CHAPTER 4

Context

This chapter provides a background study of the history of the National Zoological Gardens of South Africa, while critiqueing the overall site and the current elephant enclosure according to zoo theory.

Locality Plan of Pretoria indicating the Zoo

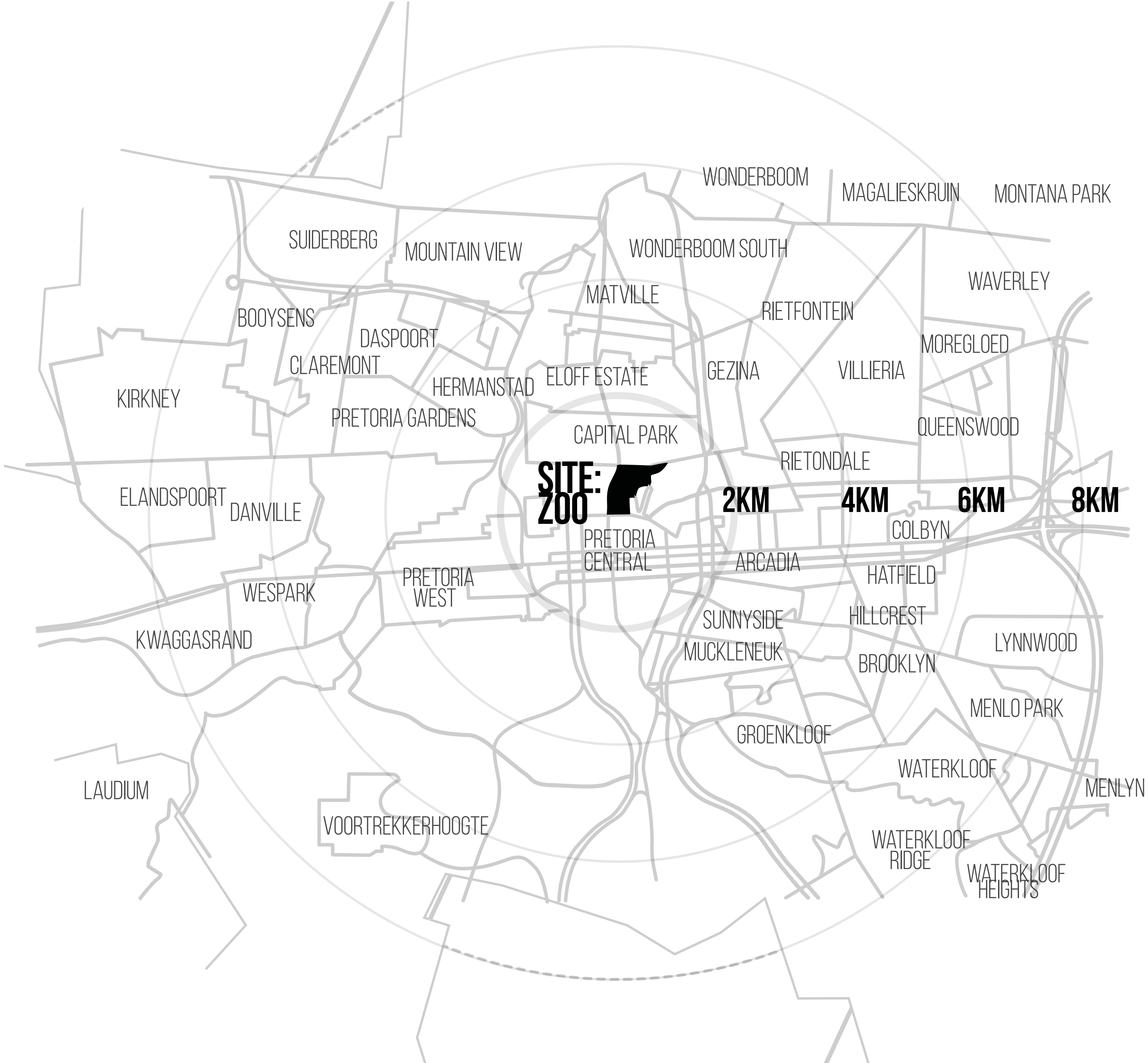


Figure 4.2 Locality map of Pretoria, adapted by Author.

Nolli Map of Pretoria indicating the Zoo

Figure 4.3 Nolli map of Pretoria and the NZG, adapted by Author.

Contextual study

Site Analysis

1. Historical background of the National Zoological Gardens of South Africa
2. Zoo analysis & Master Plan
3. Elephant enclosure critique

Location

The focus area for this dissertation, being the National Zoological Gardens of South Africa (hereafter referred to as NZG) is located on the northern periphery of the Central Business District (CBD) of Pretoria. The following chapter investigates the historical background of the NZG and contextually analyses the current conditions of the site to inform the design.

Research Methodology

Field research

The current elephant enclosure, and the NZG as a whole, will be critically analysed in relation to theory, literature review, international precedents and case studies, as well as design regulations and guidelines predominantly set by the AZA for the care and handling of elephants in captivity.

