the applicant for amendment. Please send a shapefile (see Appendix 1 for shapefile requirements) of the application site to the GDARD biodiversity information service (GDARD_BiodiversityInfo@gauteng.gov.za) to determine which specialist studies are required, the e-mail clearly indicating the project reference number. A copy of the response received from the GDARD biodiversity information service must be included in the report.

5. Specialist reports attached as appendices. Specialist reports must clearly detail methods employed and findings. Each page of the hard copy report must be signed by the relevant specialist.

NB Specialist studies not complying with the *Minimum Requirements for Biodiversity Studies* will be returned to the applicant for amendment.

6. For all specialists who undertook the specialist studies, proof of registration as Professional Natural Scientists in terms of the Natural Scientific Professions Act (No. 27 of 2003) within the relevant fields, as well as *curriculum vitae*'s, must be attached as appendices. *Curriculum vitae*'s

must detail qualifications as well as relevant work experience, publications in scientific and popular literature and research projects. (CVs and/or SACNASP registration certificates need not be attached if GDARD is already in possession of electronic copies – please email to GDARD_BiodiversityInfo@gauteng.gov.za.)

NB Specialist studies conducted by a person without the minimum qualifications as specified in the *Minimum Requirements for Biodiversity Studies* will be returned to the applicant for amendment.

7. A composite sensitivity map, compiled within a Geographic Information System. The location and size (in hectares) of all sensitive areas must be clearly indicated. The spatial extent of individual biodiversity elements contributing to the composite map must also be indicated. The sensitivity map must be provided in **colour** and must be signed by all relevant specialists.

NB A shapefile (see Appendix 1 for shapefile requirements) indicating the location and extent of all sensitive areas must be e-mailed to GDARD_BiodiversityInfo@gauteng.gov.za, the e-mail clearly indicating the project reference number.

8. A description of the sensitivity mapping rules used to compile the sensitivity map, summarized in the format of a table as follows:

BIODIVERSITY ELEMENT	SENSITIVITY MAPPING RULE
E.g. Population of Red List plant species	Area of occupancy + *200m buffer zone
E.g. Wetland	Wetland + *30m buffer zone extending from edge of wetland temporary zone
E.g. African Grass-Owl (<i>Tyto capensis</i>)	100ha of suitable foraging habitat with a minimum terrestrial buffer of 170m from the edge of a wetland/stream

**example only – appropriate distances may differ.*

NB Biodiversity assessments containing sensitivity maps not complying with the *Sensitivity Mapping rules for Biodiversity Assessments* will be returned to the applicant for amendment.

9. A map overlaying the total footprint (including all development structures, stormwater structures, service infrastructure, paved surfaces, gardens/landscaping, access roads, etc.) of the proposed activity with all sensitive areas. (Please note that individual elements (e.g. individual house units, pipelines, access roads, etc.) within the total footprint need not be indicated. An entire polygon indicating the area within which activities will take place will suffice.)

NB A shapefile (see Appendix 1 for shapefile requirements) indicating the location and extent of the proposed activity must be e-mailed to GDARD_BiodiversityInfo@gauteng.gov.za, the e-mail clearly indicating the project reference number.

10. An ecological management plan for any open space system designed to incorporate all areas designated as sensitive in the sensitivity mapping exercise (in accordance with the *Sensitivity Mapping Rules for Biodiversity Assessments*).

NB Ecological management plans not complying with the *Minimum Requirements for Ecological Management Plans* will be returned to the applicant for amendment.

11. A rehabilitation plan if the proposed activity is a pipeline, road, railway or powerline. The rehabilitation plan must be compiled by a specialist registered in accordance with the Natural

Scientific Professions Act (No. 27 of 2003) in the field of Ecological Science.

12. A recommended list of conditions in the event that the activity is authorized. Please refer to *Recommended Standard Mitigatory Measures* for guidance.

NB This may be omitted should the specialist(s) be of the opinion that the activity should not be authorized.



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MINIMUM REQUIREMENTS FOR BIODIVERSITY STUDIES

Vegetation

- Vegetation surveys must be undertaken by suitably qualified specialists registered as Professional Natural Scientists in accordance with the Natural Scientific Professions Act (No. 27 of 2003) within the field of Botanical Science. Specialists must have qualifications and experience relevant to vegetation science/ecology.
- Surveys must take place during the summer season (beginning of November to the end of April).
- Scientifically credible methods must be employed and a reference provided.
- The location and extent of all plant communities on the study site must be mapped and a description provided for each. The area (in hectares) and ecological sensitivity of each plant community must be indicated.
- All good condition natural vegetation must be designated as ecologically sensitive. The location and extent of all primary grassland (even if it is in a poor/degraded condition) must be mapped and designated as ecologically sensitive.
- A plant species list must be provided for each plant community with medicinal and invasive/exotic species indicated. The number of forb/herb, grass, shrub and tree species must be indicated for each plant community.
- A general Red List plant survey must be undertaken. Lists of potential species can be obtained from Lorraine Mills (Lorraine.Mills@gauteng.gov.za).
- Surveys must determine whether any of the following tree species are present on site: *Acacia erioloba*, *Boscia albitrunca*, *Combretum imberbe*, *Pittosporum viridiflorum*, *Prunus africana*, *Sclerocarya birrea* subsp. *caffra*.
- Ecologically sensitive areas on adjacent properties, within a minimum distance of 200m of the study site, must be identified.
- Results must be incorporated into a sensitivity map in accordance with the sensitivity mapping rules for vegetation.

Plants

- Surveys for Red and Orange List plant species must be undertaken by suitably qualified specialists registered in accordance with the Natural Scientific Professions Act (No. 27 of 2003) as Professional Natural Scientists within the field of Botanical Science. Specialists must have a minimum of three years experience as well as qualifications relevant to plant ecology and/or conservation.
- Surveys must take place during the flowering season of species historically recorded on site or confirmed on site by the Directorate of Nature Conservation. Lists of probable and confirmed species as well as details pertaining to flowering seasons can be obtained from Lorraine Mills (Lorraine.Mills@gauteng.gov.za). [Surveys for the following species need not be restricted to flowering seasons: *Aloe peglerae*, *Bowiea volubilis* subsp. *volubilis*, *Cyathea dregei*, *Encephalartos lanatus*, *Encephalartos middelburgensis*, *Hypoxis hemerocallidea* and *Prunus africana*.]
- Surveys must encompass the site and all relevant adjacent properties (minimum of 200m radius).

