

Mammal Baseline & Environmental Impact Assessment Study

Volspruit Mine

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for

EcoPartners

San Oosthuizen

san@ecopartners.co.za

by

Enviro-Insight CC

Luke Verburgt - *Pr.Sci.Nat.*

Samuel Laurence - *Pr.Sci.Nat.*

info@enviro-insight.co.za

+27 83 784 1997

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1 INTRODUCTION & PROJECT UNDERSTANDING

Enviro-Insight was requested to provide a suitably qualified mammal specialist to undertake a baseline mammal study with emphasis on three mammal species predicted to occur on site with a medium sensitivity (*Crociodura maquassiensis*, *Dasymys robertsii* and *Lycaon pictus*; Figure 1) and to perform an environmental impact assessment (EIA) for the proposed opencast Volspruit Mine.

Sensitivity	Feature(s)
High	Aves-Sagittarius serpentarius
Medium	Mammalia-Crociodura maquassiensis
Medium	Mammalia-Dasymys robertsii
Medium	Mammalia-Lycaon pictus
Medium	Sensitive species 12

Figure 1: Mammal species of conservation concern (SCC) expected to occur on the development site (reproduced from the screening tool report).

The study area is defined by the amended Volspruit Mining Right area (Figure 2) and its immediate surrounding area. It is comprised predominantly of critical biodiversity areas (CBA1) as indicated by the Limpopo Province Conservation Plan V2 (LCPv2, 2013¹) which was recently updated in 2018 (Figure 2). The closest major town is Mokopane and the study area falls in the Waterberg District Municipality of the Limpopo Province.

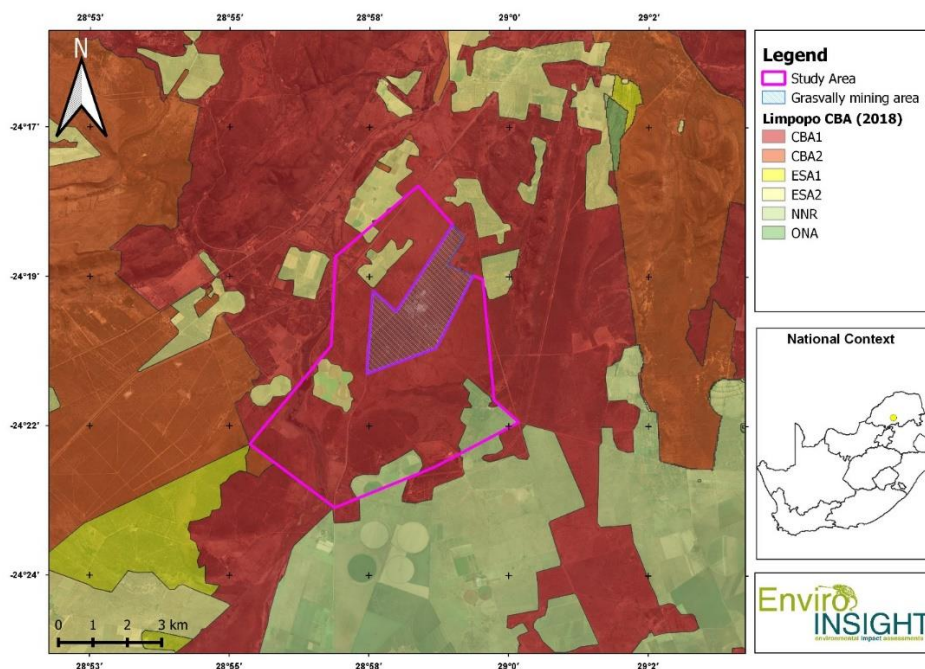


Figure 2: Location of the study area in relation to the Limpopo Province Conservation Plan V2.

¹ <https://bgis.sanbi.org/Projects/Detail/21>

The proposed mining infrastructure does not encompass the entire study area as shown in Figure 2 but is mostly restricted to the western and central portion of the study area. The exact location of the proposed infrastructure with labels indicating each component is provided in Figure 3.

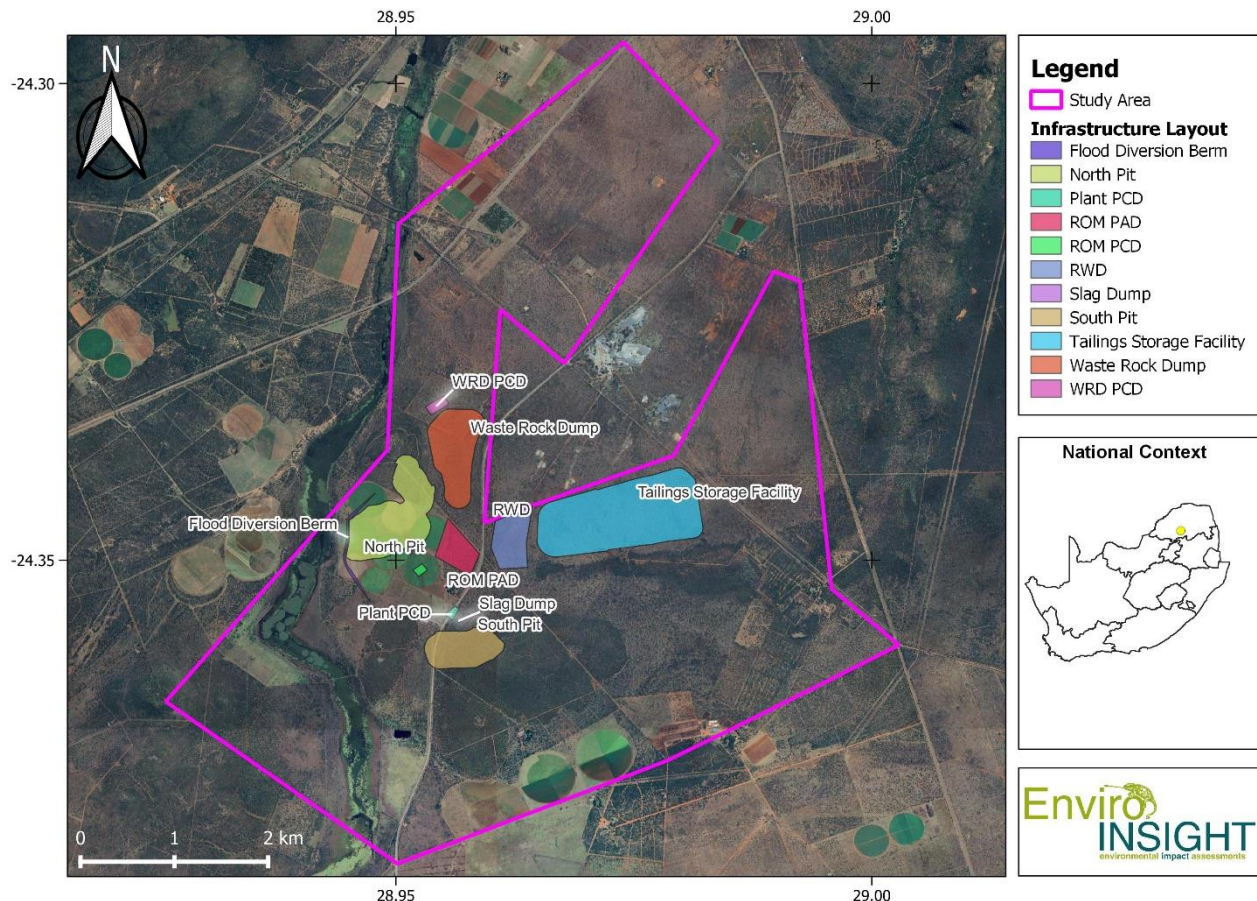


Figure 3: Proposed infrastructure layout within the study area.

2 APPROACH & METHODS

2.1 STUDY APPROACH

- Wild dogs (*Lycaon pictus*) are absent from the study area and surroundings. This species has only a single known free-roaming pack which is confined to the Waterberg²³ around the Entabeni Conservancy area (> 25 km from the study area) and which is regularly tracked and monitored through fitted VHF radio collars on two of the dogs. None of the landowners intersecting the study area have wild dogs on their properties. Consequently, a fieldwork assessment to determine the presence of the species within the study area is not required;

² <https://www.ewt.org.za/wp-content/uploads/2021/04/2021-Wild-Dog-brochure.pdf>

³ <https://endangeredwildlifetrust.wordpress.com/2018/06/01/protecting-the-last-free-roaming-wild-dogs-in-south-africa/>

- Both the Maquassie Musk Shrew (*Crocidura maquassiensis*; IUCN Vulnerable) and African Marsh Rat (*Dasymys robertsii*; IUCN Vulnerable) are strongly associated with wetlands (Taylor et al. 2016; Pilay et al. 2016).
 - The river, its floodplain and associated wetlands are considered sensitive and will be buffered from impacts associated with the proposed development on their own merit (see wetland report) and due to social considerations (farmers reliant on this resource), any impacts to the small mammal species of conservation concern will be mitigated as their primary habitat will remain intact and buffered from development infrastructure and associated impacts.
 - Both of these mammal species, and especially the Maquassie Musk Shrew are extremely difficult to locate/sample making the likelihood of successfully detecting them during a rapid faunal survey very low. Under such conditions the precautionary principle should be applied where it is assumed that both of these species are present in their preferred habitat and therefore, all suitable habitat within the study area would need to be buffered. As described below, this precautionary buffering has been applied.
 - If a fieldwork exercise involving trapping were to take place and both species were detected on site in their preferred habitat, the recommended mitigation measure would be to buffer their preferred habitat which is in no way different from applying the precautionary approach described above. Consequently, the specialists evaluated that there would be no value in performing a costly fieldwork assessment as the outcome would not differ from applying the precautionary approach and assuming that the species are present on site in their preferred habitat.

