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SMALL MAMMAL DIVERSITY OF PHALABORWA COPPER MINING COMPANY AND NEIGHBOURING LAND TYPES

Results of the 2015 rodent survey, conducted by Dr Andrew Deacon on behalf of SAEON

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November 2015

Small mammal survey: SAEON (2015)

Dr Andrew Deacon

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1. Introduction and Project brief

1.1 Introduction

The South African Environmental Observation Network (SAEON) is a research platform funded by the Department of Science and Technology (DST) and managed by the National Research Foundation (NRF). It is mandated to develop and sustain a dynamic South African *in situ* environmental observation and research network aimed at collecting, processing, interpreting and archiving long term data; as well as making such data accessible to end users: decision makers, researchers and industry. It has a decentralised structure with the National Office in Pretoria providing corporate and shared services, and six (6) nodes distributed in different geographical regions providing the actual platforms for research and education.

The SAEON Ndlovu Node is based in Phalaborwa, within the Kruger National Park, and maintains a number of long-term ecological research sites in the Limpopo and Mpumalanga Provinces. Regular collection of ecological data is required from these sites, for the purposes of detecting, understanding and predicting changes occurring to major ecosystems in the region. From time to time, specialist contractors are needed to assist with the collection and capture of such data.

1.2 Terms of reference

The Consultant was requested to trap rodents at five sites around the Phalaborwa area, of which two sites (7 trap lines in different habitats) were in the area surrounding the rural communities, and three control sites were placed in the Kruger National Park (9 trap lines in different habitats). The trapped rodents formed part of a project related to the anthropological impact on the small mammals in the area surrounding Phalaborwa. The surveys were performed to add value to the on-going small mammal project and the aspects surveyed will assist in establishing the abundance and diversity of rodents in the area. The results will be used to analyse the probable influence of human activities on the rodent populations in the area.

The Consultant collated the information obtained from the survey into this report, but also added the information to the existing SAEON and Palabora Copper rodent reports (Deacon, 2012 and 2013) in order to create a single updated report to be used by SAEON and the mine.

2. Survey methods

Live-trapping with Sherman traps is the method being used during the surveys and because the Sherman comes in a collapsible model (approximately 8cm x 7cm x 23 cm) it is easier to carry long distances.

One capture station (trap station; 10-40 traps per station) was set out per habitat. As a general guideline a spacing of approximately 10 m between traps will provide for adequate coverage. Trapping took place over a period of one or two nights per land type, equalling 40-90 trap nights per habitat. Flagging tape is used to mark capture (trap) stations over the duration of the study.

Traps are set in the evening (after 4 pm) and checked the following morning before 8 am. Since we are conducting presence/not detected surveys, overnight trapping is sufficient given that trap mortalities will not affect analysis methods; however, effort is made to minimize trap mortalities. Traps are checked early in the morning for the

entire capture session (trapping session). During the day time, traps are left closed during the morning and early afternoon to minimize mortality due to heat stress.

Traps were baited with peanut butter mixed with rolled oats and golden syrup and set out of direct sunlight to prevent overheating. All animals were identified and released at the original capture station.

3. Survey results

3.1 Project sites – trap stations

During the current survey the sites below (selected in deliberation with client) were surveyed for rodents (Co-ordinates in Tables 1; see also Figure 1). The site numeration continues from the previous surveys:

Site 11: Syenite koppies in Kruger National Park (KNP) (Masorini): The syenite koppie as reference site (Named: KNP koppie).

Site 22: Kruger Park site: This is also a reference site. It is situated in open mopane veld with a small stream (from Phalaborwa) running through it. Trap lines were set out along the drainage lines and riparian vegetation.

Site 23: Kruger Park site: Flux Tower site: Mopane vegetation; catena from crest to foot slope.

Site 24a-c: Rural Phalaborwa: Makushane. Mopane vegetation; catena from syenite koppie to riverine habitats.

Site 25a-d: Rural Phalaborwa: Lulekane. Mopane vegetation; catena from crest to foot slope.

Figure 1: Survey sites and trap stations in the Phalaborwa area and Kruger Park, used during the 2015 surveys.