- For those species confirmed on the study site (or within 200m) by the Directorate of Nature Conservation, as well as those located by the specialist during surveys, the entire extent of the population must be accurately mapped out with a GPS (WGS84 datum; geographic co-ordinate system), augmenting with data already collected by the Directorate of Nature Conservation (please contact Pieta Compaan for the relevant shape file and/or longitude/latitude co-ordinates; Pieta.Compaan@gauteng.gov.za. A shapefile of the study area in the required GIS format (see Appendix 1) must accompany the request for existing data.).
- Populations of Red List and Orange List plant species and protective buffer zones must be designated as sensitive in a sensitivity map. Buffer zone widths must be consistent with the Red List Plant Species Guidelines.

Mammals

- Surveys for mammals must be undertaken by specialists registered as Professional Natural Scientists in accordance with the Natural Scientific Professions Act (No. 27 of 2003) within the field of Zoology and with qualifications and experience relevant to mammal biology and conservation. The individual must also have recognized expertise pertaining to the species targeted in the survey.
- The survey must include the site and all relevant adjacent properties within a 500m radius.
- The mammal specialist must generate a list of mammal species that could potentially occur on the site using a qualitative and quantitative habitat assessment and knowledge of species distribution and ecology.
- The specialist must conduct a detailed survey of the site to confirm the presence or absence of potentially occurring species and to determine whether the site contains suitable habitat for Red List mammal species.
- Surveys for the Juliana's golden mole must be undertaken in summer, after a sufficient rainfall event and all available suitable habitat for the species must be mapped and designated as sensitive.
- All wetland and riverine habitats must be surveyed for the following mammal species: *Chrysoxalax villosus*, *Lutra maculicollis*, *Dasymys incomtus*.
- The specialist doing trapping or netting must be in possession of a valid permit.
- The study site and adjacent areas must be surveyed for the occurrence of caves, which must be designated as sensitive in a sensitivity map. Other potential roosting sites for bats (e.g. rock crevices, miner adits etc.) must also be surveyed for.

The specialist report must include the following information:

- A description of the major habitat types observed, i.e. vegetation types, soil types, any aquatic habitat and potential roosting sites for bats occurring on the site and on adjacent properties within a 500m radius.
- A list of all mammal species, generated from the habitat assessment, which could potentially occur on the site and all relevant adjacent properties. The list must indicate whether the species was confirmed or evidence of occurrence was observed.
- GPS co-ordinates (WGS84 datum; geographic co-ordinate system) indicating the confirmed presence of any Red List mammal species and suitable habitat for Red List mammal species, both of which must be designated as sensitive in a sensitivity map.
- A sensitivity map showing all available suitable habitat for Redlist mammal species encountered on the site and adjacent properties within a 500m radius. The sensitivity mapping rules for mammals must be adhered to.
- The season, dates and times on which the survey was undertaken.
- Information on surrounding land uses and connectivity with other open spaces.
- Any other additional information about the site that the specialist deems important in mammal conservation (e.g. trophic levels, breeding site, roosting site etc.).

Birds

Specialists undertaking ornithological studies must be registered as Professional Natural Scientists in accordance with the Natural Scientific Professions Act (No. 27 of 2003) within the field of Zoology, must be able to demonstrate relevant work experience and must have published on relevant aspects of the biology and/or ecology of birds. The individual must also have recognized expertise pertaining to the species targeted in the survey

As a general rule, specialist assessments must be conducted in a manner and at a scale that is appropriate to the species in question. An ecosystem/regional approach is required for the effective conservation of most bird species and their habitat and as such, specialist ornithological assessments must not be constrained by the extent of the application site. Instead, assessments must incorporate suitable habitat around the proposed development site (whether contiguous or fragmented) to a distance that is appropriate to the spatial requirements and movement patterns of the species in question. Such distances will vary from species to species and from one habitat type to another. The onus for ensuring that specialist ornithological assessments are conducted at the appropriate scale rests with the Specialist Ornithological Consultant (SOC), though guidelines can be obtained from the GDARD ornithologist (Craig.Whittington-Jones@gauteng.gov.za).

- The SOC must determine whether the proposed development site falls within the known or expected distribution of any of the following Red List bird species prioritized by GDARD:- Cape Vulture, Blue Crane, Lesser Kestrel, African Grass-Owl, African Marsh-Harrier, White-backed Night-Heron, White-bellied Korhaan, Martial Eagle, African Finfoot, Lesser Flamingo, Secretarybird, Black Stork, Half-collared Kingfisher and Greater Flamingo.
- The SOC must determine whether suitable habitat occurs on the proposed development site or neighbouring properties for those priority Red List species whose distribution overlaps with the proposed development site.
- Surveys for terrestrial birds must be conducted in summer, but only once the vegetation layer has recovered sufficiently from winter fires to allow for assessment of available habitat.
- Surveys for aquatic birds must be conducted in summer. For species associated with rivers, the assessment must coincide with average flow conditions (i.e. not dry and not in flood) and preferably within the breeding season. For species associated with wetlands, the assessment must follow good summer rains i.e. standing water must be present and the vegetation must have recovered sufficiently from winter fires to allow for assessment of available habitat.
- Where distribution and habitat availability suggest a high probability of one or more priority Red List bird species occurring on site, the SOC must map suitable habitat (see *Sensitivity Mapping rules for Biodiversity Assessments* (spatial rules for birds) and indicate the number of individuals/pairs that could potentially be supported, given that it is unlikely that all birds will be located during a limited survey.

The SOC's report must include, but is not limited to, the following information:

- A map showing the location of the proposed development site and the area that was covered by the survey.
- The date and hours spent on site.
- An assessment of the availability of suitable habitat (breeding, foraging, roosting etc.) on site and within an appropriate distance around the site (this distance must be motivated in terms of the spatial requirements of the priority Red List species included in the assessment).
- A sensitivity map complying with the *Sensitivity Mapping rules for Biodiversity Assessments* (spatial rules for birds).
- GPS coordinates (recorded in decimal degrees in WGS84 datum) for all confirmed sightings of Red List species.
- The size and location of buffers must be motivated in terms of the latest research and publications. All references must be listed at the end of the report.

- Where mitigation measures are appropriate, these must be detailed together with the relevant problem statement.
- A comprehensive, site-specific ecological management plan for all proposed open spaces, buffers and corridors that are relevant to the species and/or habitats under investigation.