Literature review

1. Draft minimum standards for the management of captive elephants – National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), Department of Environmental Affairs and Tourism, South Africa.
2. AZA Standards for Elephant Management and Care, 2012.
3. CAZA Elephant Care Manual, 2008.
4. A Review of the Welfare of Zoo Elephants in Europe, Animal Behaviour Research Group, Department of Zoology, University of Oxford.

Case study of elephant in captivity:

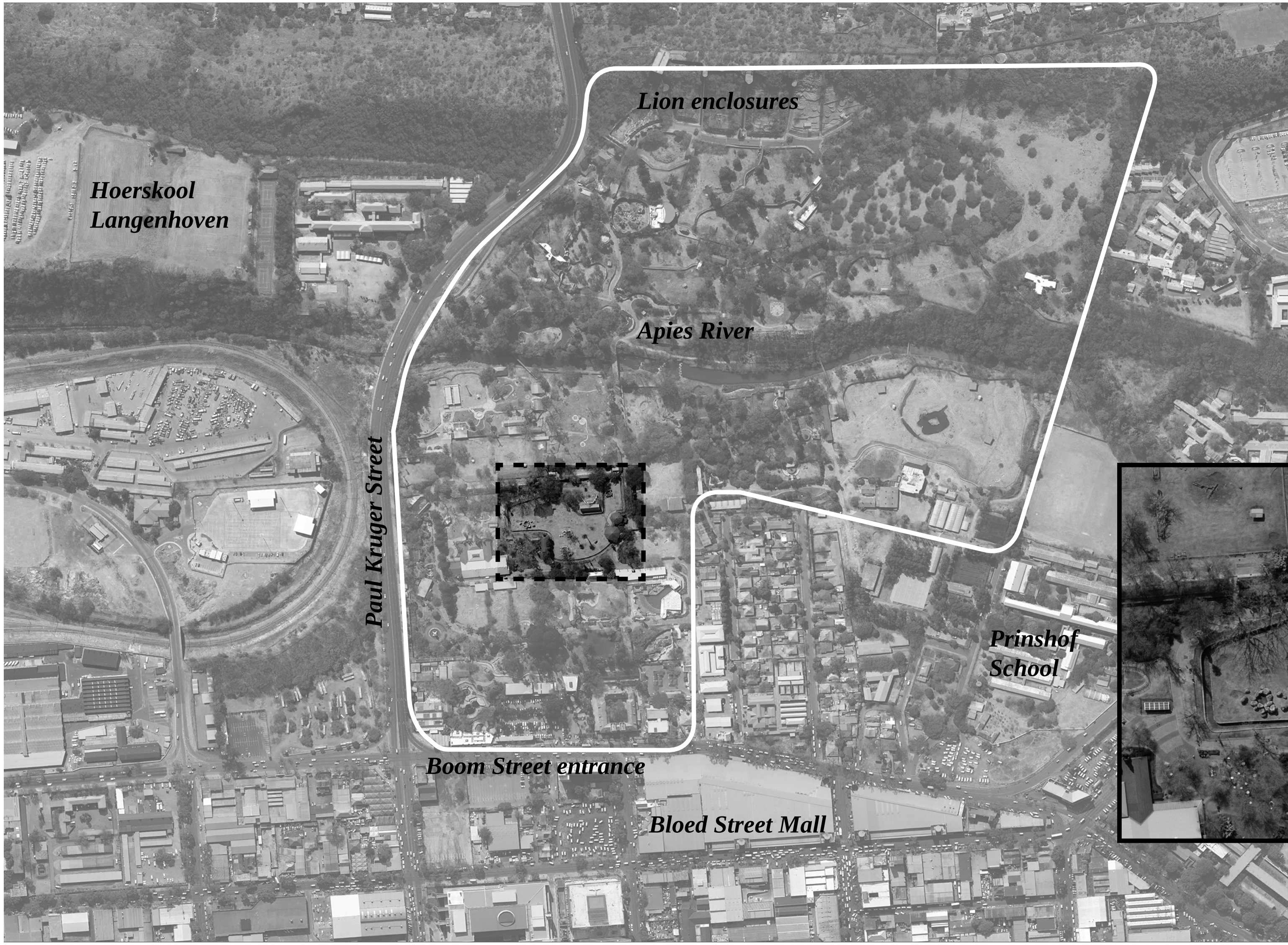
The Inokashira Park Zoo, in Japan.

Delimitations

The intention for this project is not to propose a new general design for the entire zoo precinct, but to rather focus on a selected group of animals to accommodate to their unique needs and requirements.

Elephants, being the largest land animals, suffer the most when kept in captivity in appalling conditions. For this reason they have been selected for the investigation to overcome challenges of designing for wild animals.