In summary, it was concluded that conducting fieldwork in order to appropriately assess and mitigate anticipated impacts from the proposed development on mammal species of conservation concern was unnecessary, as long as the precautionary approach was applied and the two SCC were both assumed to be present on site in their preferred habitat.

2.2 NATIONAL ENVIRONMENTAL SCREENING TOOL REPORTS

- In accordance with the terrestrial animal species protocol published in Government Notice No. 1150 of 30 October 2020, the National Environmental Screening Tool was consulted (December 2021) to provide a list of mammal species of conservation concern (MSCC) potentially affected by the proposed development.

2.3 LITERATURE REVIEW

- Relevant books and publications providing information on distribution ranges and/or conservation status of South African mammals were consulted to review the National Environmental Screening Tool predictions of mammal species of conservation concern (MSCC) occurrence in the mining right area.
- No relevant Biodiversity Management Plans for expected MSCC were identified.
- Mammal species nomenclature follows Child et al. (2016).
- The National Red List (Child et al. 2016)⁴ was utilised to provide the most current account of the conservation status of mammals in South Africa.
- Skinner & Chimimba (2005) and Stuart & Stuart (1998) were consulted in order to provide baseline ecological

⁴ <https://www.ewt.org.za/resources/resources-mammal-red-list/>

information to inform the conclusions regarding MSCC.

2.4 HABITAT CHARACTERISATION & MAPPING

Habitat suitability was confirmed from the habitat descriptions and photographs collected during the herpetofauna and avifauna surveys respectively performed by Luke Verburgt and Samuel Laurence. Vegetation units were mapped within the study area by Wetland Consulting Services (WCS). These mostly botanical delineations were converted to more structural habitat units of relevance for mammals, by the combination of certain vegetation units into a single macro-habitat. This process resulted in the identification of five structural habitat types, each of which are expected to have specific (albeit possibly overlapping) mammal communities.

2.5 ENVIRONMENTAL IMPACT ASSESSMENT

The methodology to assess environmental impacts was provided by Wetland Consulting Services (WCS). Each anticipated impact was evaluated according to its status, magnitude, extent, duration, and probability of occurrence. These evaluations were based on predefined categories associated with numerical scores as shown in Table 1. The impact significance was then calculated from the numerical scores as follows:

$$\text{Significance} = (\text{Magnitude} + \text{Duration} + \text{Extent}) \times \text{Probability}$$

The maximum value that can be reached through the described impact evaluation process is 100 SP⁵. The scenarios for each environmental impact were rated as High (SP $\geq$ 60), Moderate (SP 31-60) and Low (SP<30) significance as shown in Table 2.

Once the significance rating of an impact before mitigation has been determined, the reversibility of the impact, 'replaceability' of the affected resources and the potential of the impact to be further mitigated also need to be determined. These factors are explained in Table 3 below and play an important role in the determination of the level and type of mitigation performed or to be implemented. Table 3 sets out the criteria that should be used to assess the reversibility, loss of resources and potential for further mitigation.

Table 1: Impact assessment considerations and their associated categories and numerical scores

Status		
Positive	+	Impact will be beneficial to the environment (a benefit).
Negative	-	Impact will not be beneficial to the environment (a cost).

⁵SP: Significant Points.

Neutral	0	Where a negative impact is offset by a positive impact, or mitigation measures, to have no overall effect.
Magnitude		
Minor	2	Bio-physical and/or social functions and/or processes will remain unaltered.
Low	4	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced.
Moderate	6	Bio-physical and/or social functions and/or processes might be notably altered or enhanced.
High	8	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced.
Very high	10	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced.
Extent		
Site only	1	Effect limited to the site and its immediate surroundings.
Local	2	Effect limited to within 3-5 km of the site.
Regional	3	Activity will have an impact on a regional scale.
National	4	Activity will have an impact on a national scale.
International	5	Activity will have an impact on an international scale.
Duration		
Immediate	1	Effect occurs periodically throughout the life of the activity.
Short term	2	Effect lasts for a period 0 to 5 years.
Medium term	3	Effect continues for a period between 5 and 15 years.
Long term	4	Effect will cease after the operational life of the activity either because of natural process or by human intervention.
Permanent	5	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability of occurrence		
Improbable	1	Less than 30% chance of occurrence.
Low	2	Between 30 and 50% chance of occurrence.
Medium	3	Between 50 and 70% chance of occurrence.
High	4	Greater than 70% chance of occurrence.
Definite	5	Will occur, or where applicable has occurred, regardless or in spite of any mitigation measures.

Table 2. Definition of significance rating

Significance of predicted NEGATIVE impacts		
Low	0-30	Where the impact will have a relatively small effect on the environment and will require minimum or no mitigation. Ensure impact remains low through the application of appropriate mitigation measures where applicable.
Medium	31-60	Where the impact can have an influence on the environment and strict mitigation measures should be implemented to lower impacts and manage the project impacts appropriately
High	61-100	Where the impact will definitely influence the environment. Impact should be avoided as far as

		possible. Implement strict mitigation measures to account for residual impacts and must be mitigated, where possible.
Significance of predicted POSITIVE impacts		
Low	0-30	Where the impact will have a relatively small positive effect on the environment.
Medium	31-60	Where the positive impact will counteract an existing negative impact and result in an overall neutral effect on the environment.
High	61-100	Where the positive impact will improve the environment relative to baseline conditions.

Table 3: Additional considerations of each impact related to the reversibility of impact, irreplaceability of the resource being impacted and the potential for mitigation measures to be effective.

Reversibility of impact		
Reversible	1	The impact on natural, cultural and / or social structures, functions and processes is totally reversible.
Partially	2	The impact on natural, cultural and / or social structures, functions and processes is partially reversible.
Irreversible	3	Where natural, cultural and / or social structures, functions or processes are altered to the extent that it will permanently cease, i.e. impact is irreversible.
Irreplaceable loss of resources		
Replaceable	1	The impact will not result in the irreplaceable loss of resources.
Partially	2	The Impact will result in a partially irreplaceable loss of resources.
Irreplaceable	3	The impact will result in the irreplaceable loss of resources.
Potential of impacts to be mitigated		
High	1	High potential to mitigate negative impacts to the level of insignificant effects, or to improve management to enhance positive impacts.
Medium	2	Potential to mitigate negative impacts. However, the implementation of mitigation measures may still not prevent some negative effects.
Low	3	Little or no mechanism exists to mitigate negative impacts.

3 RESULTS

3.1 REVIEW OF NATIONAL ENVIRONMENTAL SCREENING TOOL LIST

The list generated (December 2021) by the National Environmental Screening Tool predicted the occurrence of three MSCC for the study area with Medium sensitivity⁶ (Figure 4). However, as discussed in 2.1 Study Approach, wild dogs (*Lycaon pictus*) are deemed to be absent from the study area and surroundings. This species would have historically occurred within the study area as the habitat is suitable but generations of hunting, persecution and predator proof fencing have resulted in only a single known free-roaming pack occurring outside of proclaimed conservation areas within South Africa.

⁶ Medium sensitivity is assigned by the screening tool for species that have not actually been observed in that habitat but which have been predicted to occur there through ecological niche modelling

Both the Maquassie Musk Shrew (*Crociodura maquassiensis*; IUCN Vulnerable) and African Marsh Rat (*Dasymys robertsii*; IUCN Vulnerable) are expected to occur in the wetland habitats of the study area (Taylor et al. 2016; Pilay et al. 2016).