A full ornithological assessment, as specified above, is not required where the proposed activity will involve the construction of a communication mast / cell phone tower / overhead line (powerline or telephone line). Instead, an assessment of the increased risk of mortality or injury to birds is required. Such an assessment must be conducted by a suitably qualified expert with demonstrable experience in working with infrastructure-related bird collisions. The expert must advise on appropriate mitigatory measures, especially where these activities are to take place within/adjacent to urban open space systems or within rural areas.

If a Lesser Kestrel roost is present within 100m of a proposed development, the role of the SOC is to identify and mitigate potential sources of disturbance for roosting birds and to develop a suite of appropriate management measures (given that roosting birds are known to foul areas below the roost with regurgitated pellets and faeces) that will promote the harmonious co-existence of these birds and humans.

Where Martial Eagles or Secretarybirds have been confirmed for an area or where the SOC believes that ideal habitat is present on a site, the specialist ornithological assessment must include a search for potential nest sites using aerial photos (e.g. Quickbird) and ground verification within the surrounding 14km for Martial Eagles or 9km for Secretarybirds. If nests are confirmed within this area, then the SOC must provide mitigation measures and offsets to ensure that development does not compromise the persistence of a pair in that territory.

Amphibians

Under C-Plan version 3 (latest version i.e. version 3.3), no specialist studies for any species of amphibian are requested for consideration in the review of a development application.

[The Giant Bullfrog (*Pyxicephalus adspersus*) has been removed following re-assessment of the species' status in South Africa. The species is not truly Near Threatened in South Africa (no quantitative analysis of the Giant Bullfrog distribution against the IUCN criteria can consider them as such) and the most recent evaluation of the status of the Giant Bullfrog in December 2009 did not consider the species sufficiently threatened to be listed as Near Threatened (Prof. Louis du Preez, pers. comm.). Given the current objectives of Gauteng's C-plan i.e. to be used to protect representative habitat and generate specialist studies for threatened faunal species, the Giant Bullfrog does not qualify for inclusion as a species-specific layer requiring specialist assessments. As per the C-Plan approach, the conservation of the Giant Bullfrog and of amphibians in general will be met by the protected area network as well as the designation of priority habitats i.e., pans or quaternary catchments, with associated restrictions on land use (refer to "Wetlands" section below)]

Reptiles

Under C-Plan version 3.3, no specialist studies for any species of reptile are requested for consideration in the review of a development application.

Invertebrates

- A Red List or Priority invertebrate survey must be undertaken by an individual registered with SACNASP (i.e. registered as a Professional Natural Scientist in accordance with the Natural

Scientific Professions Act (No. 27 of 2003)) in the field of Zoology and with qualifications and experience relevant to invertebrate biology and conservation. The individual must also have recognized expertise pertaining to the species targeted in the survey.

- Where the individual does not have recognized expertise pertaining to the target species, the fieldwork component of the survey may be subcontracted to another individual who possesses such expertise. In such a case the responsibility for ensuring that the requirements presented here are adhered to rests with the SACNASP registered individual. Furthermore, the report must state the name/s of the individuals subcontracted to undertake any fieldwork, it must specify their role in the survey, and their CV's must be included with the report as appendices.
- The individual undertaking the survey must be in possession of a permit to collect Red List or Priority invertebrate species included in the provincial ordinance or on the NEMBA: Threatened or Protected Species list. The permit number must be presented in the final report.
- Surveys must take place during a seasonal period where the probability of detecting an identifiable life history stage of the target species is highest, based on the biology of that species. Information on appropriate seasonal periods for Red List and Priority invertebrate species is presented in Appendix 2. Exceptions to this must be fully motivated by the specialist, such that they may be judged by the relevant specialist scientist in GDARD.
- Survey methods and survey effort must be employed such as to attain an acceptable probability of detecting a species should it be present. Species specific survey effort requirements can be obtained from Appendix 2. Exceptions to this must be fully motivated by the specialist, such that they may be judged by the relevant specialist scientist in GDARD.
- Where a Red List or Priority invertebrate species is located on site by the specialist, a voucher series must be collected and deposited with a recognized natural history collection appropriate for the taxon, along with complete data on the locality, collection event and identification. These data, along with the accession code for the series, must be submitted to the invertebrate scientist at GDARD (Ian.Engelbrecht@gauteng.gov.za) in an appropriate electronic format.

Wetlands

- All specialist studies must be undertaken by suitably qualified specialists who (1) are registered in accordance with the Natural Scientific Professions Act (2003) as Professional Natural Scientists within the field of Ecological or Aquatic Science (2) have specific post-graduate qualifications relating to wetlands. In the absence of the latter, the specialist must have attended an appropriate course on wetland rehabilitation and delineation (copy of certificate must be provided).
- The wetland delineation procedure must identify the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas and is that part of the wetland that remains flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.
- Delineation must be undertaken according to “DWAF, 2003: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones”.
- Locating the outer edge of the temporary zone must make use of four specific indicators including the terrain unit indicator, the soil form indicator, the soil wetness indicator and the vegetative indicator.
- The wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive in a sensitivity map (refer to *Sensitivity Mapping rules for Biodiversity Assessments*).

The catchment of all pan wetlands must be demarcated. Please note that GDARD's sensitivity project is an internal one and that a shapefile of these pans may be requested from (Pieta.Compaan@gauteng.gov.za).

The report must include the following information (but not restricted to):

- The present ecological state of the wetland.
- The impacts which are likely to occur due to the proposed development, and recommendations to avoid or minimize such impacts.

- If the wetland is degraded, a rehabilitation plan must be included (all wetlands must be conserved and rehabilitated if necessary; their destruction for development purposes will not be supported).
- The delineation procedure that has been applied.
- Conservation worthy/valuable biota identified in the wetland or surrounding areas.
- Sensitivity map showing the outer edge of the temporary wetland and the buffer in relation to the proposed development.
- A plan indicating how the stormwater that will be generated by the proposed development will be managed.

NB: A shapefile (see Appendix 1 for shapefile requirements) of the delineated wetland must be e-mailed to Pieta.Compaan@gauteng.gov.za for GDARD's records.

All wetland habitats must be surveyed for the following mammal species: *Chrysospalax villosus*, *Mystromys albicaudatus*, *Lutra maculicollis*, *Amblysomus septentrionalis*, *Dasymys incomtus*. Minimum requirements for mammal studies apply.

The edge of the wetland must be clearly demarcated in the field with pegs or poles that will last for the duration of the construction phase, colour-coded as follows:

- **RED** – Indicating the edge of the wetland (**Note:** This includes the permanent, seasonal and temporal wetlands, or parts thereof; and no vehicles or building materials are allowed in this zone) [These should be put along the entire length of the property/site.],
- **ORANGE** – Indicating the edge of the buffer zone (30m within urban areas and 50m outside urban areas). However, allowance must be made for sensitive species that require larger areas, e.g. Grass Owl, Giant Bullfrog, etc.