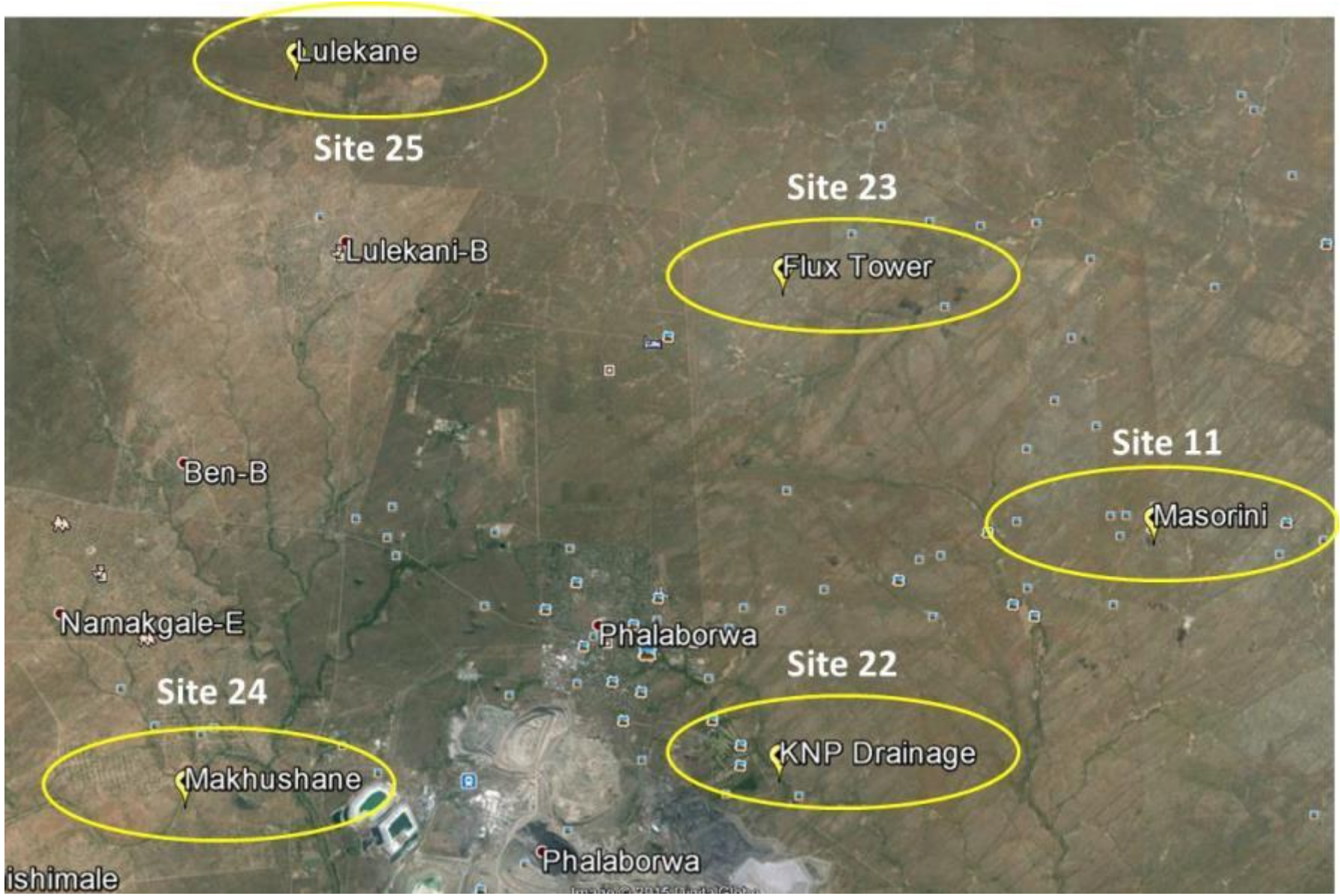


Table 1: Rodents trapped during the 2015 survey in the project area.

Sites	Trapping effort	Co-ordinates	Rodents
Site 11: Syenite koppies in Kruger National Park (KNP) (Masorini)	40 trap nights	23°55'27.75"S 31°15'57.03"E	1 Tete veld rat *(Aethomys ineptus)* *2* Bushveld Namaqua rockmouse *(Micaelamys namaquensis subsp. alborarius)*
22a KNP: drainage line site – Riparian and valley bottom	20 trap nights	23°58'104"S 31°10'551"E	None
22b KNP: drainage line site – Drainage line edge and valley bottom	20 trap nights	23°58'027"S 31°10'494"E	None
22c KNP: drainage line site – Drainage line edge and valley bottom	20 trap nights	23°58'674"S 31°10'263"E	1 Tete veld rat *(Aethomys ineptus)*
23 KNP: Flux Tower site: From crest to foot slope.	20 trap nights		1 Tete veld rat *(Aethomys ineptus)*
24a Rural Phalaborwa: Makhushane. Foot slope	40 trap nights	23°58'557"S 31°03'016"E	1 Tete veld rat *(Aethomys ineptus)*
24b Rural Phalaborwa: Makhushane. Riverine	20 trap nights	23°58'672"S 31°03'928"E	2 Tete veld rat *(Aethomys ineptus)*
24c Rural Phalaborwa: Makhushane. Syenite koppies	33 trap nights	23°58'777"S 31°03'541"E	4 Bushveld Namaqua rockmouse *(Micaelamys namaquensis subsp. alborarius)*
25a Rural Phalaborwa: Lulekane. Crest 1	30 trap nights	23°49'967"S 31°04'333"E	1 Bushveld Gerbil (*Gerbilliscus leucogaster*)
25b Rural Phalaborwa: Lulekane. Mid-slope	20 trap nights	23°50'506"S 31°04'396"E	None
25b Rural Phalaborwa: Lulekane. Foot slope	10 trap nights	23°50'243"S 31°04'501"E	None
25d Rural Phalaborwa: Lulekane. Crest 2	20 trap nights	23°50'494"S 31°04'656"E	1 Bushveld Gerbil (*Gerbilliscus leucogaster*)

4. Discussion

During the 2015 survey, the rodent trapping were done at 3 new sites and two older reference sites in the KNP. The main aim of this survey was to establish rodent diversity in rural Phalaborwa (Lulekane and Makhushane) and compare it with the KNP reference sites (one new site). The data were analysed and added to the rodent diversity data base. Table 1 supplies a summary of the rodents collected during the 2015 survey period.

From the start it was clear that the rodent activity was the lowest ever recorded (comparing previous surveys), and only 15 rodents of three species were caught at the 5 sites surveyed. With such low trapping successes it is difficult to obtain any trend and the only reasonable conclusion on the lack of rodent numbers will be the fact that it was during a very dry period that the surveys took place.

Table 2: Summary of trapping effort and trapped rodents.

Project area	**Trap sites**	**Combined number of trap nights**	**Combined number of rodents**	**% of rodents per trap night**
Kruger National Park (Masorini)	Sites 11	40 trap nights	3 rodents	**7.5%**
Kruger National Park (Drainage line)	Site 22a, b and c	60 trap nights	1 rodent	**1.6%**
Kruger National Park (Flux tower)	Site 23	20 trap nights	1 rodent	**5.0%**
Rural Phalaborwa: Makhushane	Site 24a, b and c	93 trap nights	7 rodents	**1.7%**
Rural Phalaborwa: Lulekane.	Site 25a, b, c and d	80 trap nights	3 rodents	**7.5%**

Rodent numbers was low as very little rain fell after a relative dry year (only about half of natural precipitation) and it was already mid-spring. The drought is reflected in the South African Weather Service's map (Figure 2).

The 12-month (November 2014 to October 2015) as well as 24-month (November 2013 to October 2015) standard precipitation index (SPI) maps give an indication of areas where prolonged droughts exists, in other words where below-normal rainfall occurred over a period of one year or longer. The Phalaborwa has a status of "Moderately Dry".

In areas where the environment often experience severe fluctuations in climate and ecological conditions, small mammals adjust to these circumstances (temperatures, rainfall, predation and plant productivity):

- Population numbers of small mammals fluctuate greatly from very low numbers during droughts to high numbers after good rain when food is plentiful.
- Most rodents are nocturnal; during the heat of the day, they remain in burrows, hollow trees and other micro-habitats which are comparatively cool and moist.
- Efficient conservation of body fluids is essential for survival. Dry faeces, concentrated urine, select food with high water content, metabolic water, minimal use of water for evaporation cooling.
- Reproduction occurs when food and water are plentiful. Consequently, several years of drought can mean cessation of reproduction for extended periods, and therefore a dramatic fall in population numbers.

During extended dry periods rodent populations decline to low levels and it was found that trap successes dropped to 10% during these periods. Rodent populations contracting into isolated pockets of more favourable habitat. With the rodent decline, predator populations also decline, as well as competitors. Predators will increase during favourable conditions, but not at the rate that rodents increase.

Rodents are adapted to exploit favourable environmental conditions resulting from an abundance of food and the absence of predation, leading to a population explosion. Following good rains rodents respond quickly to the improved forage and cover; a high percentage of females being pregnant and with many juveniles in evidence. This is followed by a period of explosive population growth, and cannibalism under the rodents is rife, many mice were diseased and some became grossly deformed (Skinner & Chimimba, 2005).