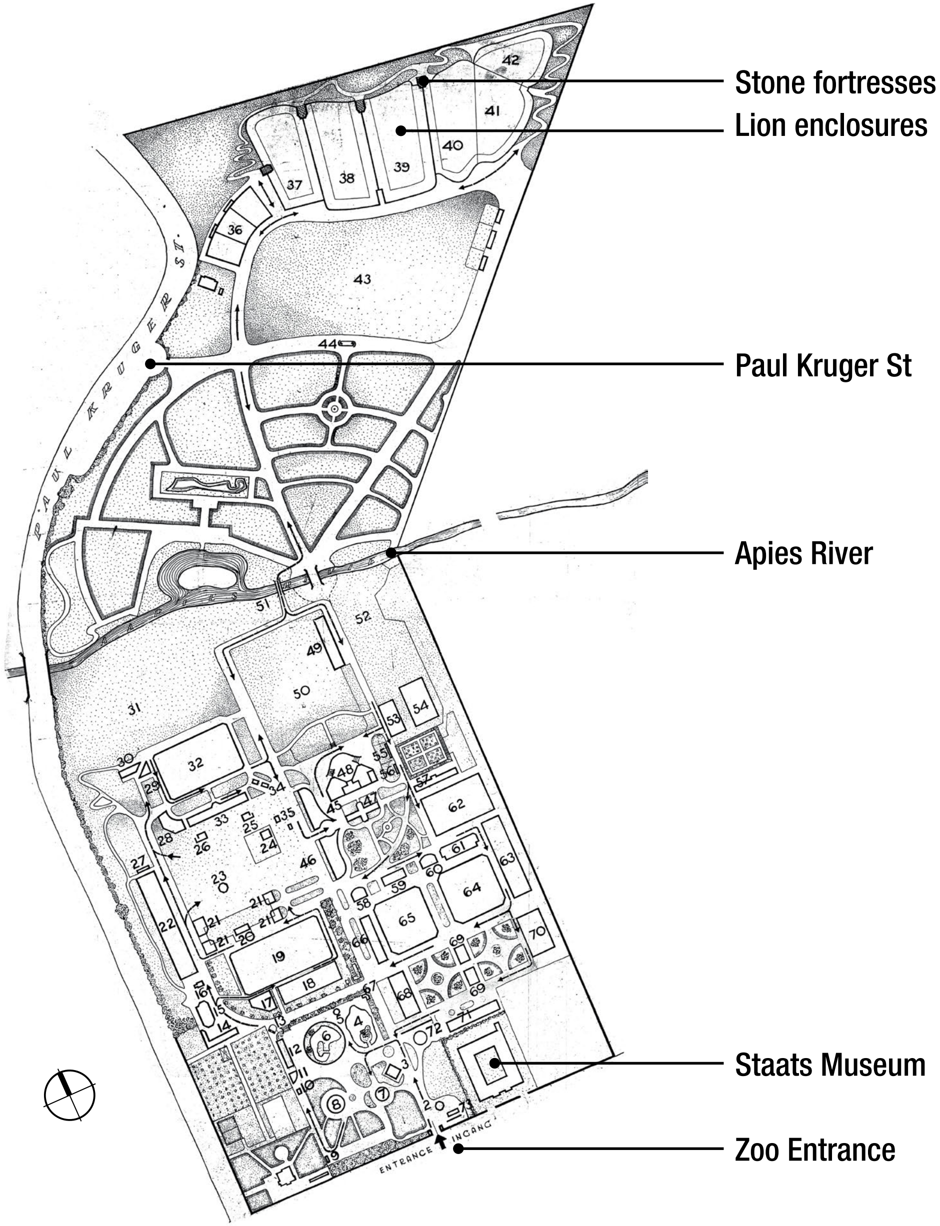
Aerial photograph of the NZG



Existing elephant enclosure

Figure 4.4 Aerial photograph showing the entire NZG precinct, with the elephant enclosure.

The National Zoological Gardens of South Africa



Historical Background

The National Zoological Gardens of South Africa was established in 1899 when the Transvaal Republican Government purchased the farm 'Rus in Urbe' with the intention of creating a zoo. Until the year 1913, the zoo was linked directly to the Transvaal Museum, previously known as the "Staatsmuseum der Zuid-Afrikaansche Republiek". The establishment and existence of the zoo is entirely due to the persisted efforts of the late Dr. J. W. B. Gunning, who was the Director of both the Transvaal museum and the zoo during the period of 1900 to 1913. The first animals brought to the zoo in 1899 were temporarily housed in the garden behind the museum, and then later relocated to the farm. During this time, the zoo was referred to as the Transvaal Zoological Gardens, with the name later changed to the National Zoological Gardens (NZG) in 1916.

During this early period, the zoo depended mostly on donations and entrance fees to run operations. However, with its growing animal collection, these conditions were not conducive for its survival. In October 1933, the zoo was declared a State Funded Institution with Act 23 of 1931.

The zoo was eventually declared a Cultural Institution by 1969, later falling under the Department of Arts, Culture, Science and Technology's responsibility in 1994. After the division of this department, the NZG was de-proclaimed in 2004 as being a cultural institute due to its heavy emphasis on conservation. The NZG was then moved to the Department of Science and Technology, which declared it a National Facility under the administration of the National Research Foundation (NRF) (Dry & Joubert Architects, 1991).

Figure 4.5 Map of the NZG illustrating the northern extension beyond the Apies River

Present status

As the zoo is closely affiliated with international associations, such as the World Association of Zoos and Aquariums (WAZA), most developments undertaken aim to be in accordance with international practices.