Rivers

All specialist studies must be undertaken by suitably qualified specialists who (1) are SASS5 accredited through DWAF, (2) are registered in accordance with the Natural Scientific Professions Act (2003) as Professional Natural Scientists within the field of Ecological or Aquatic Science (3) have attended DWAF's Riparian Delineation and Management course as well as DWAF's EcoStatus Determination course. River specialist studies must include the following:

- An ecological study, with specific emphasis on ecological processes and connectivity at the landscape level.
- Delineation of the riparian zone according to "DWAF, 2005: A practical field procedure for the identification and delineation of Wetland and Riparian areas".
- Delineation of a 100m buffer zone from the edge of the riparian zone for rivers/streams outside urban areas and a 32m buffer zone from the edge of the riparian zone for rivers/streams within urban areas.
- Impact assessment of the proposed development on the hydrological regime and the change thereof, including the effect of that change on the downstream habitat and integrity of the system.
- Surface runoff and stormwater management plan indicating the management of all surface runoff generated as a result of the development prior to entering any natural drainage system (i.e. stormwater and flood retention ponds). This must also consider the possible alteration of run-off rate, possible volume of debris and siltation problems.
- A sensitivity map where riparian zones and buffer zones are designated as sensitive.

All riverine habitats must be surveyed for the following mammal species: *Chrysospalax villosus*, *Lutra maculicollis*, *Dasymys incomtus*. Minimum requirements for mammal studies apply.

An EcoStatus Level 3 Determination study according to "DWAF 2008: RIVER ECOCLASSIFICATION: MANUAL FOR ECOSTATUS DETERMINATION (Version 2), WRC Report No: TT329/08" to determine the current Ecological Category (EC) of the river and an

assessment of alternative ECs in terms of drivers and biological responses as applied in the National Aquatics Ecosystems Health Biomonitoring Programme (RHP) must be undertaken for:

- All rivers within priority quaternary catchments (i.e. A21F, A21G, B31A, B31B, B31C, B20E, B20F, B20H, B20J, C21A, C21B, C21C); and
- All rivers that provide suitable habitat for White-backed Night-Heron / African Finfoot / Half-collared Kingfisher (or where the presence of these species have been confirmed).

The minimum tools required for EcoStatus Level 3 determination must be applied i.e. IHI, GAI, FRAI, MIRAI and VEGRAI.

The edge of the watercourse must be clearly demarcated in the field with pegs or poles that will last for the duration of the construction phase, colour-coded as follows:

- **RED** – Indicating the edge of the riparian zone [These should be placed along the entire length of the property/site.]
- **ORANGE** – Indicating the edge of the buffer zone (32m for rivers within urban areas and 100m outside urban areas)

Ridges

Specialist studies, complying with the minimum requirements described in the preceding sections and describing the following, must be conducted:

- (a) the ecological conditions – including the functional, hydrological and compositional aspects – of the ridge,
- (b) flora and fauna – including any mammals, birds, reptiles, amphibians and invertebrates – that are present on the ridge,
- (c) the impacts of the proposed activity on a) and b),
- (d) the stability of the slope and any implications thereof for the application, and
- (e) the cultural, historical, open space and visual value aspects as well as the current use and value of the ridge for social purposes and the extent to which the proposed activity will impact on these uses or values

Applications involving developments on a ridge falling within Class 1, 2 or 3 must also be supported by a study on service provision and access. The study on service provision and access must, as a minimum, describe the location of access roads to the site, what services are available, and, if no services are available, how the site will be serviced and the impact that any new infrastructure contemplated may have on the ridge.

Caves

Surveys must be conducted to determine whether caves occur on site or within 500m of the proposed development.

SENSITIVITY MAPPING RULES FOR BIODIVERSITY ASSESSMENTS

The objective of a sensitivity mapping exercise is to determine the location and extent of all sensitive areas that must be protected from transforming land uses. A development proposal is only considered compatible with the biodiversity sensitivities of the site if all sensitive areas are avoided and are incorporated into an open space system.

The sensitivity map must be constructed within a GIS so that it can inform the proposed development layout and enable comparative analyses between sensitive areas and the proposed activity.

Ecologically sensitive areas on adjacent properties, within a minimum distance of 200m of the study site, must be included in the sensitivity map.

The sensitivity map must comply with the following spatial mapping rules:

Vegetation

All good condition natural vegetation and primary grassland (even if it is in a poor/degraded condition) must be mapped and designated as sensitive.

Buffer zones of at least 200m must be provided to mitigate deleterious edge effects.

Red List & Orange List plants

The entire area occupied by populations of Red List and Orange List plant species must be mapped and buffer zones provided to mitigate deleterious edge effects such as the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution. Plant populations and protective buffer zones, beginning from the outer edge of the population, must be designated as sensitive.

Rules for buffer zone widths are as follows:

- 200m for Red List and Orange List plant populations occurring within urban areas (all built up areas in Gauteng, including residential, commercial, retail, institutional, educational, industrial and mixed use developments, where proposed developments are 50 percent abutted by urban development and which can be readily connected to municipal bulk infrastructure services).
- For Red List and Orange List plant populations occurring within rural areas:
 - 600m for A1 species (taxa endemic to Gauteng)
 - 500m for A2 species (taxa endemic to Gauteng and one other province)
 - 400m for A3 species (taxa endemic to Gauteng and two or more other provinces)
 - 300m for B species (taxa not endemic to South Africa)

Suitable habitat for expected Red List and Orange List plant species (i.e. those species historically recorded in the area but not located during surveys due to unfavourable environmental conditions) must be mapped and designated as sensitive.

[Sensitivity mapping is not required for plant taxa listed in the **Declining** category of the Orange List.]

Red List mammals

- All suitable habitat for terrestrial Red List mammal species observed or potentially occurring on the site must be mapped and designated as sensitive. (Suitable habitat for Red List mammal species that is observed in an area where the vegetation is not deemed sensitive must also be mapped and designated as sensitive.)
- All suitable habitat for Red List mammal species associated with wet habitats observed or potentially occurring on the site must be mapped and designated as sensitive, including the appropriate buffers for wetlands and rivers (refer to sensitivity mapping rules for wetlands and rivers).
- All caves, including a 500m buffer zone must be designated as sensitive.