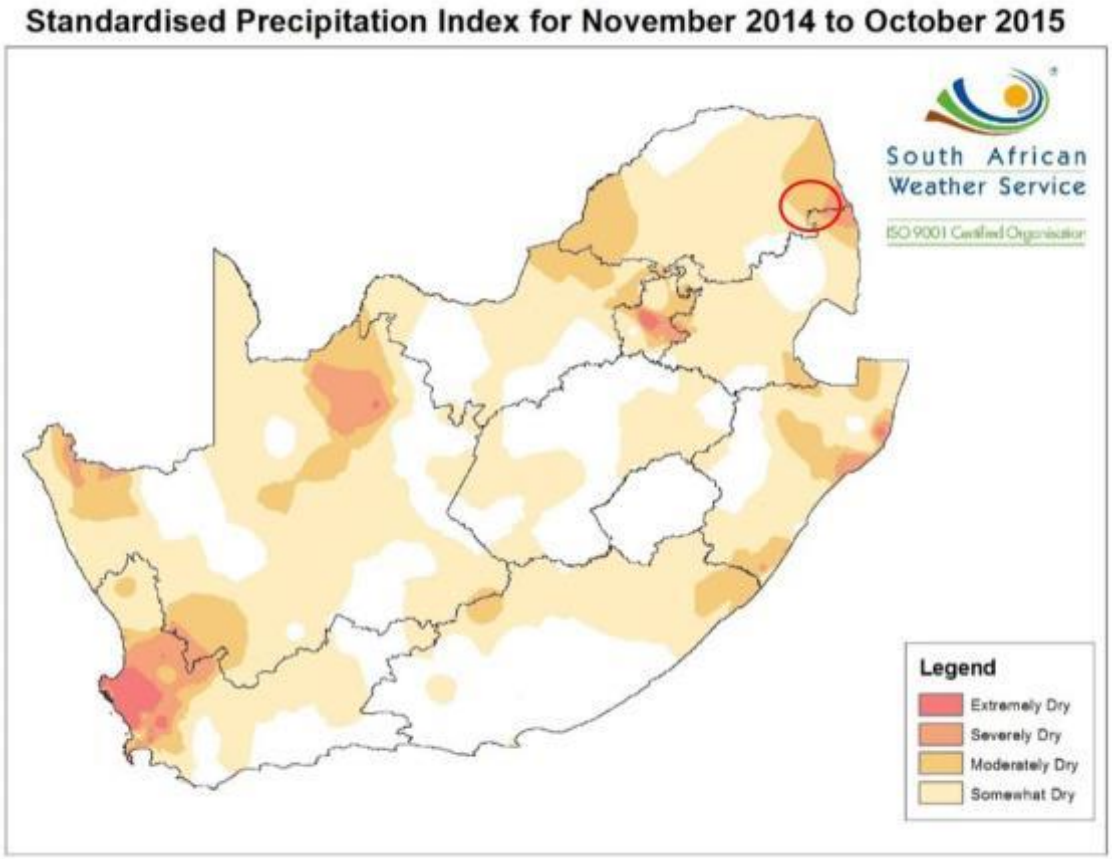


Figure 2: The South African rainfall map for the period November 2014 to October 2015.

It is unfortunate that the sampling effort were done during a period of low rodent numbers and low activity, but the resulting low catch-per-unit effort emphasized the fact that rodents decline or withdraw during periods of droughts. Figure 3 shows the lack of cover and the dry conditions in the region. In the rural areas the vegetation cover is even less due to overgrazing by cattle and the lack of rain.

Due to a camera error, some of the photos for the sites were lost, and only photos for Sites 22 and 25 could be recovered.

Figure 3: The lack of cover and the dry conditions is evident in this photo (drainage line transect in the KNP).

REFERENCES

Deacon, A. R. 2012. Small mammal survey: Palabora Mining Company and Kruger National Park (2012). Internal report to SAEON and PMC.

Deacon, A. R. 2013. Small mammal survey: Palabora Copper (2014). Internal report to SAEON and PC.

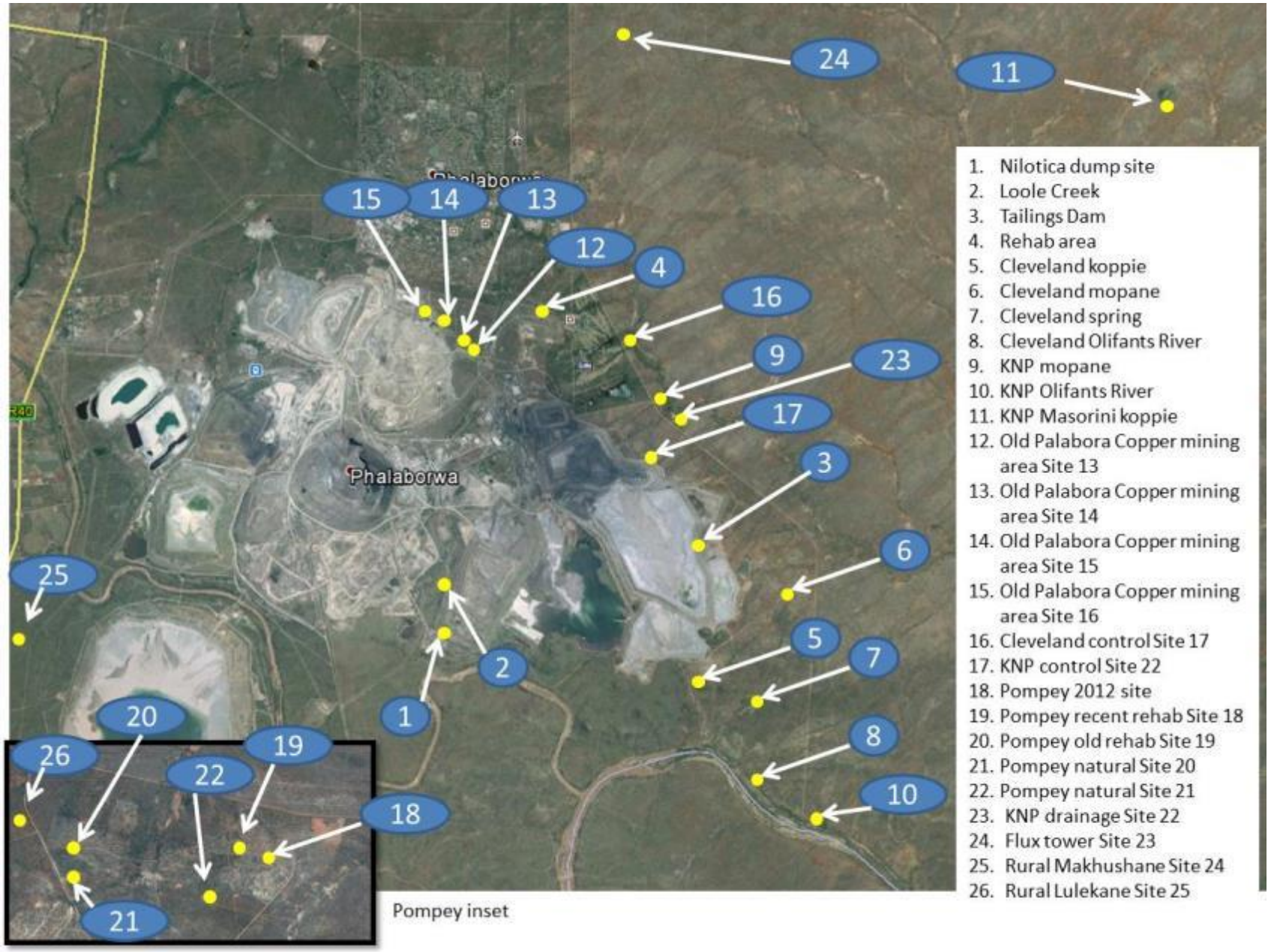
Skinner, J. D., Chimimba, C. T. 2005. The mammals of the southern African subregion. University of Pretoria.