The NZG is regarded as a leading zoological institution with international recognition. With nearly 643 species and 9000 specimens, the NZG has one of the largest and most remarkable animal collections in the world. Having developed three unique Game Breeding Centres, the zoo is ideally suited to make a significant contribution to the conservation of biodiversity in Africa. Over 70 species, categorised as 'threatened', have been successfully bred. This thriving record makes the zoo the most successful 'ex-situ' conservation agency in South Africa.

The NZG is also closely associated with other zoos and agencies devoted to conservation in numerous African countries, including Algeria, Angola, Botswana, the Democratic Republic of the Congo, Ivory Coast, Mozambique, Malawi and Nigeria (NRF, 2006).

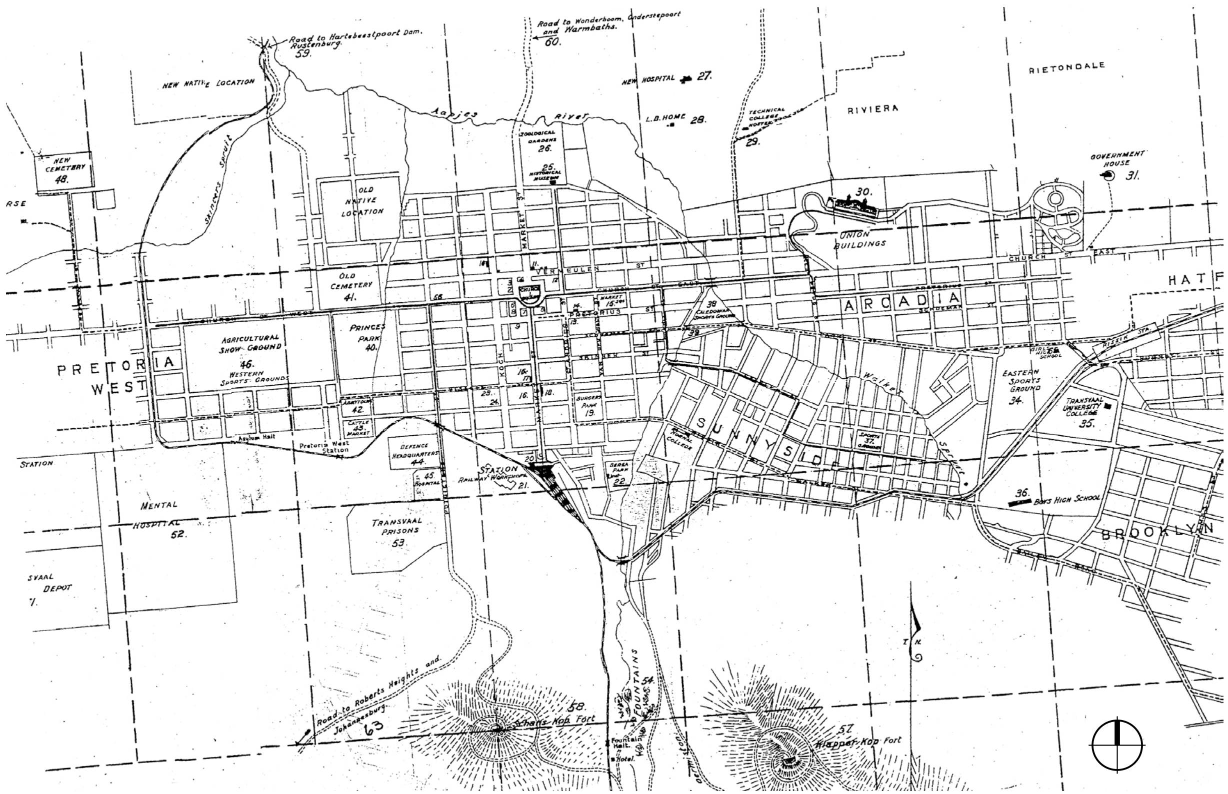


Figure 4.6 Map of Pretoria showing the NZG, 1928.

National Zoological Gardens Masterplan

Introduction
Services Analysis
Ecology Analysis
Zoo Analysis
Masterplan

Introduction

The Department of Public Works and Land Affairs commissioned the firm Dry & Joubert Architects on 24 August 1989 to develop a masterplan for the National Zoological Gardens of South Africa (Hereafter referred to as the NZG or the zoo). The absence of a masterplan was placing severe pressure on the zoo regarding any future projects and developments. The masterplan therefore provides a detailed guideline for future development and operations.

The provisional masterplan consists of two volumes:

1. Volume 1 includes a masterplan for the NZG of South Africa.
2. Volume 2 includes a complete animal inventory of the NZG of South Africa.

The original document was then expanded by the firm Dry Mokoena & Partners in June 1996, as instructed by the Department of Public Works.

For the purpose of this project, Volume 1 was acquired for its information regarding site conditions, geological and geotechnical aspects.

"By exhibiting, caring for, acquiring and multiplying indigenous and exotic animals, a national and educational service is rendered to the community and thereby to foster concept, knowledge, research, maintenance of appreciation for our wild life." - Dry & Joubert Architects, 1991.