Red List birds

The sensitivity map must demarcate as sensitive areas of suitable habitat (differentiating between breeding, foraging, roosting etc.) on the proposed development site and neighbouring properties for each priority Red List bird species, together with appropriate buffers and corridors. All sensitive habitats (e.g. wetlands) must be clearly demarcated using the appropriate techniques (see wetland requirements in *Minimum Requirements for Biodiversity Studies* and *Sensitivity Mapping rules for Biodiversity Assessments*), even where the probability of priority Red List species utilizing them is considered small.

The species-specific spatial rules specified in the table below must be applied and relevant areas designated as sensitive. (More information on the spatial requirements for priority Red List bird species can be obtained from the GDARD ornithologist (Craig.Whittington-Jones@gauteng.gov.za).)

Blue Crane	400ha of contiguous suitable foraging habitat around Blue Crane breeding sites (usually in a wetland)
African Grass-Owl	100ha of suitable foraging habitat with a minimum terrestrial buffer of 170m from the edge of a wetland/stream
African Marsh-Harrier	Wetlands larger than 100ha that are identified as suitable habitat for this species must be buffered by 200m of terrestrial habitat.
White-backed Night-Heron	A buffer zone of 50m must be provided from the edge of the riparian zone (see delineation requirements for riparian zones in <i>Minimum Requirements for Biodiversity Studies</i>)
White-bellied Korhaan	The extent and location of the open space network set aside to accommodate the breeding and foraging requirements of this species must be motivated by the SOC. Contiguous habitat patches must be >100ha.
African Finfoot	A buffer zone of 50m must be provided from the edge of the riparian zone (see delineation requirements for riparian zones in <i>Minimum Requirements for Biodiversity Studies</i>)
Half-collared Kingfisher	A buffer zone of 50m must be provided from the edge of the riparian zone (see delineation requirements for riparian zones in <i>Minimum Requirements for Biodiversity Studies</i>)

Red List amphibians (Giant Bullfrog)

N/A

Red List reptiles

N/A

Red List or priority invertebrates

- Prior to commencement of a survey, landscape scale habitat areas, defined as areas where significant biotic and abiotic environmental variables are more or less constant, must be mapped for the site (Habitat Areas, HA's). A map of plant communities produced during a vegetation survey for the site will suffice where such a map may be available. However, the invertebrate specialist may undertake to produce a map for the site more appropriate for the target invertebrate species if it is deemed necessary.
- These habitat areas should be classified as natural or transformed areas, where natural areas consist primarily of natural vegetation (regardless of whether it is primary or secondary vegetation) and transformed areas consist primarily of anthropogenic land cover types such as built up land, roads, mines, erosion, unnatural vegetation cover, cultivated lands/crops or are dominated by alien vegetation.
- This map must form the basis for the survey of the site by the specialist and all natural areas must be surveyed appropriately for the target species. Surveys in transformed areas are not required.
- For those Red List or priority species located on site within the last five years or during the specialist survey, the habitat areas where they were located must be designated as sensitive. An exception to this rule may be made for species known to exhibit an aggregated population dispersion pattern and where individuals do not utilize the entire habitat area. In such cases the extent of the population must be mapped and designated as sensitive. Information regarding species collected on site in the last five years is available from the GDARD Invertebrate Scientist (Ian.Engelbrecht@gauteng.gov.za).
- In exceptional circumstances where the specialist locates a target species in a habitat type where it is highly likely that its presence was transient or artificial, and where the species is not located in suitable habitat nearby, the specialist may refrain from designating that area as sensitive but must motivate this in the report.
- For those Red List or priority species located on site within the last five years or during the specialist survey, and which have spatiotemporal habitat requirements for long term persistence which extend beyond the habitat area where they were located, the additional habitat areas needed to fulfill those requirements must be designated as sensitive.
- Where habitat areas on site have been designated as sensitive due to the presence or spatiotemporal requirements of a target species, corridors sufficient to sustain the long term movement of that species between those areas, and linking those areas to natural areas outside of the site, must be designated as sensitive. Species specific corridor requirements can be obtained from Appendix 2. Exceptions to these rules must be fully motivated by the specialist, such that they may be judged by the relevant specialist scientist in GDARD.
- In order to mitigate against the impact of edge effects on populations of Red List or Priority invertebrates, buffers must be designated for all habitat areas where the species is located, habitat areas selected to meet the spatiotemporal requirements of the species, and corridors designated to provide connectivity between those areas. Species specific buffer requirements can be obtained from Appendix 2. These buffers must also be designated as sensitive in the sensitivity map.
- Habitat areas occupied by a species, habitat areas necessary to fulfill the spatiotemporal requirements of the species, corridors facilitating movement of a species between habitat areas and buffers against edge effects must be clearly designated on the sensitivity map such that they may be easily distinguished by the reader in order to facilitate evaluation by GDARD.

Wetlands

The wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, must be designated as sensitive. Rules for buffer zone widths are as follows:

- 30m for wetlands occurring inside urban areas
- 50m for wetlands occurring outside urban areas

Note that these buffer zones are essential to ensure healthy functioning and maintenance of wetland ecosystems. Larger buffer zones may be required for wetlands supporting sensitive species (refer to mapping rules in species-specific sections).

The priority pan and its catchment, must be designated as sensitive. Priority pans have been selected according to criteria regarding the proportion of transformed area within a one kilometer radius of the pan. It is imperative that the pan catchments are protected from any additional urban or industrial transformation. Development footprints should be modified to prevent encroachment on the pan catchments and its buffer. A 50m buffer from the edge of this catchment is required.

The catchment of all pan wetlands must be designated as sensitive.

Rivers (non-perennial / perennial)

Riparian zones and buffer zones must be designated as sensitive according to the following mapping rules.

- The riparian zone must be delineated according to “DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones”.
- A 100m buffer zone from the edge of the riparian zone for rivers/streams outside urban areas.
- A 32m buffer zone from the edge of the riparian zone for rivers/streams within urban areas.

Note that these buffer zones are essential to ensure healthy functioning and maintenance of aquatic ecosystems and also function as wildlife corridors and refugia. Larger buffer zones may be required for aquatic ecosystems supporting sensitive species (refer to mapping rules in species-specific sections).

Ridges

All ridges must be designated as sensitive. (A shapefile indicating the location and extent of ridges in the province can be obtained from Pieta.Compaan@gauteng.gov.za.) Already transformed areas (i.e. dominated by exotics, denuded of vegetation, landscaped, covered in development structures) can be ascribed a low sensitivity. Where the interface between the lower slopes and adjacent land is deemed important for certain species (e.g. low density herbivores recorded on site and important/rare invertebrates), a buffer zone of 200m must be mapped and designated as sensitive. A 200m buffer zone for Class 1 ridges must be designated as sensitive.