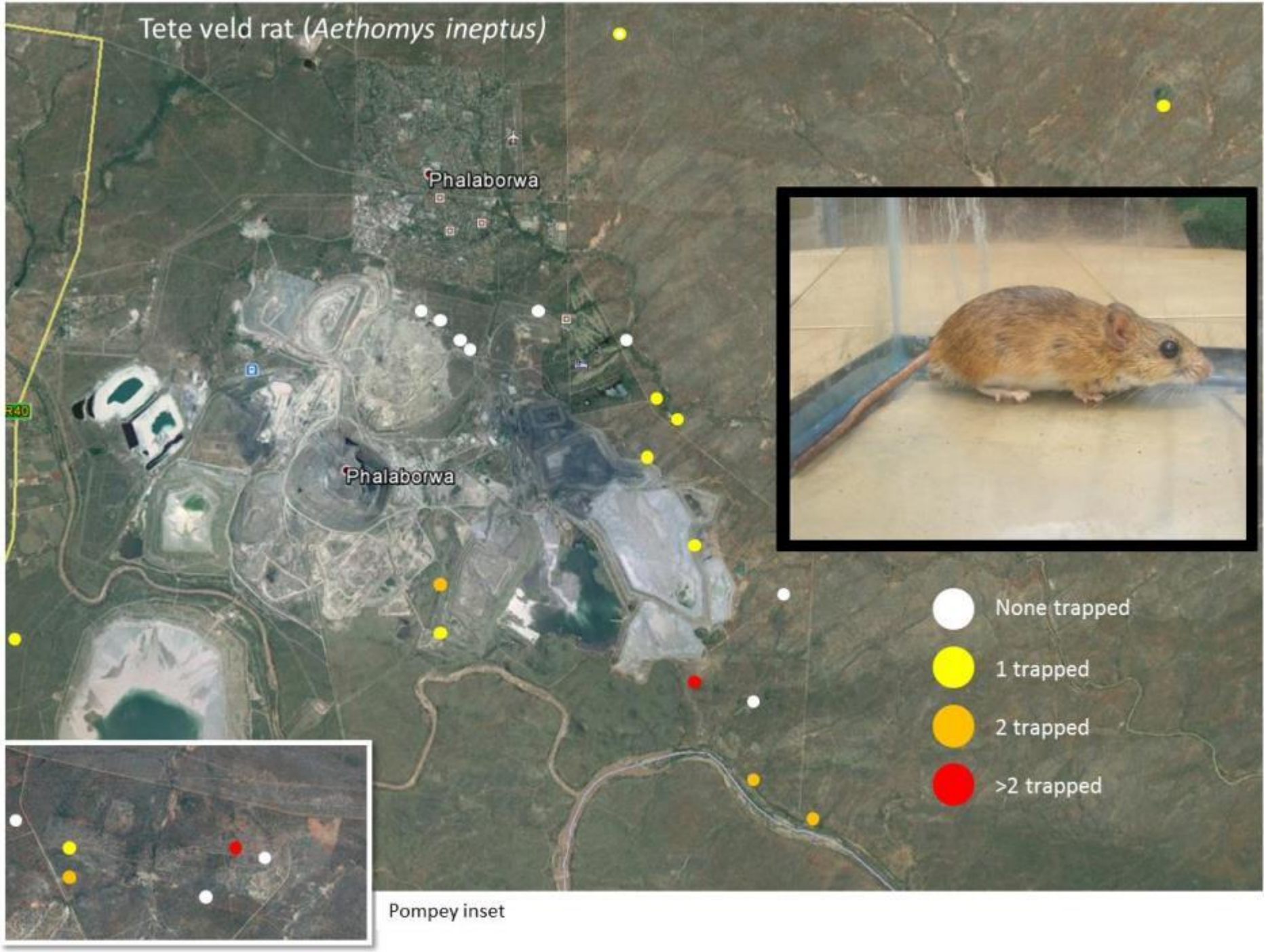
Appendices

Appendix 1: A summary of the small mammal species trapped in the study area, with a synopsis of preferred habitat, status in South Africa, and diet per species.