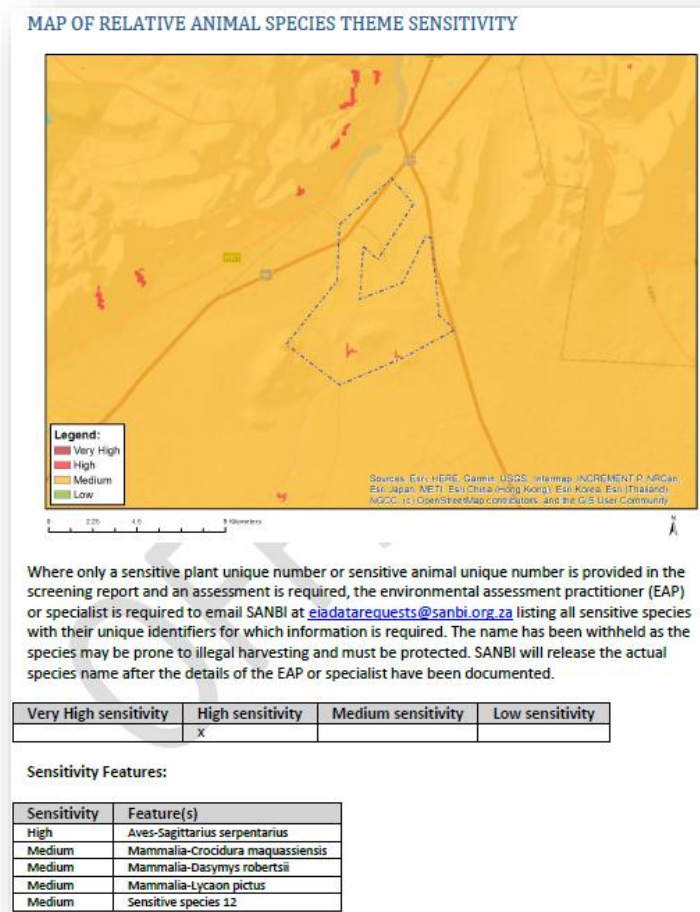


Figure 4: Screening Tool Report on the Animal Species Theme.

3.2 HABITAT SAMPLE SITES

Four of the 20 herpetofauna sample sites provide sufficiently detailed habitat descriptions and representative photographs to indicate habitat suitability for both the *Crociodura maquassiensis* and *Dasymys robertsii*. These habitat descriptions are provided in Appendix 1 (original herpetofauna sample site names retained) and locations are mapped in Figure 5.

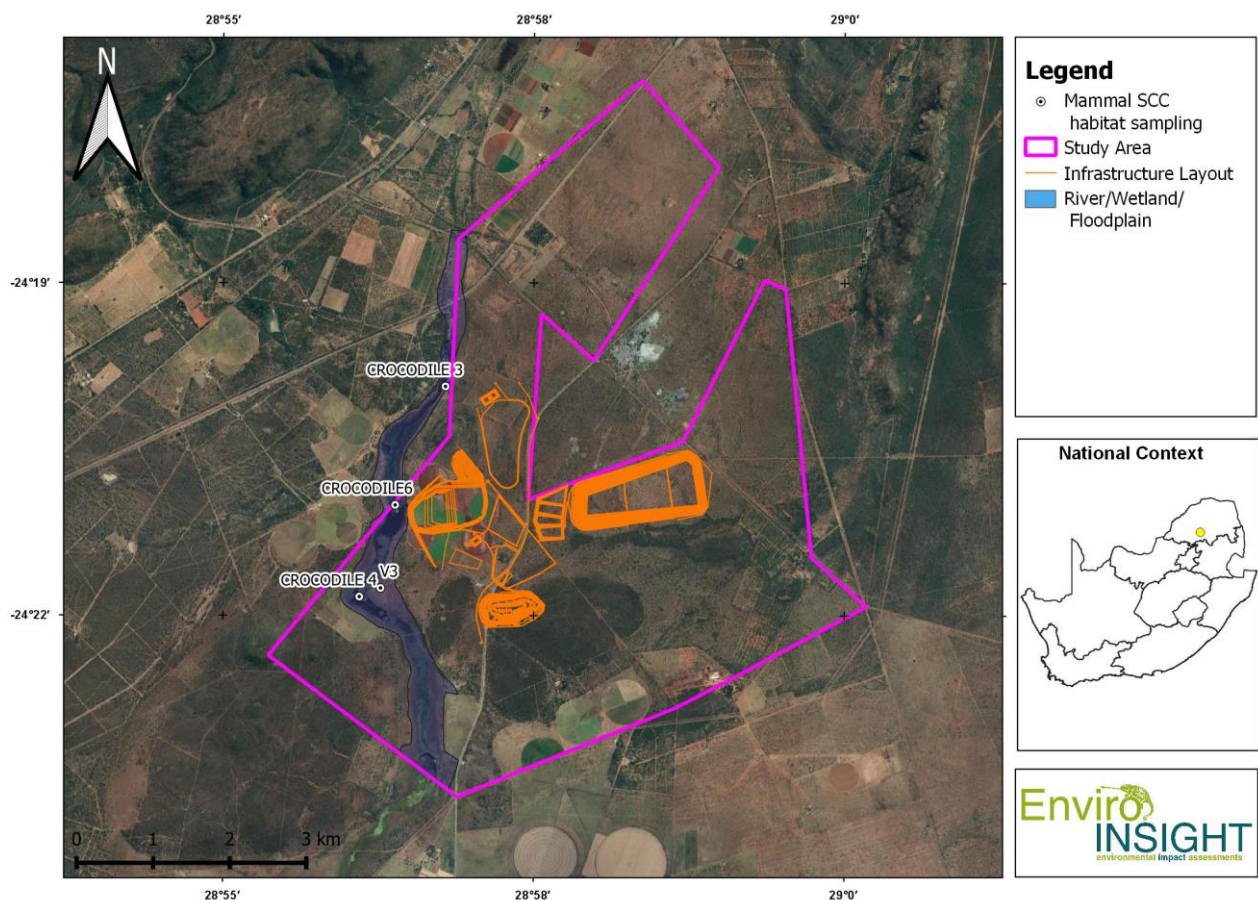


Figure 5: Mammal SCC samples sites and proposed infrastructure in relation to the study area.

3.3 MAMMAL SPECIES OF CONSERVATION CONCERN

3.3.1 Maquassie Musk Shrew (*Crocidura maquassiensis*; IUCN Vulnerable B2ab(ii,iii,iv))

This species has an extensive global distribution with an estimated extent of occurrence of 721,746 km² spanning South Africa, Swaziland and Zimbabwe (Cassola 2016). Although tolerant of a range of different habitats, this species is dependent on moist habitats such as montane grasslands, coastal forests and riparian or wetland areas. Consequently, Taylor et al. (2016) used wetlands as a proxy for suitable habitat when conducting the Red List assessment for this species. It follows therefore that such wetland habitat is likely to represent ideal conditions for this species and should be protected from degradation as indicated in Taylor et al. (2016).

This species is extremely difficult to trap/ sample (Taylor et al. 2016) rendering short term trapping exercises redundant and since this study area falls within the global range of the species, the precautionary principle is applied and it is assumed that the species is present in the wetland habitats within the study area.

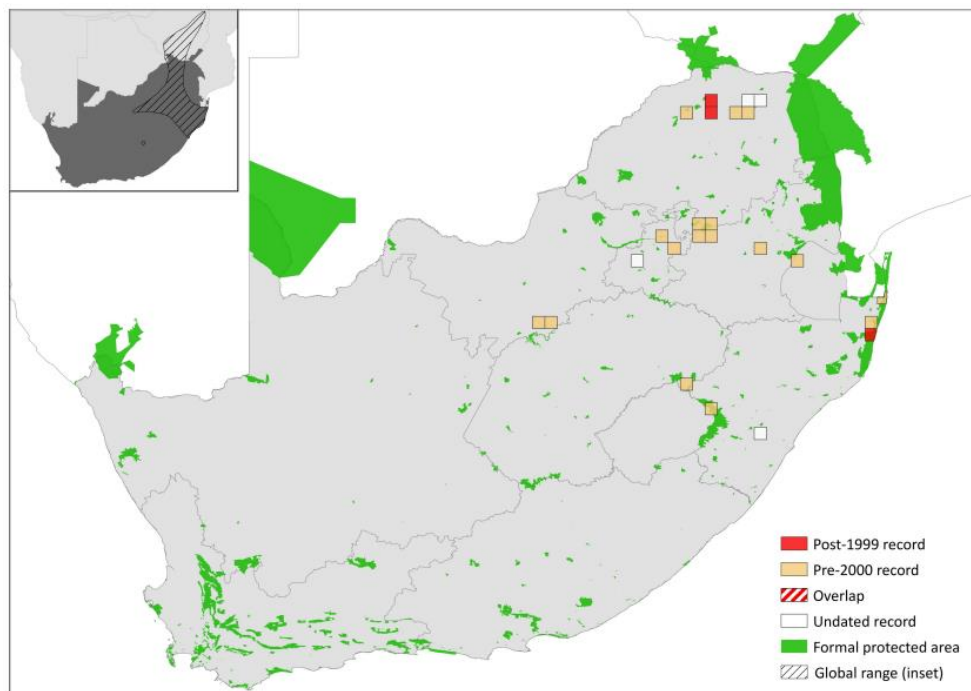


Figure 6: Distribution records in South Africa for Maquassie Musk Shrew (*Crociodura maquassiensis*) and global range [reproduced from Taylor et al. 2016].