Caves

All caves and a 500m buffer zone must be designated as sensitive.

Corridors

All provincially important species and climate change corridors, inclusive of disturbed, degraded or transformed areas must be designated as sensitive. (A shapefile indicating the location and extent of provincially important corridors can be obtained from Pieta.Compaan@gauteng.gov.za.)

Directorate of Nature Conservation

Glencairn Building, Corner Eloff and Market Street, JOHANNESBURG
Postal Address: P.O. Box 8769, JOHANNESBURG, 2000
Tel (011) 355-1563 & Fax (011) 355-1000
Enquiries: Phuti.matlamela@gauteng.gov.za

MINIMUM REQUIREMENTS FOR ECOLOGICAL MANAGEMENT PLANS

The Ecological Management Plan (EcoMP) must be undersigned by a registered ecologist with clear indication (membership number) of being registered with at least one of three institutes namely:

- SACNASP (SA Council for Natural Scientific Professions) in accordance with the Natural Scientific Professions Act (No. 27 of 2003) in the fields of Botanical / Ecological / Zoological Science;
- The SA Institute of Ecologists and Environmental Scientists (professional membership) in the fields of Botanical / Ecological / Zoological Science;
- The Grassland Society of South Africa (professional membership) in the fields of Botanical / Ecological / Zoological Science / Wildlife Management.

An EcoMP must comprise of two parts, firstly the bio-geographic context and secondly the specific action plans.

Bio-geographic context and inventory:

This section of the document should contain an appropriate description of the biome or veldtype/vegetation type, general vegetation and climatic conditions of the immediate area, specific details of the property, location, farm name / portion, size of property, size of area accessible to the priority species (e.g. wild ungulates or Red/Orange List species of fauna/flora), extent of infrastructure development, previous and current land use zoning, present veld condition assessment results, present game load and recommended stocking rates.

As a minimum, details of the following must be included in this section of the EcoMP:

- Vision & Mission:
 - Indicates the direction of management aspiration;
 - Contains a description of the function of the venture;
 - Formulates the justification for the existence of the venture;
 - Supplies the foundation on which all future actions will be based and against which all actions can be measured.
- Description
- Climate and weather
- Topography
- Geology
- Geomorphology
- Hydrology
- Vegetation
- Animals
- Cultural Heritage
- Financial & Human Resources

- Infrastructure

Action Plans:

Action plans are comprised of specific objectives (objectives are derived from the mission statement and represent the priority areas in which management must attain achievement to give direction to the management intention) related to a biodiversity attribute warranting specific interventions. Action plans specify specific operational goals (operational goals are the functional performance areas derived from the respective objectives; they describe the expected results, which, when amalgamated, will contribute to the realization of the objectives) and tasks / actions which are required and will be implemented. These tasks and actions are associated with specific responsibilities and dated deadlines (i.e. what, why, when, who and how?).

Action plans should result in a report back to the Directorate of Nature Conservation on an annual or bi-annual basis (as agreed on approval of the EcoMP).

As a minimum, the action plans must detail objectives, operational goals and tasks/actions pertaining to the following:

Generic Management Objectives

- Operational
- Waste
- Security & Risks
- Financial Security
- Surface Run-off & Storm water (e.g. management through artificial wetlands / stormwater and flood retention ponds to maintain natural hydrological conditions within affected natural drainage systems / wetlands / pans)
- Recreational Activities (e.g. trails, bird hides, etc.)
- Appropriate Legislative Tools for formal protection (e.g. the NEMA: Protected Areas Act 57 of 2003 / conservation servitudes)

Management Objectives with specific regard to Biodiversity, Conservation & Impact Mitigation

- Soil
- Vegetation
- Fauna (with emphasis on pollinators and keystone species)
- Fire Management (specifically to ensure persistence of grassland)
- River Health Biomonitoring and EcoStatus Level 3 Determination (to determine the Ecological Category of rivers, to monitor any changes in ECs and to ascertain the causes of such changes)
- Alien Species Eradication & Monitoring, and Management of Domestic Pets
- Management and Monitoring of Red & Orange List Species and their Habitat (to ensure persistence of populations and reduce mortality of individuals)
- Maintenance of Ecological Processes, Connectivity & Buffer Zones
- Minimization of Edge Effects
- Rehabilitation of Degraded Areas (e.g. degraded wetlands, corridors and buffer zones)
- Management Recommendations for Adjacent Land (especially where correct management on adjacent land is crucial for the long-term persistence of sensitive species)

Directorate of Nature Conservation

Glencairn Building, Corner Eloff and Market Street, JOHANNESBURG
Postal Address: P.O. Box 8769, JOHANNESBURG, 2000
Tel (011) 355-1563 & Fax (011) 355-1000
Enquiries: Phuti.matlamela@gauteng.gov.za

RECOMMENDED STANDARD MITIGATORY MEASURES

Developments

- An appropriate management authority (e.g. the body corporate) that must be contractually bound to implement the EMP and ROD during the operational phase of the development should be identified and informed of their responsibilities in terms of the EMP and ROD.
- All areas designated as sensitive in a sensitivity mapping exercise (see *Sensitivity Mapping Rules for Biodiversity Assessments*) should be incorporated into an open space system. Development should be located on the areas of lowest sensitivity.
- Development structures should be clustered as close as possible to existing development.
- The open space system should be managed in accordance with an ecological management plan that complies with the *Minimum Requirements for Ecological Management Plans* and forms part of the EMP.
- The open space system should be fenced off prior to construction commencing (including site clearing and pegging). All construction-related impacts (including service roads, temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment/building materials/vehicles or any other activity) should be excluded from the open space system. Access of vehicles to the open space system should be prevented and access of people should be controlled, both during the construction and operational phases. Movement of indigenous fauna should however be allowed (i.e. no solid walls, e.g. through the erection of palisade fencing).
- Information boards should be erected within the development to inform residents of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements.
- Construction activities should be timed to coincide with the period when the Red List bird species that could potentially occur on site are unlikely to be breeding.
- Outside lighting should be designed to minimize impacts on fauna. All outside lighting should be directed away from sensitive areas. Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible.
- Only indigenous plant species, preferably species that are indigenous to the natural vegetation of the area, should be used for landscaping in communal areas. As far as possible, plants naturally growing on the development site, but would otherwise be destroyed during clearing for development purposes, should be incorporated into landscaped areas. Forage and host plants required by pollinators should also be planted in landscaped areas.
- Where possible, trees naturally growing on the site should be retained as part of the landscaping, with specific emphasis on the following species: *Acacia erioloba*, *Boscia albitrunca*, *Combretum imberbe*, *Ilex mitis* var. *mitis*, *Pittosporum viridiflorum*, *Prunus africana*, *Sclerocarya birrea* subsp. *caffra*. Measures to ensure that these trees survive the physical disturbance from the development should be implemented. A tree surgeon should be consulted in this regard.