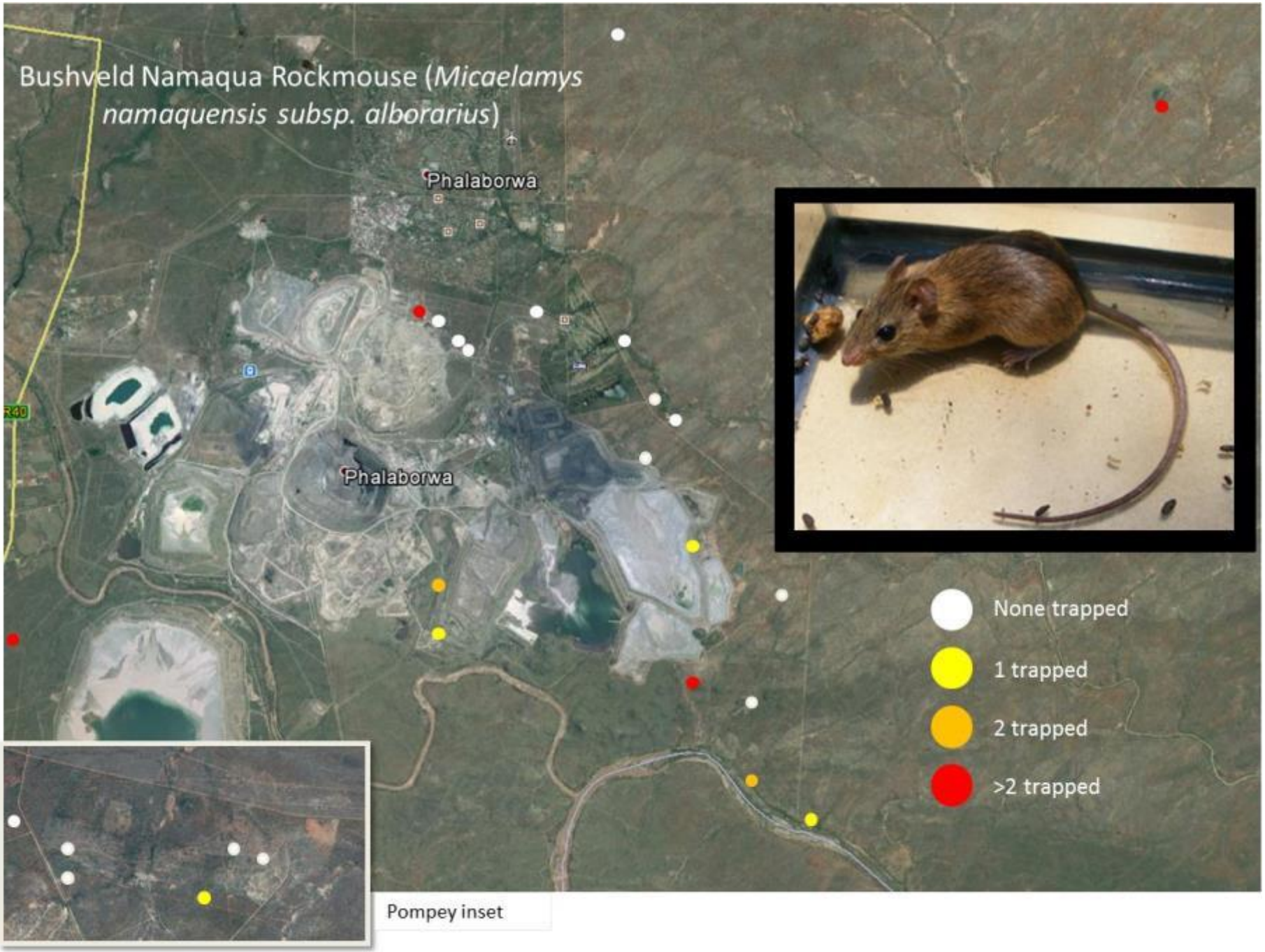
MAMMAL	HABITAT	Status (SA)	Diet
Bushveld Gerbil (*Gerbilliscus leucogaster*)	Widespread – Survives regardless of vegetation type or degree of cover present, having been recorded in open grasslands, Acacia woodland or scrub, and mopane woodland. Commonly encountered on old cultivated lands. Occur on hard ground, but prefer light sandy soils or sandy alluvium. Nocturnal and terrestrial. Does not usually excavate its own burrows but uses holes in termitaria or under tree roots, however, can excavate burrows in sandy soils. These burrows are usually found at the base of small shrubs, but also in the open, and they have resting chambers floored with vegetable debris. A fresh ramp of sand is left at the entrances to the burrows in the morning, following night-time activity. Independent of water, but does not tolerate waterless conditions.	Data deficient	Granivorous and insectivorous. Insects (40%), seeds (25%) and herbage (30%). Insects and seeds predominate in summer. Grasses, sometimes rhizomes and bulbs.
Spiny mouse (*Acomys spinosissimus*)	Widespread – associated with rocky areas/terrain: Nocturnal and terrestrial (single or groups) – rests in rock crevices, under tree roots. More common habitat: among boulders in rocky habitat. Sheltered overhanging rocks, under exfoliated slabs and in other sheltered crannies. Also sandy alluvium along rivers, dry woodland and in thickets; use cover of roots of trees exposed by erosion; or holes in termite mounds. Nests made of grass and other debris in crannies or under foliated slabs of rock.	Least concern	Grass, fruit and seeds. Also termites and other insects. Spiders, millipedes and small snails.
Pouched mouse (*Saccostomus campestris*)	Widespread and catholic, wide habitat tolerance: In burrows, sandy soil or sandy alluvium, open short grass fringes of pans, rocky koppies, fringes of lowland forests. Exclusively terrestrial, predominantly solitary and nocturnal.	Least concern	Subsists on the seeds of a diversity of plant species.
Veld Rat species *(Aethomys ineptus & chrysophilus)*	Widespread – Grassland with open shrub association, open woodland, fringes of pans. Sandy ground or sandy alluvium, or hard ground – holes or rock crevices and piles of boulders. Associated with cover: rocky crevices, piles of debris, clumps of grass or fallen trees. Dry Acacia scrub, as well as in the fringe vegetation of evergreen forests. Sheltering in burrows under bush on the plains. Lives in burrows with interconnecting runways; may frequent old termite mounds. High reproductive potential under favourable conditions. Not gregarious; shelters are used at most by a pair or a family party.	Least concern	Primarily a seed-eater, but will also knaw on kernels of nuts, takes insects.
Bushveld Namaqua rockmouse (*Micaelamys namaquensis subsp. alborarius*)	Widespread – where there are rocky koppies, outcrops or boulder-strewn hillsides - preferred areas. Cracks and rock crevices of rocky koppies or outcrops (prefers crevices and does not burrow), or on piles of stones in the veld, low lying ridges and stony country and is often plentiful in old ruins. In the absence of outcrops, may nest in holes or forks in trees or under bushes. Piles plant debris over the entrances to its shelters. Calcareous outcrops. Nocturnal, terrestrial and communal.	Least concern	Omnivorous, prefer seeds of grass and other vegetation when available.
Multimammate mouse species (*Mastomys spp coucha & natalensis*)	Wide habitat tolerance (pioneer species - drought, burn, ploughing) from sea level to high-lying ground, absent from arid areas. Fond of grassland where there is some cover of low scrub. In riverine associations running westwards into arid country - in dry watercourses or fringes of swamps. Frequents the fringes of pans where there are calcareous outcrops nearby. Partial to sandy ground, overgrown with scrub and grass. Under fallen logs, crevices between rocks, cavities inside pile of stones or debris or even holes in termite mounds. Households; fringes of agricultural land, degraded forests, fields. Communal, terrestrial and nocturnal. Often occurs in high numbers. Constructs its own burrows but often uses existing burrows of other rodents.	Least concern	Variety of grass and seeds, including Acacia seeds, dry pods, and the pulpy parts of wild fruits;when populations reach high levels, they may resort to cannabalism. Insects are also take.
Pygmy Mouse (*Mus minutoides)*	In all types of vegetation. Wide variety of habitats. Nocturnal and terrestrial, not communal. Fairly damp country where there is high grass, bush or other cover. Makes its own burrows in soft ground. Normally finds shelter under piles of debris, fallen tree trunks/logs and similar type of cover, also boulders or holes in termite mounds.	Least concern	Grass seeds and insects.