3.3.2 African Marsh Rat (*Dasymys robertsii*; IUCN Vulnerable B2ab(ii,iii,iv))

All three members of the *Dasymys* genus, known as African Marsh Rats, are dependent on riparian and wetland ecosystems and do not tolerate habitat degradation (Pilay et al. 2016). They are not common and are thought to occur at relatively low densities in fragmented subpopulations. *Dasymys robertsii* is known from South Africa, Swaziland and Zimbabwe and has a relatively large global geographic distribution (Figure 7). The species is listed as being vulnerable to extinction due to the ongoing degradation, fragmentation and loss of suitable wetland habitat. Consequently, recommended mitigation and conservation actions are coupled with the prevention of any degradation of suitable wetland habitat as well as applying active restoration of degraded riparian vegetation while promoting connectivity between subpopulations (Pilay et al. 2016).

Since this study area falls within the global range of the species, the precautionary principle is applied and it is assumed that the species is present in the wetland habitats within the study area.

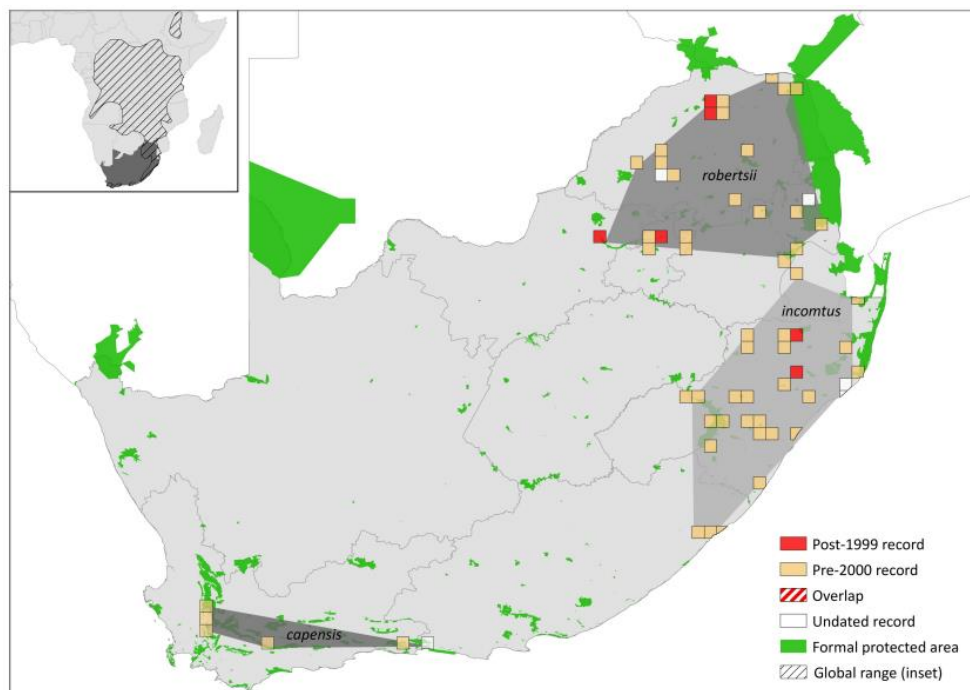


Figure 7: Distribution records in South Africa for African Marsh Rats (*Dasymys pp.*) and global range [reproduced from Pilay et al. 2016].

3.4 CURRENT IMPACTS

The current impacts observed on MSCC and their habitats were in relation to the riparian (wetland) habitat. Certain areas of the floodplain are mechanically mowed to facilitate grazing for ranched game (see V3 in Appendix), which likely alter habitat conditions for the anticipated MSCC and reduce habitat suitability. Furthermore, artificial damming of the river (see Crocodile6 in Appendix) may limit the extent of the riparian vegetation surrounding the impoundment during seasons with heavy rains, and therefore may limit/ reduce the available suitable habitat. Conversely however, smaller impoundments may promote the persistence of facultative riparian vegetation during seasons when there is drought. Finally, water abstraction from the artificial impoundments for agricultural purposes, affects the surface water levels and consequently, both the quantity and quality of the local riparian habitat conditions. In general however, the observed current negative impacts on the riparian/wetland habitats were not extensive or intensive enough to warrant major concern (low significance).

3.5 SITE ECOLOGICAL IMPORTANCE (SEI)

As described in the species protocol guidelines (SANBI 2020), Site Ecological Importance (SEI) is a “standardised metric for identifying site-specific ecological importance for species, in relation to a proposed project with a specific footprint and suite of anticipated activities”. SEI allows for rapid spatial inspection and evaluation of impacts of a proposed development within the context of on-site habitats and SCC, and also facilitates the integration of inputs from different specialist studies.

SEI was evaluated for each of the structural habitats mapped (Figure 5) in the study area, and the detailed evaluation is

presented in Table 5 below. The spatial representation of this SEI evaluation, with the application of buffers, is presented in Figure 8 and , from which can be seen that the proposed project infrastructure has minimal interaction with the High SEI and mostly interacts with the Medium SEI. Following final design of the infrastructure, an updated map showing the interaction between the finalized flood diversion berm, the northern pit and SEI was produced, WITH the inclusion of the 50 m wetland buffer (Figure 9). A loss of approximately 1 hectare (ha) of High SEI habitat is anticipated. Area calculations for the habitats and their assigned SEI are presented in Table 5.

Table 4: Mammal habitats, their surface area in the study area and their assigned site ecological importance (SEI).

Habitat	Area (ha)	Mammal SEI
Dense Combretum woodland	485.7	Low
Koppie	13.0	High
River/Wetland/Floodplain	200.8	High
Savanna	1672.4	Medium
Transformed/Degraded	926.8	Very Low
Wetland buffer (50 m)	31.5	High

Buffers

The species protocol guidelines (SANBI 2020) do not provide prescribed buffers around habitats utilised by mammal SCC, but rather require that such buffers are assessed on a project-by-project basis. For the two MSCC associated with the riparian/wetland habitats, buffers around the riparian/wetland habitats defined for appropriate wetland ecological function by the wetland specialist report (50 m; WCS) were utilised as these were considered to be sufficient for the MSCC (if the project maintained the primary habitat of the MSCC in good ecological function). Therefore, no additional mammal-specific buffers were applied and the 50 m buffer was included in the SEI evaluation as part of the riparian/wetland habitat.

Table 5: Evaluation of Site Ecological Importance (SEI) of mammal habitats in the study area. BI = Biodiversity Importance.

Habitat	Conservation Importance	Functional Integrity	Receptor Resilience	Site Ecological Importance
River/Wetland/Floodplain + 50 m buffer	High – Assumed occurrence (precautionary principle) of populations of threatened species (<i>Crocidura maquassiensis</i> and <i>Dasymys robertsii</i>), both of which are listed under Criterion B.	Very High - Very large (> 100 ha) intact area for any conservation status of ecosystem type, high habitat connectivity serving as functional ecological corridors, minimal current negative ecological impacts.	High - Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality.	HIGH (BI = Very High)
Savanna	Low - No confirmed or highly likely populations of	Very High - Very large (> 100 ha) intact area for any	Medium - Will recover slowly (~ more than	MEDIUM (BI = Medium)

Habitat	Conservation Importance	Functional Integrity	Receptor Resilience	Site Ecological Importance
	MSCC or range-restricted species.	conservation status of ecosystem type, high habitat connectivity serving as functional ecological corridors, minimal current negative ecological impacts	10 years) to restore > 75% of the original species composition and functionality	
Koppie	Low - No confirmed or highly likely populations of MSCC or range-restricted species.	High - Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type, only minor current negative ecological impacts.	Very Low - Habitat that is unable to recover from major impacts – complete functionality cannot be restored if excavations take place on the koppies habitat	HIGH (BI = Medium)
Transformed/Degraded	Very low - No confirmed or highly likely populations of MSCC or range-restricted species. No natural habitat remaining.	Very low - Several major current negative ecological impacts	Very High - Habitat that can recover rapidly	VERY LOW (BI = Very Low)
Dense <i>Combretum</i> woodland	Low - No confirmed or highly likely populations of SCC or range-restricted species.	Very High - Very large (> 100 ha) intact area for any conservation status of ecosystem type, high habitat connectivity serving as functional ecological corridors, minimal current negative ecological impacts	High - Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor.	LOW (BI = Medium)