- In order to minimize artificially generated surface stormwater runoff, total sealing of paved areas such as parking lots, driveways, pavements and walkways should be avoided. Permeable material should rather be utilized for these purposes.
- The crossing of natural drainage systems should be minimized and only constructed at the shortest possible route, perpendicular to the natural drainage system. Where possible, bridge crossings should span the entire stretch of the buffer zone (see *Sensitivity Mapping Rules for Biodiversity Assessments* for buffer zone requirements).

Roads / Railways / Pipelines / Powerlines

- The appropriate agency should implement an ongoing monitoring and eradication programme for all invasive and weedy plant species growing within the servitude.
- Rehabilitation of natural vegetation should proceed in accordance with a rehabilitation plan compiled by a specialist registered in terms of the Natural Scientific Professions Act (No. 27 of 2003) in the field of Ecological Science.
- Any post-development re-vegetation or landscaping exercise should use species indigenous to South Africa. Plant species locally indigenous to the area are preferred. As far as possible, indigenous plants naturally growing along the route, but would otherwise be destroyed during construction, should be used for re-vegetation / landscaping purposes.
- Where a road / railway / pipeline/ powerline is to traverse a wetland, measures are required to ensure that the road / railway / pipeline/ powerline has minimal effect on the flow of water through the wetland, e.g. by using a high level clearspan bridge or box culverts rather than pipes.
- Prior to construction, fences should be erected in such a manner to prevent access and damage to any sensitive areas identified in a sensitivity mapping exercise (see *Sensitivity Mapping Rules for Biodiversity Assessments*).
- Sealing of surfaces under a bridge or gabion construction should be avoided.
- Disturbance to any wetlands during construction should be minimized. A plan for the immediate rehabilitation of damage caused to wetlands should be compiled by a specialist registered in accordance with the Natural Scientific Professions Act (No. 27 of 2003) in the field of Ecological Science. This rehabilitation plan should form part of the EMP and a record book should be maintained on site to monitor and report on the implementation of the plan.

The following recommended mitigatory measures apply to roads, railways and pipelines:

- Engineering measures are recommended to lower the risk of spillages into any wetlands located within 200m of the road/railway/pipeline.

The following recommended mitigatory measures apply to roads and railways:

- Appropriate road design and traffic control measures are recommended to reduce air pollution and animal mortality.
- All stormwater structures should be designed so as to block amphibian and reptile access to the road surface.
- A comprehensive surface runoff and stormwater management plan should be compiled, indicating how all surface runoff generated as a result of the road development (during both the construction and operational phases) will be managed (e.g. artificial wetlands / stormwater and flood retention ponds) prior to entering any natural drainage system or wetland and how surface runoff will be retained outside of any demarcated buffer/flood zones and subsequently released to simulate natural hydrological conditions. This plan should form part of the EMPr.
- Where roads/railways traverse streams/rivers, an underpass should provide for the movement of aquatic as well as terrestrial species through the inclusion of appropriate buffer zones within the underpass (a 32m buffer zone from the edge of the riparian zone recommended for rivers within urban areas and a 100m buffer zone from the edge of the riparian zone recommended for rivers outside urban areas).

- Suitable terrestrial underpasses should be provided to facilitate safe movement of animals, specifically where roads/railways traverse provincially important species/climate change corridors or ridges or habitat suitable for any Red/Orange List amphibian/ reptile/ mammal species. The number and spacing of underpasses will need to be determined by a specialist registered in accordance with the Natural Scientific Professions Act (No. 27 of 2003) in the fields of Ecological / Zoological Science. All underpasses should be dressed with a layer of sand (minimum 10cm), should be a minimum of 1.5m high and 1.0m wide so as to facilitate maintenance access and should be provided with small grates in the road surface to allow light penetration into the underpass. Underpasses should be accessible to maintenance staff and should be cleared of accumulated material at least at the start of each rainy season.
- A barrier (either prefab concrete wall or galvanized sheeting that extends as a continuous sheet above ground for at least 40cm and below ground for at least 30cm) that will physically block animals from accessing the road surface should be constructed for a distance of 200m on either side of all aquatic and terrestrial underpasses and at any point where roads are associated with suitable habitat for Grass Owls. Holes under barriers should be routinely filled in and areas directly adjacent to the barrier should be kept free of vegetation.
- Where roads are associated with suitable habitat for Grass Owls, road signs warning motorists to slow down on account of Grass Owls should be erected (in accordance with applicable legislation) and road margins should be regularly mowed to a distance of 5m from the hard edge of the road and/or regularly burned to prevent the accumulation of grass cover that could provide refuge for small mammals. In addition, a maximum speed limit of 60km/h should be enforced through the introduction of speed traps, rumble strips and speed bumps. Where a road-related mortality problem is encountered with other priority species, similar measures may be required.
- Where roads traverse natural corridors such as streams and ridges, traffic control measures are recommended (e.g. 60km/h speed limits, speed traps, rumble strips and speed bumps).
- Where roads are associated with powerlines and telephone lines (these provide an attraction for species that hunt from perches), road margins should be mowed and/or burned regularly to prevent the accumulation of grass cover that could provide refuge for small mammals.

The following recommended mitigatory measures only apply to powerlines / telephone lines / communication masts / cell phone towers:

- Where communication masts / cell phone towers / overhead lines (powerlines or telephone lines) are to be constructed within/adjacent to urban open space systems or within rural areas, a suitably qualified expert should advise on appropriate mitigatory measures.
- The design (including mitigation measures) and location of any proposed powerlines (whether new alignments or refurbishment/upgrading of existing lines) should be endorsed by a suitably qualified expert..
- Anti-collision devices such as bird flappers should be installed where powerlines cross corridors, rivers or ridges.