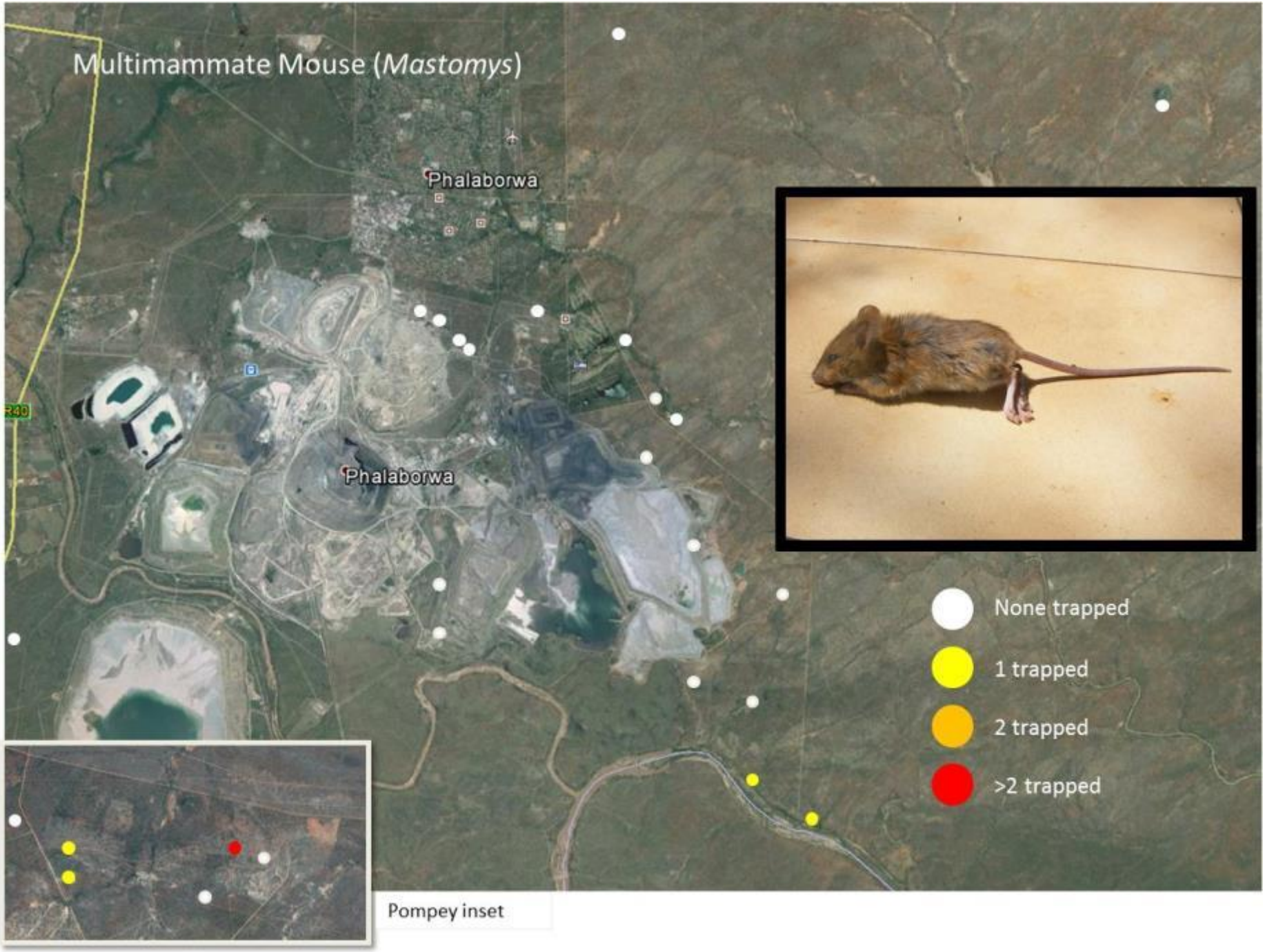
Appendix 2: Sampling sites used during 2012, 2013 and 2015, followed by distribution of rodents trapped at these sites.

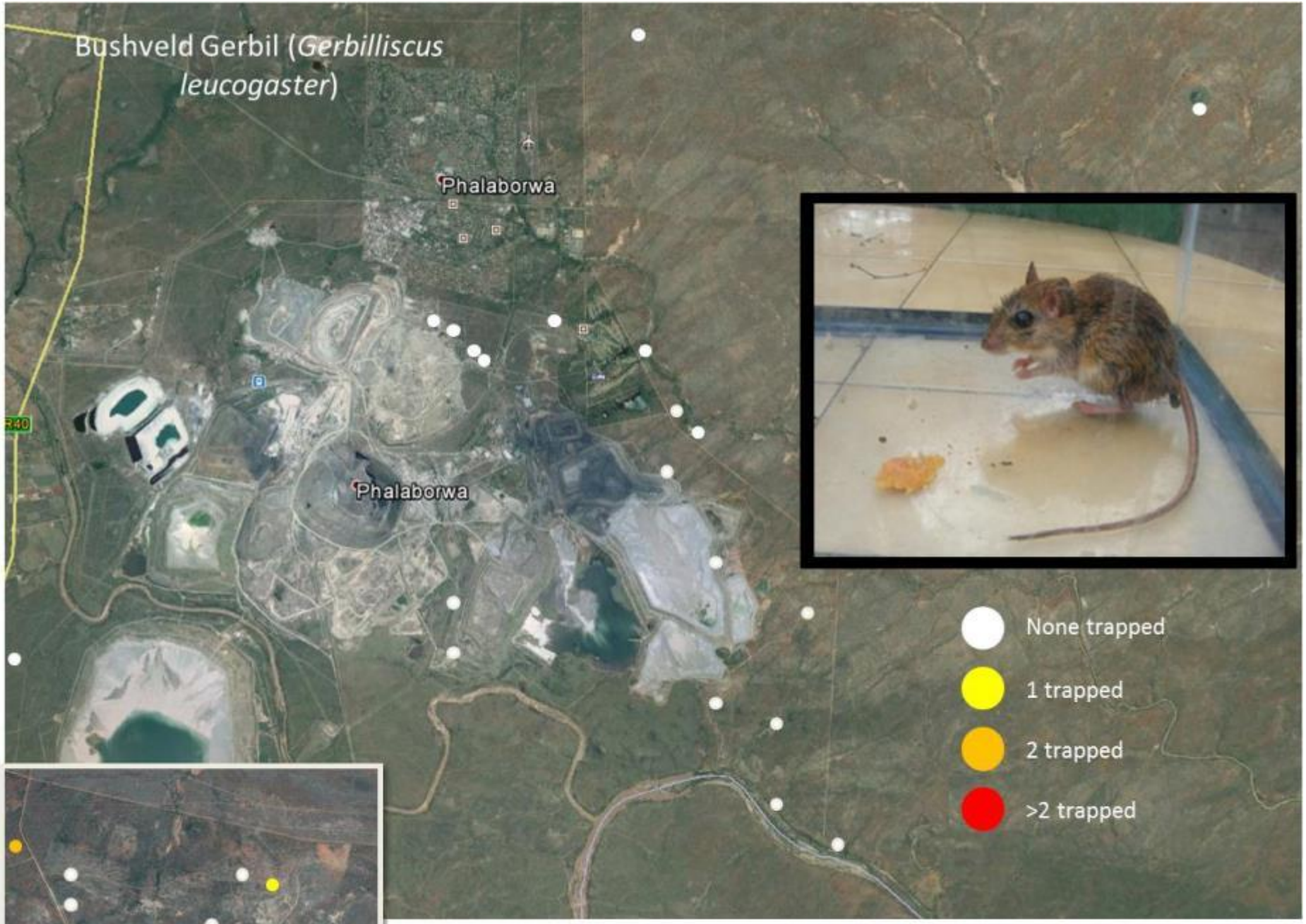




Pompey inset


Bushveld Namaqua Rockmouse (*Micaelamys namaquensis subsp. alborarius*)
Phalaborwa
Phalaborwa
R40
None trapped
1 trapped
2 trapped
>2 trapped
Pompey inset