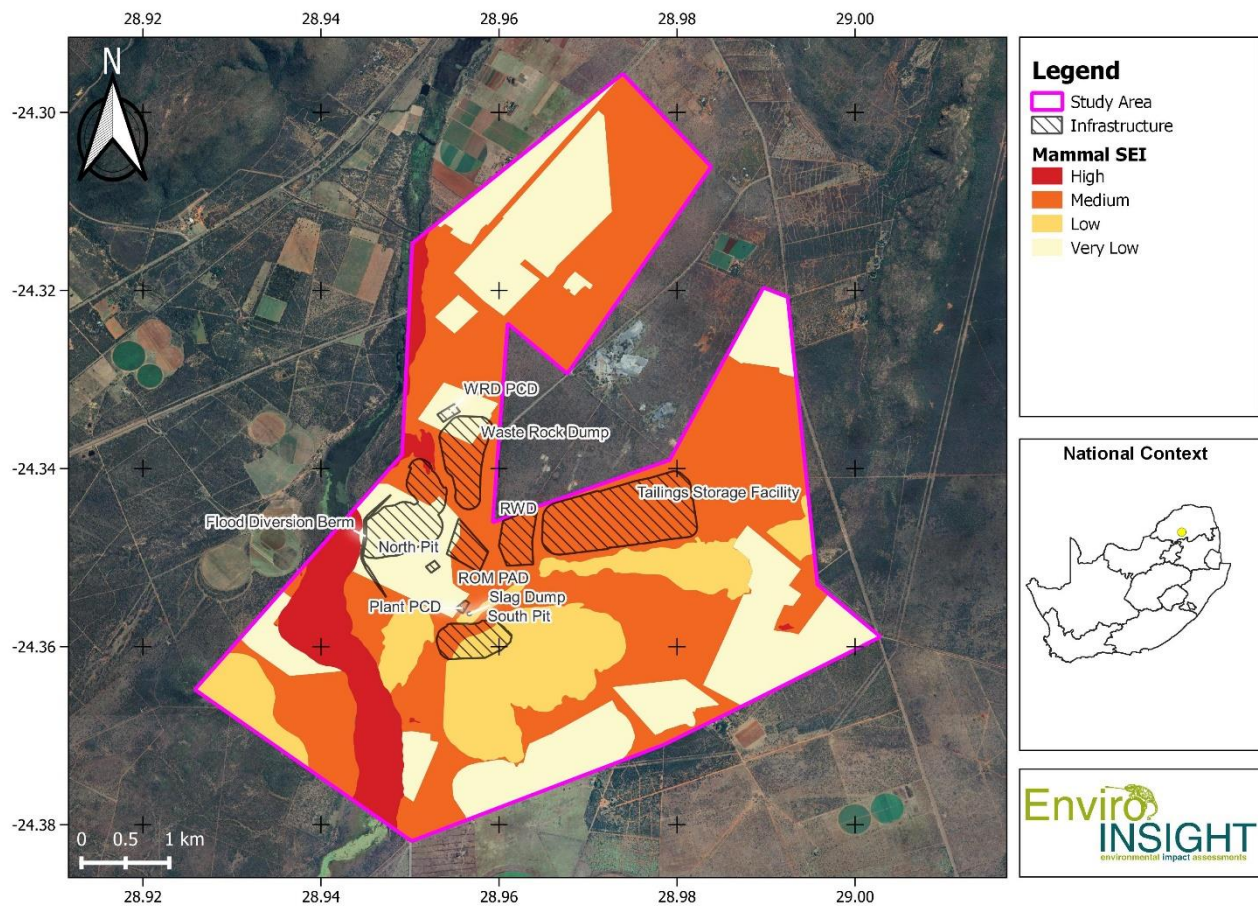


Figure 8: Mammal Site Ecological Importance (SEI) of the study area.

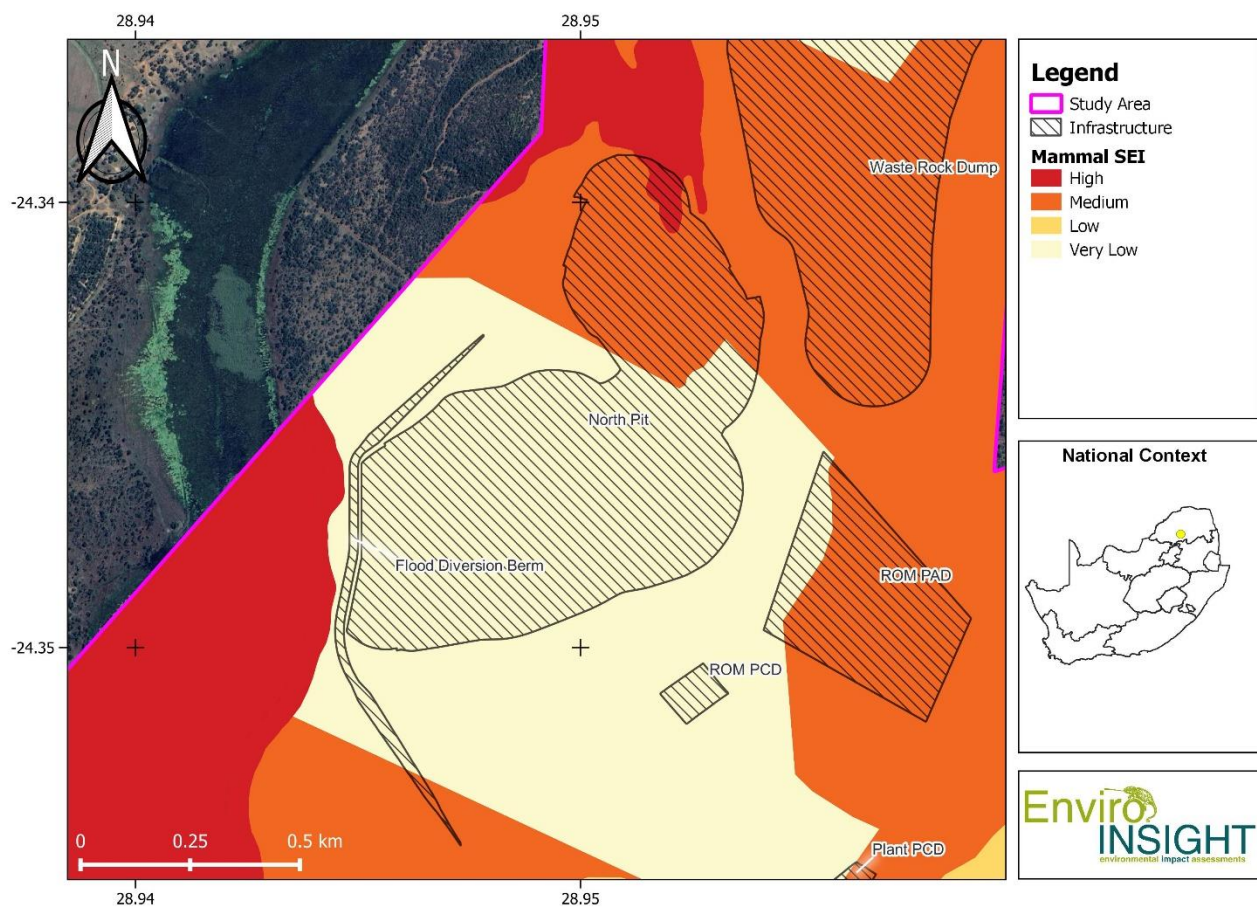


Figure 9: Mammal Site Ecological Importance (SEI) of the study area in relation to the finalized position of the flood diversion berm.

3.6 MAJOR ANTICIPATED IMPACTS TO MAMMAL SCC

A comprehensive environmental impact assessment (EIA) following the methodology set out in 2.5 Environmental Impact Assessment has been compiled and is presented in 3.7 Environmental Impact Assessment. The following represents a short discussion on the potential major impacts to mammals in relation to the site ecological importance evaluated above.

- Habitat loss & degradation - the northern pit and flood protection berm does not overlap with the High SEI habitats of the riparian/wetland (Figure 8, Figure 9). SANBI (2020) recommends avoidance mitigation wherever possible for High SEI areas, which has been applied here.

3.7 ENVIRONMENTAL IMPACT ASSESSMENT

The major anticipated impact to MSCC described above was evaluated according to the impact assessment methodology set out in 2.5 Environmental Impact Assessment and is presented in Table 6 along with proposed mitigation measures to avoid or minimise the anticipated impacts. From the context provided by Table 2, impacts are not considered to be of High significance following appropriate mitigation.

Table 6: Environmental impact assessment for potential impacts related to mammal species of conservation concern.

No.	Environmental Component	Potential Impact	Rating (prior to mitigation)								Proposed Mitigation Measures	Rating (post-mitigation)					
			Status	Magnitude	Extent	Duration	Probability	Significance	Reversibility	Irreplaceable loss of resources		Potential of impacts to be mitigated	Magnitude	Extent	Duration	Probability	Significance
CONSTRUCTION PHASE																	
1	Mammals	Habitat loss & degradation of river/riparian/wetland habitats and other High SEI habitats for mammals	-	6	2	4	5	60	1	2	1	High SEI Habitat destruction cannot be avoided by northern pit. All stromwater runoff into riverine ecosystem to be managed with silt traps and/or decontamination processes.	5	2	4	2	22
OPERATIONAL PHASE																	
1	Mammals	Habitat loss & degradation of river/riparian/wetland habitats and other High SEI habitats for mammals	-	6	2	4	5	60	1	2	1	High SEI Habitat destruction cannot be avoided by northern pit. All stromwater runoff into riverine ecosystem to be managed with silt traps and/or decontamination processes.	5	2	4	2	22
DECOMMISSIONING PHASE																	
1	Mammals	Habitat loss & degradation of river/riparian/wetland habitats and other High SEI habitats for mammals	-	6	2	3	2	22	1	2	1	High SEI Habitat destruction cannot be avoided by northern pit. All stromwater runoff into riverine ecosystem to be managed with silt traps and/or decontamination processes.	5	2	4	2	22

3.8 CUMULATIVE IMPACTS

The proposed development has the potential to contribute to and ultimately exacerbate the negative impacts already experienced by the riverine ecosystem. As described above in 3.4 Current Impacts, this ecosystem already experiences several negative impacts, predominantly from agriculturally related activities. The proposed activities from the mining development could contribute to these negative impacts placing further stress on this ecosystem if the potential negative impacts from these activities are not properly mitigated as recommended.