Limitations

As the only available geological and geotechnical survey and analysis of the NZG was completed in 1991, variations may be expected. For the purpose of this dissertation and the relevant analyses, such as soil conditions, the data in question is assumed valid.

Services Analysis

Water

The NZG currently consumes water from four different sources, including the Municipal supply, bore holes, purified sewerage from Daspoort Water Care Works and water from the Apies River (Dry & Joubert Architects, 1991).

Municipal Water

Metered water supply from the Municipality is supplied to the NZG via a 100mm Ø connection located on Boom Street, adjacent to the Aquarium building. This water is then utilised for human consumption, drinking water for animals, fire water throughout the zoo and a limited amount used for irrigation purposes, via 50mm Ø connections (Dry & Joubert Architects, 1991).

This water is stored in five different elevated tanks located in various points within the zoo, including: the main entrance, elephant enclosure, restaurant, farmyard and the composting area.

Bore holes

There are seven serviced bore holes within the NZG. Water from these bore holes is used to supply the aquarium, water features, including drinking and irrigation water for animals and gardens which are located north of the river respectively.

Bore holes 1 and 3 are situated within the new elephant site precinct. Bore hole 1, situated north of the river close to the western boundary of the zoo, supplies water through a 50mm Ø GMS pipe to elevated water storage tanks in the Aquarium building (Dry & Joubert Architects, 1991).

Bore hole 3 however, also situated north of the river, dispenses water through a 100mm Ø GMS pipe to a ground level reservoir. This reservoir then supplies water to the farmyard, to the pond and water feature with a water wheel which specifically circulates water, via a 75m Ø gravitational feeder. This reservoir also supplies drinking water to the two game enclosures east of the reservoir.

Purified water

Purified sewerage, extracted from the Daspoort Water Care Works, is only utilised for irrigation purposes south of the river. This purified water, supplied to the south western corner of the zoo, is of a high biochemical standard suitable for irrigation only. Under an agreement entered into by the Government of the Union of South Africa and the City Council of Pretoria on 21 February 1957, the government is allowed to extract water from the river in lieu of the 500kl of effluent supplied 8 hours per day to the zoo from Daspoort.

Previous tests of this water supply indicated that effluent treated with lime and alum, while being fully chlorinated, will be in accordance with the Water Act (Dry & Joubert Architects, 1991).

Water from the Apies River

The hippo pool just north of the river, soon to be an elephant pool, only utilises water from the Apies which is pumped directly into the pool. The pool is flushed twice a week, with the effluent water led gravitationally back to the river.

Water from the river is also used to irrigate gardens closely surrounding the pool itself, being the site chosen for the project.

When testing was carried out of all effluent water being released back into the river from various pools, ponds and dams in the zoo, these tests revealed that all water, excluding that from the hippo pool, met the requirements. It was recommended that water from the hippo pool be passed through a fine sieve in order for the water and effluent quality to be acceptable (Dry & Joubert Architects, 1991).

Storm Water

The present, somewhat improvised, storm water system in the zoo gravitates naturally towards the Apies River, which itself functions as a primary storm water collector for the CBD of Pretoria.

The system installed south of the river has longer, underground lines discharging storm water directly in the river. The system north of the river is less formal, with storm water lines discharging into open channels.

Due to the location of the farmyard, it is predicted that in the event of an extreme storm it will be flooded by 0,5m of water, which can be seen in the 1 : 50 year flood line drawing (Dry & Joubert Architects, 1991).

Services Analysis Plans

Sewerage

(Not to scale)