Multimammate Mouse (*Mastomys*)
Phalaborwa
Phalaborwa
R40
None trapped
1 trapped
2 trapped
>2 trapped
Pompey inset



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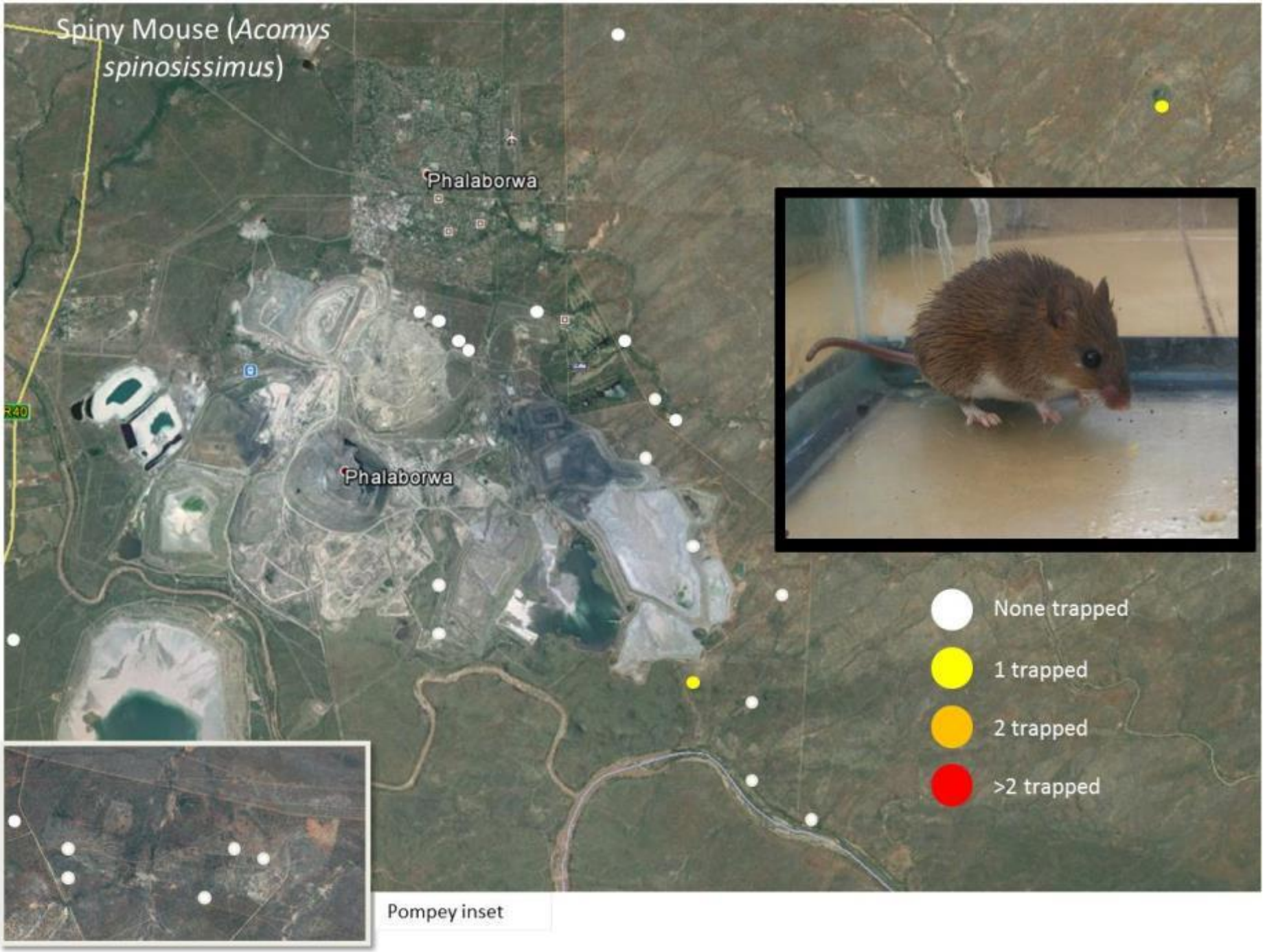
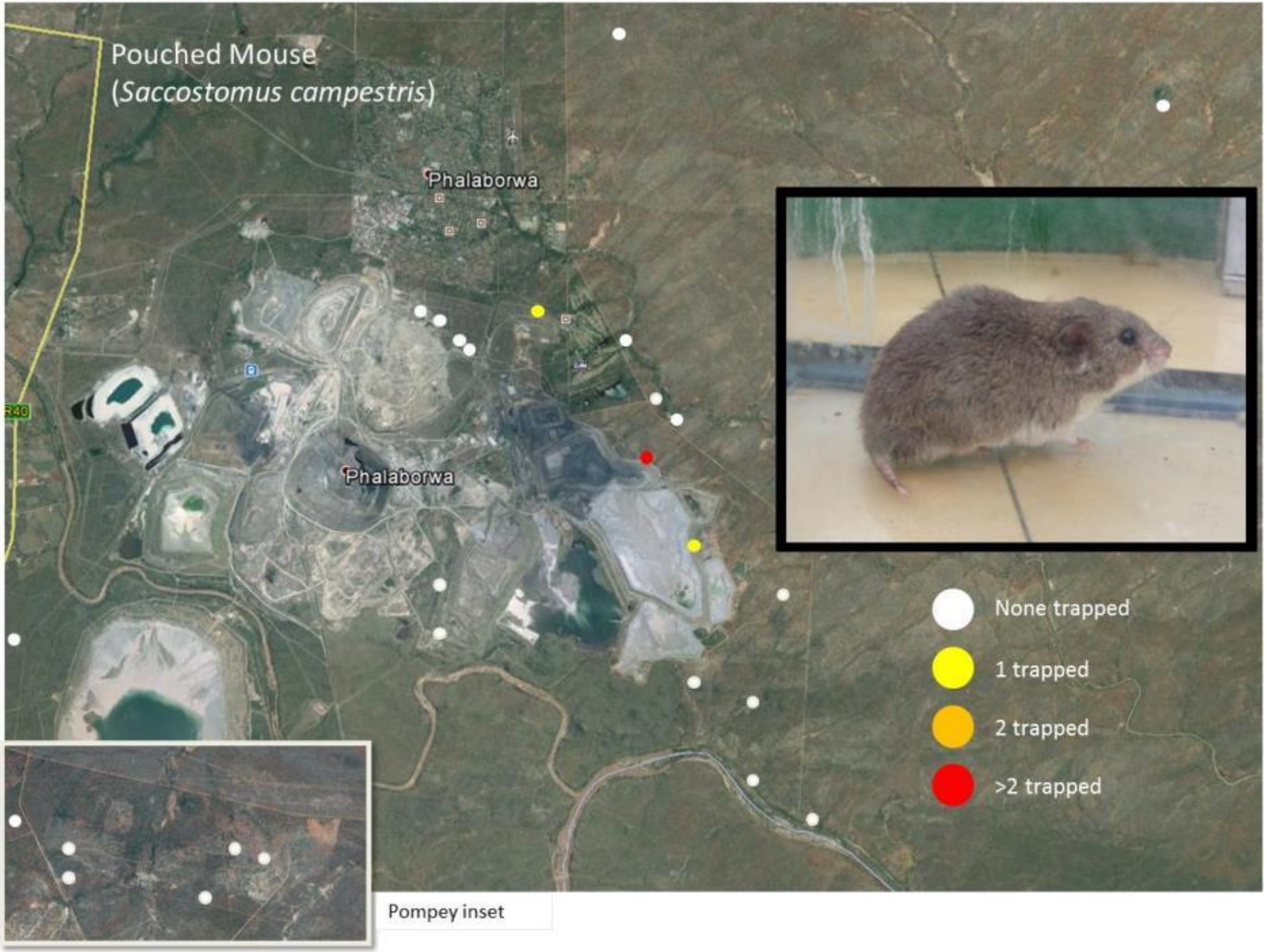
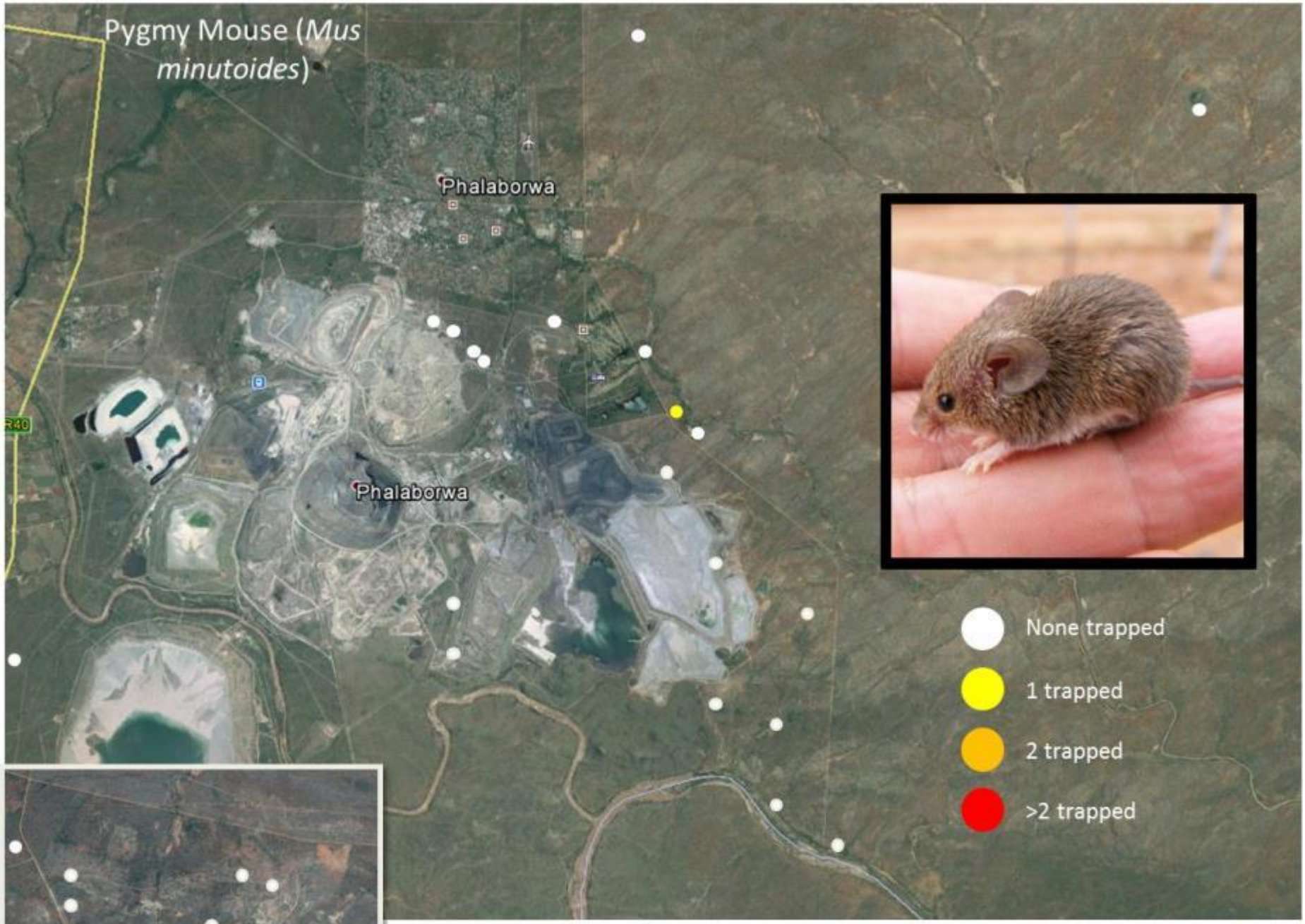

Spiny Mouse (*Acomys spinosissimus*)
Phalaborwa
Phalaborwa
R40
None trapped
1 trapped
2 trapped
>2 trapped
Pompey inset


Pouched Mouse
(*Saccostomus campestris*)
Phalaborwa
Phalaborwa
R40
None trapped
1 trapped
2 trapped
>2 trapped
Pompey inset


Pygmy Mouse (*Mus minutoides*)
Phalaborwa
Phalaborwa
R40
None trapped
1 trapped
2 trapped
>2 trapped
Pompey inset

Appendix 3: Trapping sites.

13 Old Palabora Copper mining area

14 Old Palabora Copper mining area

15 Old Palabora Copper mining area

16 Old Palabora Copper mining area – boulder dump

17 Cleveland Reserve - Drainage line & mopane veld

18 Pompey: Recently mined

19 Pompey: Old mining area

20 Pompey: Natural

21 Pompey: Natural

22 KNP: drainage line site

22 KNP: drainage line site (2015)

25. Rural Phalaborwa: Lulekane (2015)