4 CONCLUSION

Both the Maquassie Musk Shrew (*Crocidura maquassiensis*; IUCN Vulnerable) and African Marsh Rat (*Dasymys robertsii*; IUCN Vulnerable) are considered (under the precautionary principle) to occur within the river/riparian/wetland habitats in the study area. The presence of these species elevates the site ecological importance (SEI) of the river/riparian/wetland habitats to HIGH. Habitats with a High SEI should be avoided by development infrastructure and activities (SANBI 2020). Unfortunately, the northern pit intersects with these habitats. Since appropriate avoidance will not be possible due to the location of the resource, extra care will be required to ensure that no impacts occur the remainder of the High SEI habitats outside of the pit areas. It is not necessary to monitor the mammals specifically but rather the wetland water quality and other habitat parameters should serve as guidance for when mitigation measures must be implemented and/or the calculation of habitat loss due to an operational error/accident. Any pollution and degradation to the wetland habitat west of the flood diversion berm could be of significance, as it has the potential to influence a very large area downstream and hence the added care and increased frequency of monitoring that must be implemented to avoid this scenario. With

minimisation mitigation applied as discussed above (Table 6), all impacts on MSCC are expected to be of low significance. A monitoring plan is not recommended because of the low likelihood of trapping success related to the MSCC. Instead, monitoring activities should focus on the habitat itself, as recommended in the wetland report (WCS).

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6 APPENDIX

Appendix 1: Habitat descriptions of herpetofauna sample sites that have relevance to the mammal species of conservation concern (rivers, floodplains, wetlands).

V3 23/11/2021 14:48:22 -24.3567074° 28.9402912°	Habitat Description Open grassy floodplain (mowed) bordered by reeds (river) and woodland fringe. Survey Conditions Not fully surveyed, just habitat evaluation.
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CROCODILE 4

23/11/2021 14:52:45

-24.3576992°

28.9375545°

Habitat Description

Recently filled pan in river drainage area. Insufficient to support crocodiles.

Survey Conditions

Cool but not cold, no breeze. Only a single frog species calling



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CROCODILE6 23/11/2021 16:17:05 -24.3467105° 28.9421206°	Habitat Description Artificial impoundment in the Nyl River forming only long-term standing water in the area. Survey Conditions Warm, slight breeze, dark. Ideal. Relatively low levels of activity. Nocturnal Survey? Yes	 Click to view original file
 Click to view original file		 Click to view original file
CROCODILE 3 24/11/2021 11:09:41 -24.332509° 28.9486009°	Habitat Description Artificially dammed section of river. Two different waterbodies. Presence of <i>Cyprus</i>. Very shallow, not suitable for crocodiles. However, definitely has barbel and at least one other fish species in the upstream pond, indicating near permanence of this waterbody. Survey Conditions Cool (but not cold) and quite windy. Frog activity very good, but few species.	 Click to view original file

Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za



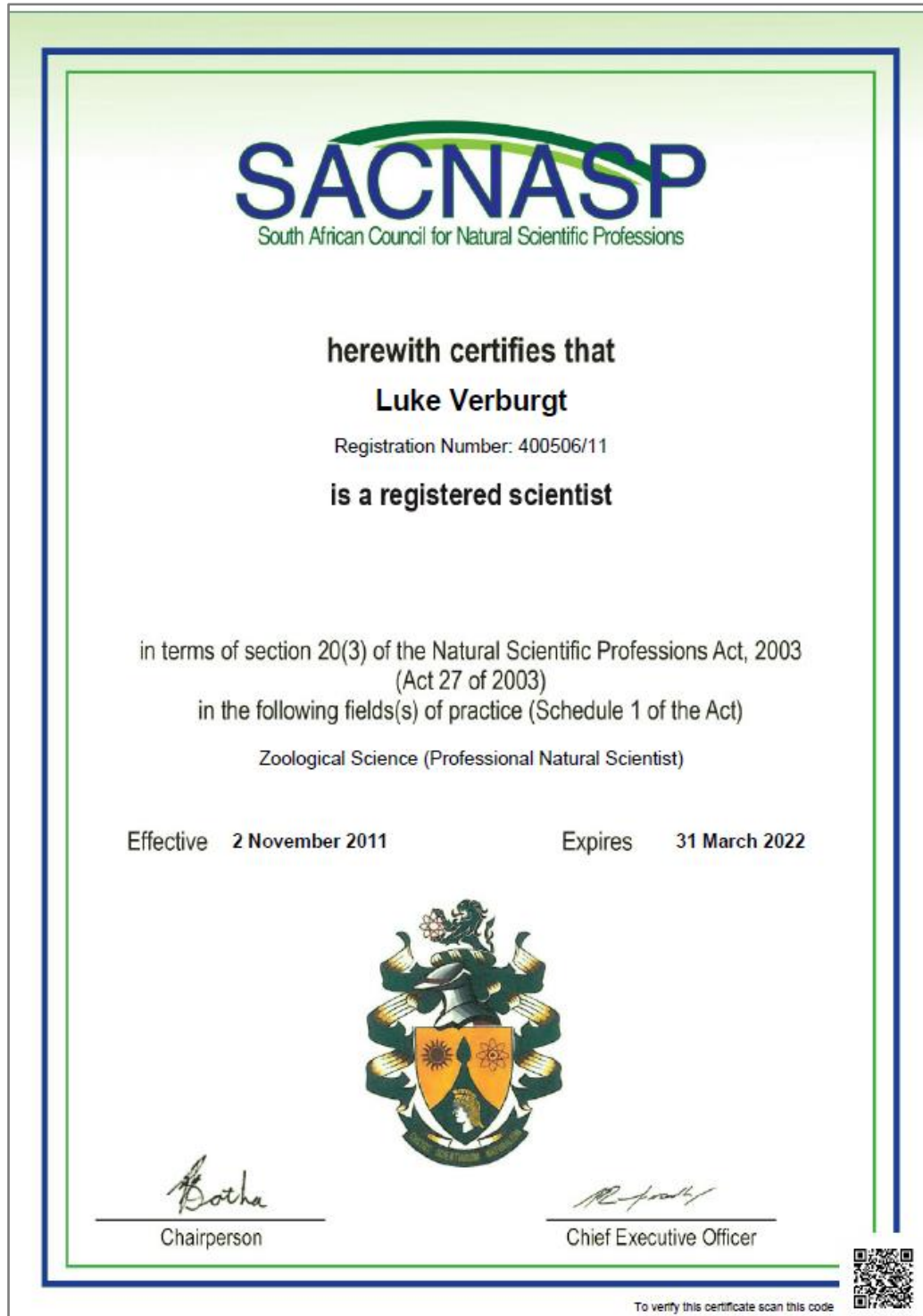
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7 QUALIFICATIONS AND CV

7.1 LUKE VERBURGT



Personal details

Full Name Luke VERBURGT
DOB 31 March 1977
Nationality South African
Marital Status Married
Email luke@enviro-insight.co.za
Phone +27 083 784 1997
ID number 770331 5171084

Education

Completed Degree and Institution

1994 Matric, Pietersburg Hoërskool, Polokwane, South Africa
1999 BSc in Zoology, University of Pretoria, Pretoria, South Africa
2002 BSc (Honours) in Zoology, University of Pretoria, Pretoria, South Africa
2006 MSc in Zoology (Evolutionary Biology, Behaviour, Bioacoustics), University of Pretoria, Pretoria, South Africa.

Memberships & Certificates

SACNASP registration for Zoological Science (member # 400506/11)
Herpetological Association of Africa (HAA)

Other Training

Course in Ecological Niche Modelling, University of Pretoria, 2008
IUCN Workshops: Evaluation of conservation status and protected area analysis for South African Reptiles. SANBI, Cape Town, 2017
Key Biodiversity Areas Workshops: Evaluation of KBA's in Mozambique through the Wildlife Conservation Society and IUCN, 2019

Highlighted relevant experience

19 years of experience performing EIA across 20 countries in Africa.

Lead author of the Guidelines for the application of the Species Protocols during environmental authorisation in South Africa (SANBI 2020)

Member of the species specialist panel for the IUCN Red List assessment of South African Reptiles

Publications & Contributions

Pietersen D.W., Verburgt L. & Davies, J.P. 2020. Field Guide to Snakes and other Reptiles of Zambia and Malawi. Struik Nature Field Guides.

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northeastern Mozambique. Zootaxa 4379(2) 177-198.