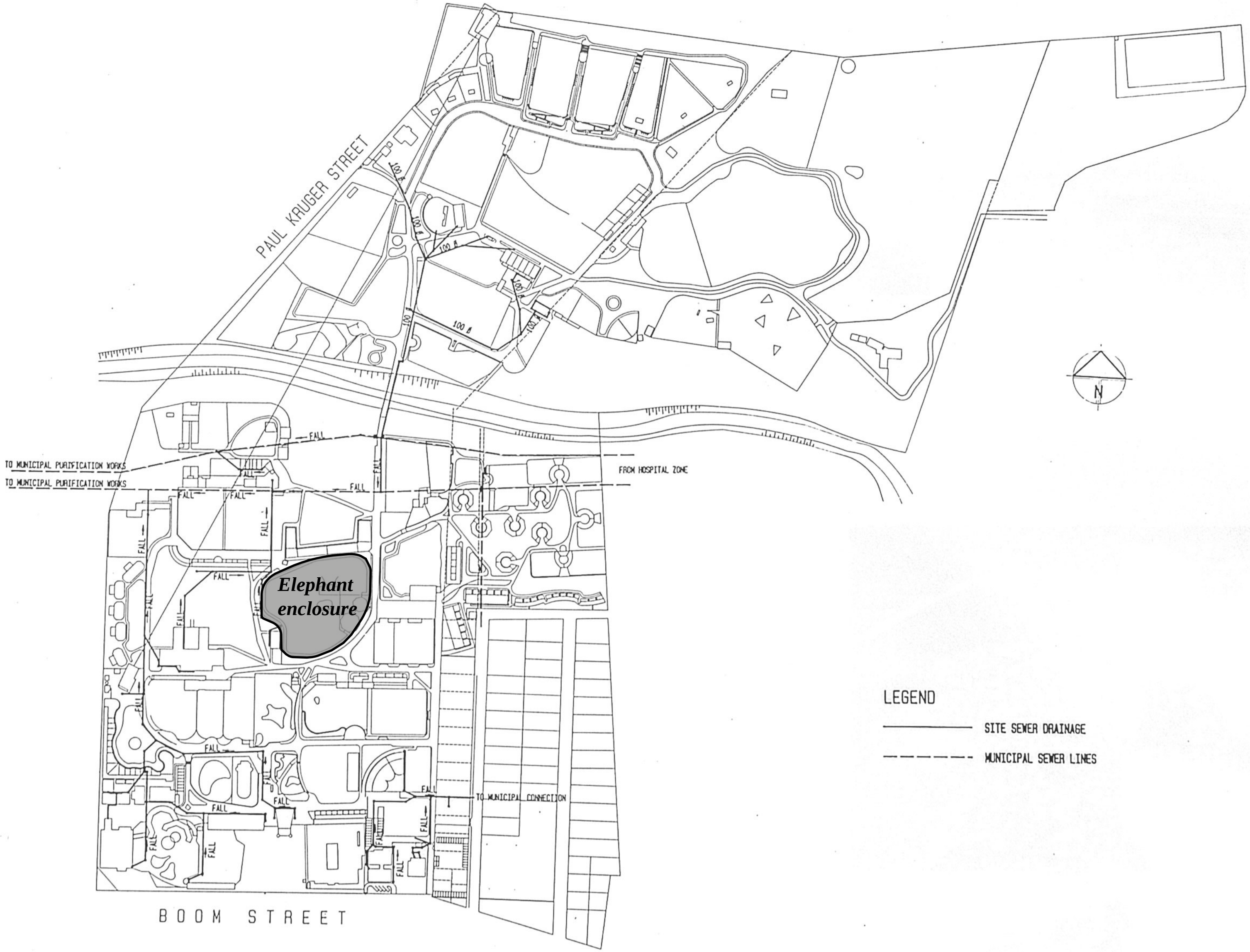


Figure 4.7 Sewerage map

Municipal Water Supply

(Not to scale)