Directorate of Nature Conservation

Glencairn Building, Corner Eloff and Market Street, JOHANNESBURG
Postal Address: P.O. Box 8769, JOHANNESBURG, 2000
Tel (012) 328-5144 & Fax (012) 328-4125
Enquiries: Pieta.compaan@gauteng.gov.za

APPENDIX 1: MINIMUM REQUIREMENTS FOR SHAPEFILES

The Directorate of Nature Conservation requires that a shapefile be emailed to GDARD_BiodiversityInfo@gauteng.gov.za. The shapefile must be in the geographic (decimal degrees) coordinate system in the WGS84 datum, in other words, not projected e.g. to Transverse Mercator. If the shapefile received is not in this coordinate system, it will be sent back. It is essential that the shapefile contain at least the following three files having the same prefix, but different extensions:

- .shp – the file that stores the feature geometry (or the shape of the feature).
- .shx – the file that stores the index of the feature geometry.
- .dbf – the dBASE file that stores the attribute information of features.

When shapefiles are created using ESRI's ArcGIS software, a file with the following extension must also be included:

- .prj – the file that stores the coordinate system information. Before the shapefile is emailed to GDARD, please open this file (i.e. with Notepad), or check the shapefile's properties in ArcGIS, and make sure that the coordinate system is set to geographic, WGS84.

Optional extensions to include may be any of the following:

- .xml – the file that stores metadata (information about the data).
- .sbn and .sbx – the files that store the spatial index of the features.
- .fbn and .fbx – the files that store the spatial index of the features for shapefiles that are read-only.
- .ain and .aih – the files that store the attribute index of the active fields in a table or a theme's attribute table.

The collection of files should be treated as one file and should never be separated, or else the shapefile will be rendered unusable.

NB: Please note that a file with any of the following extensions is not a shapefile: .apr, .aep, .axl, .mxd. These are examples of map documents (commonly referred to as project files) created by different ESRI GIS software. Map document files only contain references to data stored on your hard disk and do not contain the data physically. Such a file cannot be opened without the accompanying shapefiles. GDARD only requires the shapefile, and not the map document.

For more information on GIS and how to create shapefiles, please contact Pieta Compaan (Pieta.Compaan@gauteng.gov.za) for a copy of *Introduction to GIS and Guidelines to create a shapefile using Diva-GIS Software. Version 1, 2008.*

AGRICULTURE AND RURAL DEVELOPMENT

Directorate of Nature Conservation

Glencairn Building, Corner Eloff and Market Street, JOHANNESBURG
 Postal Address: P.O. Box 8769, JOHANNESBURG, 2000
 Tel (011) 355-1894 & Fax (011) 355-1000
 Enquiries: lan.Engelbrecht@gauteng.gov.za

APPENDIX 2: SPECIES SPECIFIC INFORMATION FOR USE IN MEETING THE MINIMUM REQUIREMENTS FOR SURVEYS AND SENSITIVITY MAPPING RULES FOR INVERTEBRATES*

Species	Priority status	General Habitat Requirements	Distribution (approximate)	Appropriate sampling methods	Appropriate sampling period	Required sampling effort	Required corridor dimensions	Required buffer zones
<i>Lepidochrysops praeterita</i>	IUCN Red List	Grassland; Mostly Andesite/rocky ridges; 1600-1800m; Host: <i>Becium obovatum</i>	Gatsrant ridge system between Orange Farm and Potchefstroom	Netting	September - April	Minimum two sampling occasions of 4 hours each from 10h30-1400 in full sunshine	100m wide	200m wide within urban areas, 400m outside urban areas
<i>Chrysoritis aureus</i>	IUCN Red List	Grassland; Rocky ridge terrain; 1600-1700m; Aspect S/SW; Hosts: <i>Clutia pulchella</i> & <i>Crematogaster liengmeii</i>	Ventersdorp geology ridges between Heidelberg and Greylingstad	Netting	September - April,	Minimum two sampling occasions of 4 hours each in full sunshine	100m wide	200m wide within urban areas, 400m outside urban areas
<i>Ichneustoma stobbiai</i>	GDARD Priority Species/Qualifies for Red List Endangered: B1abii, iii, iv+2abii, iii, iv	Grassland; Flat and ridge terrain, Mostly associated with low koppies 1500-1900m; Mostly rocky sandy/loam terrain	Magaliesberg and other ridges in the northern parts of Gauteng	Netting; Digging for larvae	Netting – spring after first rains >25mm, Digging for larvae –	Netting: Minimum two sampling occasions of 1 hour each in full sunshine	100m wide	200m wide within urban areas, 400m outside urban areas

					February	Digging: 8 hrs per hectare		
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*The inclusion of this table as an appendix is intended to better facilitate updating of the information therein as research progresses. The parameters included here are derived from the best current knowledge available. Where no information is currently available on species specific spatial requirements, the precautionary principle supports the use of generic parameters. Should new information be presented and deemed scientifically sound these parameters will be adjusted accordingly. In order to ensure that the most current parameters are being applied to the species listed this table will be updated periodically.

Trapdoor Spider Sampling Effort Requirements:

Minimum pitfall trapping effort required is 4 x 48 hour active trapping sessions spread evenly over a four week period. Continuous trapping for a four week period is considered to meet this requirement.

Suggested search effort for trapdoor spiders atypids, ctenizids, cyrtauchenids, idiopids per habitat area HA:

1. for areas up to 7ha in extent, 1 full person-day's search
2. for areas 7 to 20ha in extent, 2 full person-day's search
3. for areas 20 to 50ha in extent, 3 full person-day's search
4. for areas 50 to 150ha in extent, 4 full person-day's search
5. for areas 150 to 400ha in extent, 5 full person-day's search
6. for areas 400 to 1000ha in extent, 6 full person-day's search

1 full person day = 7.5 actual search hours given breaks and interruptions this gives an 8.5 – 9 hour total working day

Suggestion effort for pitfall trapping of trapdoor and baboon spiders:

1. for areas up to 7ha in extent, 10 traps for 4 x 48 hours, 5 traps for 4-weeks continuous
2. for areas 7 to 20ha in extent, 15 traps for 4 x 48 hours, 7.5 traps for 4-weeks continuous
3. for areas 20 to 50ha in extent, 20 traps for 4 x 48 hours, 10 traps for 4-weeks continuous
4. for areas 50 to 150ha in extent, 25 traps for 4 x 48 hours, 12.5 traps for 4-weeks continuous
5. for areas 150 to 400ha in extent, 30 traps for 4 x 48 hours, 15 traps for 4-weeks continuous
6. for areas 400 to 1000ha in extent, 35 traps for 4 x 48 hours, 17.5 traps for 4-weeks continuous

A trap is defined as one capturing unit e.g. a plastic tub or bucket with a minimum diameter of 10cm, with drift fences in place.