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Gryllodes sigillatus. African Zoology. 40:323-326

Employment & work-related experiences

2009 - present Co-Director and Co-Owner of Enviro-Insight CC, Ecologist, Lead-Herpetologist and GIS specialist.
2007 - present Scientific Collaborations, University of Pretoria
2006 - present Software development, database management, web-design
2005 - present Co-supervisor, University of Pretoria
2001-2010 Demonstrator and Lecturer, University of Pretoria
1995-1995 Project Assistant, Blouberg Conservation Project

Key areas of expertise

Herpetological Assessments and Survey, Environmental Impact Assessments, Biodiversity and Ecological Assessments, Environmental Management and Monitoring Plans, GIS mapping, Spatial analyses, Software Development, Statistics, Health and Safety Training, Project Management

Language skills

Language	Speaking	Reading	Writing
English	Excellent	Excellent	Excellent
Afrikaans	Good	Fair	Basic
Portuguese	Basic	Basic	None
German	Fair	Fair	None
Northern Sotho	Basic	None	None

References

Prof, JWH Ferguson, willemferguson@zoology.up.ac.za
Prof, AE McKechnie, aemckechnie@zoology.up.ac.za
Prof, CT Chimimba, ctchimimba@zoology.up.ac.za

Project Experience

For further details please contact me directly: luke@enviro-insight.co.za

Time span	Nature of project	Capacity	Industry / Sector	Client / Developer	Country (Province)
2020	Herpetofauna Survey & High Conservation Value Assessment	Herpetologist	Forestry / Plantation	HCV Africa / Socapalm	Sao Tome & Principe
2020	Herpetofauna Survey & Environmental Impact Assessment	Herpetologist	Mining / Copper	Managem	Morocco
2020	Mozambique onshore environmental monitoring – palma sand skink Survey	Herpetologist	Oil & Gas	Total / SLR	Mozambique (Cabo Delgado)
2020	Herpetofauna Survey & High Conservation Value Assessment	Herpetologist	Forestry / Plantation	HCV Africa / Socapalm	Cameroon (Douala)
2020	Letseng Monitoring	Herpetologist	Mining / Diamonds	Bathusi / Letseng Diamonds	Lesotho
2019	Herpetofauna Survey & High Conservation Value Assessment	Herpetologist	Forestry / Agriculture	HCV Africa / Socapalm	Ivory Coast (Bas-Sassandra)
2019	Herpetofauna Survey & High Conservation Value Assessment	Herpetologist	Forestry / Agriculture	HCV Africa / Socapalm	Cameroon (Douala)
2019	Herpetofauna Survey & Environmental Impact Assessment (Wet Season Fieldwork)	Herpetologist	Mining / Metals	HCV Africa / Pensana Metals	Angola (Huambo)
2019	Environmental and Social Impact Assessment Report	Senior Specialist	Transport / Rail	ERM / Yapi Merkezi	Tanzania
2019	Herpetofauna Survey	Herpetologist	Forestry / Plantation	Merensky	South Africa (Limpopo)
2019	Rehabilitation Study (Herpetofauna)	Herpetologist	Mining / Coal	EkolInfo / AngloAmerican	South Africa (Mpumalanga)
2018	GIS Least Cost Road Model	GIS Specialist	Mining / Gold	Avesoro	Liberia (Grand Cape Mt)
2018	Environmental Impact Assessment	Herpetologist	Agriculture	Montrose	Angola (Cabinda)
2018	Environmental Impact Assessment	Herpetologist	Agriculture	Montrose	Angola (Huambo)
2018	Environmental Impact Assessment	Herpetologist	Agriculture	Montrose	Angola (Kwanza Sul)
2018	Environmental Impact Assessment	Herpetologist	Agriculture	Montrose	Angola (Lunda Sul)
2018	Mining Application Process / EIA	Herpetologist	Mining / Coal	Insa Coal	South Africa (Gauteng)
2018	Faunal baseline and Impact Assessment	Ecologist & GIS specialist	Transport / Pipeline	Advisian	South Africa (Western Cape)

Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za

2018	Monitoring - Sebenza and Prospect	Project Manager	Electricity / Power Stations	Eskom / City Power	South Africa (Gauteng)
2018	GIS Least Cost Road Model	GIS Specialist	Mining / Gold	Avesoro	Liberia (Grand Cape Mt)
2018	Ecological & Ridge Delineation Assessment	Herpetologist & GIS specialist	Development	HES - Henwood Environmental Solutions	South Africa (Gauteng)
2018	Invasive Species Assessment	Herpetologist	Municipality	Sazi / City of Johannesburg	South Africa (Gauteng)
2018	Biodiversity Study (Silver Hills)	Herpetologist	Mining / Gold	Avesoro	Liberia (Grand Cape Mt)
2018	Biodiversity Study (Sarama)	Herpetologist	Mining / Gold	Avesoro	Liberia (Grand Cape Mt)
2018	Mining Application Process / EIA	Herpetologist	Mining / Coal	Insa Coal	South Africa (Gauteng)
2018	Faunal baseline and Impact Assessment	Herpetologist	Transport / Pipeline	Advisian	South Africa (Western Cape)
2018	Behavioral Ecology Research on Snake repellent	Supervisor	Science / Research	University of Pretoria / private	South Africa (Limpopo)
2018	Biodiversity Offset Plan (New Liberty)	Ecologist & GIS Specialist	Mining / Gold	Avesoro	Liberia (Grand Cape Mt)
2018 - 2017	Herpetological Study (Prieska)	Herpetologist	Mining / Copper	Ecorex	South Africa (Northern Cape)
2018 - 2017	Faunal baseline and Impact Assessment (Saldanha)	Ecologist	Transport / Pipeline	Advisian	South Africa (Western Cape)
2018 - 2015	Database & Software Development for Marion Island Marine Mammal Programme	Programmer / Developer	Science / Research	University of Pretoria / Marion Island Marine Mammal Programme	South Africa (Marion Island)
2017	Herpetological Survey (Buffelskloof)	Herpetologist	Science / Research	BKNR / private	South Africa (Mpumalanga)
2017	Environmental Impact Assessment (Koulekoun & Kodiaran)	Herpetologist	Mining / Gold	Ecorex / Tri-K	Guinea (Kankan)
2017	Scoping (Weaju)	Ecologist	Mining / Gold	Aureus / Avesoro	Liberia (Grand Cape Mt)
2017	Herpetofauna Monitoring (Woodbush)	Herpetologist	Forestry / Plantation	Komatiland	South Africa (Limpopo)
2017	Environmental Impact Assessment (Majama Mine)	Herpetologist	Mining / Coal	Geo-Consult International	South Africa (Limpopo)
2017	Basic Assessment Kuruman (Red Sands)	Ecologist	Development / Filling Station	Midturon Information Consultants	South Africa (Northern Cape)
2017	Herpetological Monitoring (Letseng Mine)	Herpetologist	Mining / Diamonds	Riaan / Letseng Diamonds	Lesotho (Mokhotlong District)

Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za

2017	Environmental Impact Assessment (Pavua)	Ecologist	Dam / Hydro-electric	TBC / Mott McDonald	Mozambique (Sofala)
2017	Basic Assessment (Knopjeslaagte)	Ecologist	Development	Nali / Mitrajaya Development	South Africa (Limpopo)
2017	Environmental Impact Assessment (Skurvekop)	Herpetologist	Mining / Coal	TBC / Exxaro	South Africa (Mpumalanga)
2017 - 2016	Environmental Impact Assessment (dual season)	Herpetologist	Mining / Gold	Aureus	Liberia (Grand Cape Mt)
2016	Environmental Impact Assessment (Inhassoro)	Herpetologist	Development / Industrial	Sasol / Golder / Mark Wood Consultants	Mozambique (Inhambane)
2016	Walkdown (Zonderwater)	Herpetologist	Mining / Iron Ore	Ekolno / Exxaro	South Africa (Limpopo)
2016	Environmental Impact Assessment	Herpetologist	Dam / Hydro-electric	Mott MacDonald	Mozambique (Inhambane)
2016	Sasol REIA Ecology	Herpetologist	Oil & Gas / Development	ERM	Mozambique (Inhambane)
2016	Angola - Okavango Wilderness Project (2 expeditions)	Herpetologist	Science / Research	National Geographic	Angola (Moxico)
2016	Rhino Oil & Gas - GIS project	GIS Specialist	Oil & Gas / Development	TBC / Rhino Oil & Gas	South Africa (EC, KZN, MPU, GAU)
2015	Environmental Impact Assessment	Herpetologist	Mining / Uranium & Molybdenum	TBC / Ferret	South Africa (Western & Eastern Cape)
2015	Marion Island site visit for Database & Software Development	Programmer / Developer	Science/Research / Software Development	University of Pretoria / Marion Island Marine Mammal Programme	South Africa (Marion Island)
2015	Environmental Impact Assessment (dual season)	Herpetologist	Mining / Gold	Aureus	Liberia (Grand Cape Mt)
2015	Gap Analysis	Herpetologist	Mining / Gold	Aureus	Liberia (Grand Cape Mt)
2015	Ecological Constraints Mapping	Ecologist	Mining / Oil & Gas	Anadarko	Mozambique (Cabo Delgado)
2015	Critical Habitat Evaluation	Ecologist	Mining / Oil & Gas	Anadarko	Mozambique (Cabo Delgado)
2015	Monitoring - Terrestrial Fauna & Flora	Fauna specialist & Ecologist	Mining / Coal	Golder Associates / Rio Tinto Mozambique	Mozambique (Tete)
2015	Rapid Grassland Assessment	Ecologist	Development	Bokamoso	South Africa
2015	Research Platysaurus lizards	Herpetologist	Research / Taxonomy	n/a	South Africa (Limpopo)
2014	Biodiversity Assessment with EIA	Herpetologist	Transport / Port & Rail	Impacto / Italhai	Mozambique (Zambezia & Tete)

Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za

2014	Biodiversity Assessment	Ecologist	Development / Farming	Red Ant	South Africa (Gauteng)
2014	Environmental Impact Assessment - Update & Expansion	Herpetologist	Mining / Oil & Gas	Impacto & RS2 / Anadarko	Mozambique (Cabo Delgado)
2014	Flora & Fauna Biodiversity Assessment	Ecologist		Impacto / Kingho	Mozambique (Tete)
2014	Biodiversity Assessment (dual season)	Herpetologist	Mining / Iron Ore	EkolInfo / Exxaro	South Africa (Limpopo)
2013	Biodiversity Assessment	Herpetologist	Mining / Coal	EkolInfo / Exxaro	South Africa (Mpumalanga)
2013	Flora & Fauna Biodiversity Assessment with EIA	Ecologist	Development / Industrial	Worley Parsons / ArcelorMittal	South Africa (Western Cape)
2013	Biodiversity Assessment	Herpetologist	Mining / Coal	EkolInfo / Coffey Mining	Mozambique (Tete)
2013	Biodiversity Assessment	Herpetologist	Development / Housing	EkolInfo	South Africa (Gauteng)
2013	Environmental Management Plan & Tree marking & Walkdown	Ecologist	Energy / Transmission	Baagi / ESKOM	South Africa (Northern Cape)
2013	Flora & Fauna Biodiversity Assessment with EIA	Herpetologist	Agriculture / Forestry	Impacto / Portucel	Mozambique (Zambezia & Manica)
2013	Bullfrog survey with EIA & recommendations for tailings storage facility	Herpetologist	Mining / Platinum	Prescali	South Africa (North-West)
2013	Flora & Fauna Biodiversity Assessment with EIA	Herpetologist & Mammalogist / Fauna specialist	Agriculture / Sugarcane	Impacto / MAI	Mozambique (Gaza)
2013	Environmental Impact Assessment - Update & Expansion	Herpetologist	Mining / Oil & Gas	Impacto & RS2 / Anadarko	Mozambique (Cabo Delgado)
2013 - 2012	Environmental Impact Assessment (dual season)	Herpetologist	Mining / Iron Ore	ERM / Western Cluster Limited	Liberia (Bomi County or Grand Cape Mt)
2012	Biodiversity Assessment	Herpetologist	Mining / Coal	EkolInfo / Coffey Mining	Mozambique (Tete)
2012	Biodiversity Assessment	Ecologist	Development / Housing	Stefan Frylinck & Associates	South Africa (Mpumalanga)
2012	Flora & Fauna Biodiversity Assessment with dual season EIA	Herpetologist	Mining / Iron Ore	EkolInfo / Exxaro	South Africa (Limpopo)
2012	Biodiversity Assessment (Carolina)	Herpetologist	Mining / Coal	Borent / Exxaro	South Africa (Mpumalanga)
2012	Biodiversity Assessment (New Castle)	Herpetologist	Mining / Coal	Borent / Exxaro	South Africa (Kwa-Zulu Natal)
2012	Flora & Fauna Biodiversity Assessment with dual season EIA	Herpetologist	Mining / Oil & Gas	Impacto & ERM / Anadarko	Mozambique (Cabo Delgado)

2012	Health & Safety Service - Container clearing	Herpetologist	Mining / Oil & Gas	Anadarko	Mozambique (Cabo Delgado)
2012	Environmental Impact Assessment (single season)	Herpetologist	Mining / Infrastructure	ERM / China Union	Liberia (Bong County)
2012	Scoping Assessment	Herpetologist	Mining / Iron Ore	ERM / China Union	Liberia (Bong County)
2012	Environmental Training - Venomous Snakes	Course Presenter	Education & Training	Geo Pollution Technologies	South Africa (Gauteng)
2012	Python Scoping	Herpetologist	Development	Pachnoda	South Africa (Gauteng)
2011	Scoping Assessment for EIA	Herpetologist	Mining / Coal	EkolInfo / Anglo Coal	South Africa (Limpopo)
2011	Environmental Impact Assessment (single season)	Herpetologist	Mining / Iron Ore	Pachnoda / Aquila Steel	South Africa (Limpopo)
2011	Flat Lizard Research project	Herpetologist	Research / Taxonomy	Macquarie University Australia / M. Whiting	South Africa (Limpopo)
2011	Faunal Assessment with dual season EIA	Herpetologist	Mining / Coal	Impacto / Ncondezi	Mozambique (Tete)
2011	Aerial Ecological Survey	Ecologist	Energy / Transmission	Promap / Madagascar Government	Madagascar (Toamasina / Antananarivo)
2011	Flora & Fauna Biodiversity Assessment with EIA	Herpetologist	Mining / Coal	Rural Maintenance / Malawi Government	Malawi (Northern)
2011	Faunal Assessment with EIA	Herpetologist	Hydrology / Water security	Impacto / Moamba Major Damming Project	Mozambique (Maputo)
2011	Flora & Fauna Biodiversity Assessment with EIA	Fauna specialist & Ecologist	Mining / Coal	Impacto / Jindal	Mozambique (Tete)
2011	Flora & Fauna Biodiversity Assessment with dual season EIA	Herpetologist	Mining / Oil & Gas	Impacto & ERM / Anadarko	Mozambique (Cabo Delgado)
2011	Flora & Fauna Biodiversity Assessment - dual season EIA	Herpetologist	Mining / Coal	EkolInfo	South Africa (Mpumalanga)
2011	Site Selection Assessment & Scoping	Ecologist	Mining / Oil & Gas	Impacto & ERM / Anadarko	Mozambique (Cabo Delgado)
2011	Flora & Fauna Biodiversity Assessment - dual season EIA	Herpetologist	Mining / Coal	EkolInfo	South Africa (Mpumalanga)
2011 - 2010	Environmental Training - Dangerous Game & Venomous Snakes	Course Presenter	Energy / Education & Training	Endangered Wildlife Trust (EWT) / ESKOM	South Africa (Throughout)
2011 - 2010	Flora & Fauna Biodiversity Assessment (dual season)	Herpetologist	Energy / Hydroelectricity	Impacto / Mozambique Government	Mozambique (Tete)
2010	Python Scoping & Vegetation Functionality	Herpetologist	Agriculture / Livestock	AGES	South Africa (Gauteng)

Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za

2010	Python Scoping	Herpetologist	Development / Housing	AGES	South Africa (Gauteng)
2010	Health & Safety Service - Snake removal	Herpetologist	Energy / Health & Safety	ESKOM	South Africa (Gauteng)
2010	Monitoring	Assistant Mammalogist	Mining / Coal	Impacto / VALE	Mozambique (Tete)
2010	Monitoring	Herpetologist	Research / Biodiversity	University of Pretoria / CEFS	South Africa (Gauteng)
2010	Flora & Fauna Biodiversity Assessment with EIA	Herpetologist	Energy / Hydroelectricity	Rural Maintenance / Malawi Government	Malawi (Northern)
2009	Herpetofauna bio-survey on Dronfield, Benfontein & Rooipoort	Herpetologist	Development / Conservation	De Beers	South Africa (Northern Cape)
2009	Python Scoping	Herpetologist	Development / Agriculture	Ekolnfo	South Africa (Gauteng)
2008	Herpetofauna bio-survey on Tswalu Kalahari Reserve	Herpetologist	Development / Conservation	De Beers	South Africa (Northern Cape)
2007	Herpetology Specialist Study	Herpetologist	Mining / Coal	Ferret & Environmental Services / Borent	South Africa (Western & Eastern Cape)
2007	Herpetology Specialist Study	Herpetologist	Mining / Coal	Ferret & Environmental Services / Borent	South Africa (Mpumalanga)
2007	Herpetology Specialist Study	Herpetologist	Mining / Coal	Ferret & Environmental Services / Borent	South Africa (Mpumalanga)
2007	Herpetology Specialist Study	Herpetologist	Mining / Coal	Ferret & Environmental Services / Borent	South Africa (Mpumalanga)
2007	Herpetology Specialist Study	Herpetologist	Mining / Coal	Ferret Mining & Environmental Services / Borent	South Africa (Gauteng)
2006	Herpetology Specialist Study	Herpetologist	Mining / Uranium	Ferret & Environmental Services / Borent	South Africa (Mpumalanga)
2003	Herpetology Specialist Study	Herpetologist	Development / Housing	EcoCheck / Environmental Services and Art	South Africa (Gauteng)

7.2 SAMUEL LAURENCE