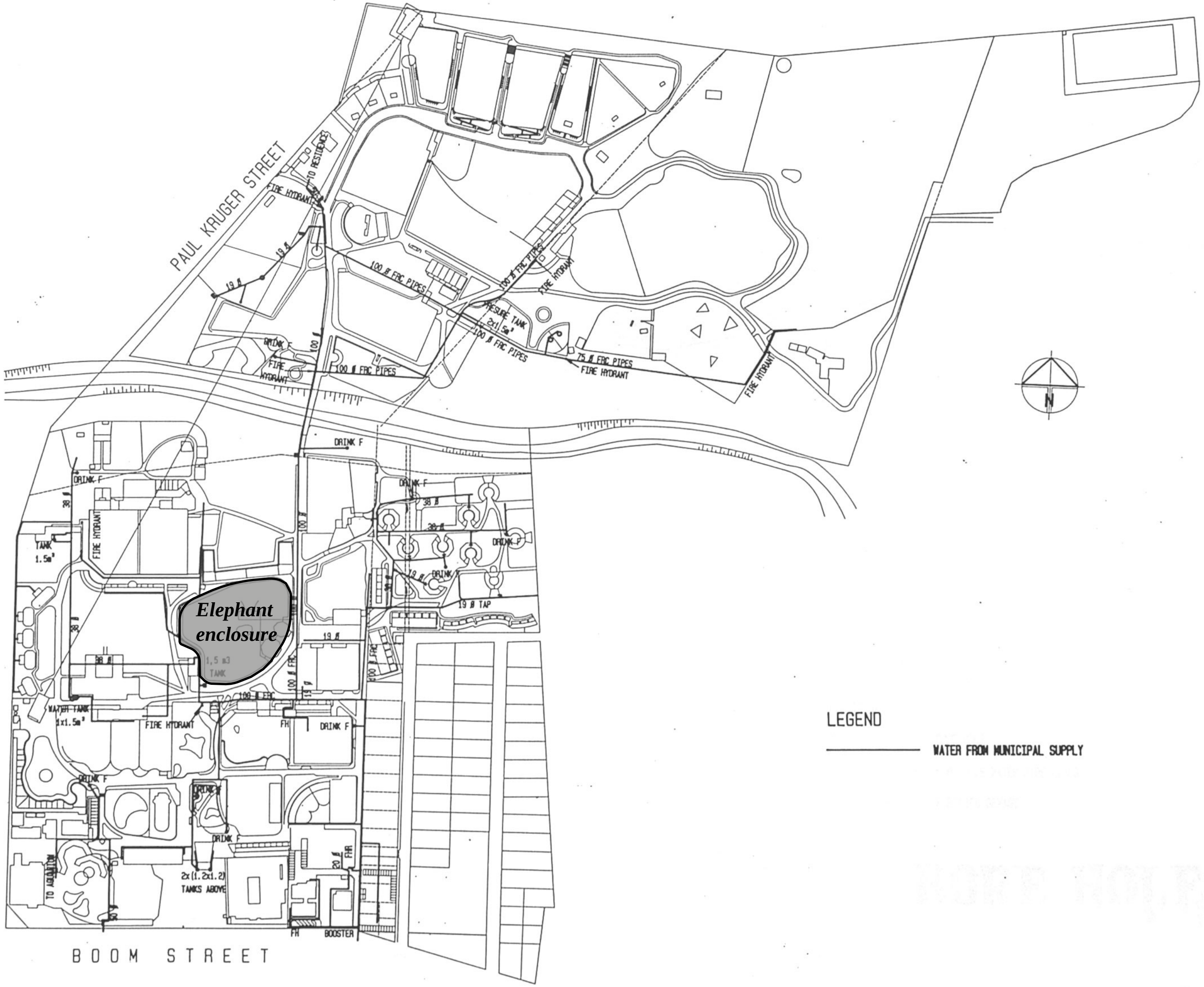


Figure 4.8 Municipal water supply map

Bore Holes & Purified Sewage
(Not to scale)

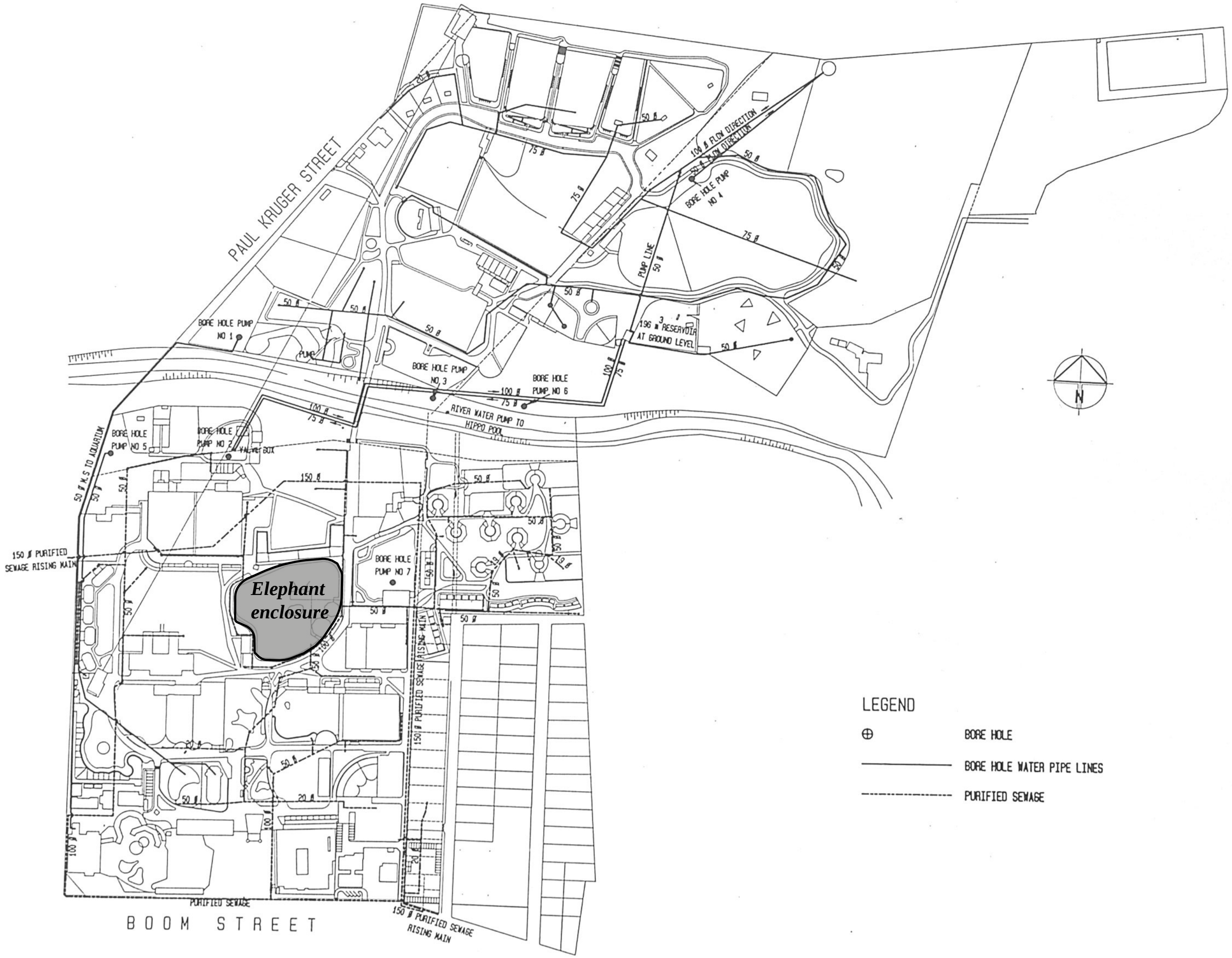


Figure 4.9 Bore Hole map

Storm Water
(Not to scale)

Figure 4.10 Municipal water supply map

Electrical Supply
(Not to scale)

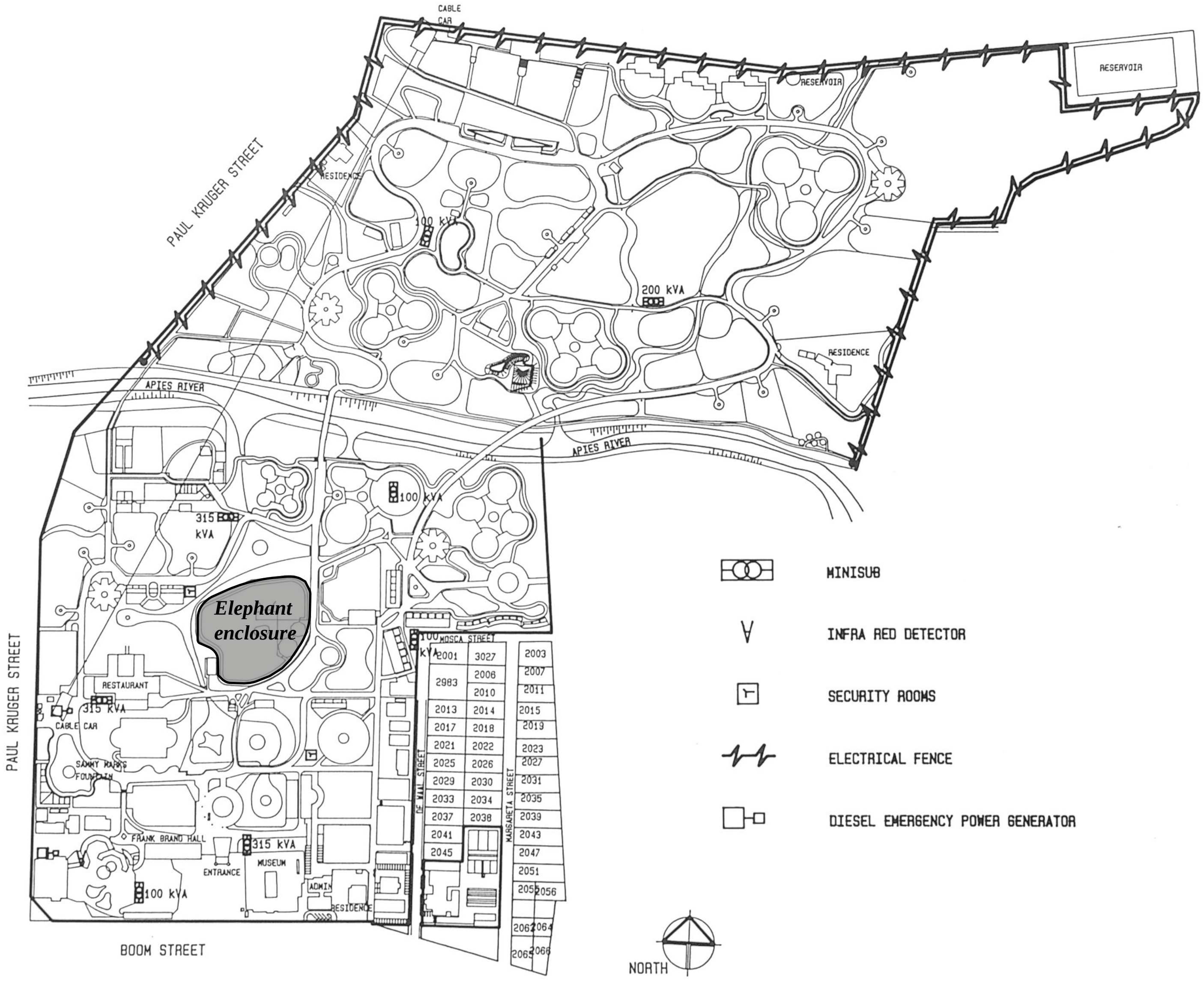


Figure 4.11 Bore Hole map

Ecological Analysis

Soil Survey

The soil survey was undertaken to characterise the soil and other related terrain structures, to be understood in terms of suitability for future landscaping developments.

Soil was classified according to the binomial system for South Africa, and described morphologically. Eighteen soil profiles were specifically chosen and investigated throughout the NZG to derive a detailed soil survey. These eighteen open test pits were excavated by means of a tractor mounted backactor (TLB), and entered by an engineer. The soil profiles were described according to the visual and tactile procedures, including: moisture condition, colour, soil consistency, soil structure, soil type and origin (MCCSSO) (Dry & Joubert Architects, 1991).

Regional Geology

The NZG is situated on recent alluvial and colluvial sands, clays, gravels and residual soils, with quartzite, shale and andesite bedrock underlying at a depth. A diabase sill, spread across east-west in the northern portion of the zoo, is intruded into the sediments.

Bedrock

Outcrop of quartzite bedrock expands along the northern portion of the NZG, with shale and andesite bedrock to the south of the river (Dry & Joubert Architects, 1991).

Soils

Most of the site is covered by transported and residual soils. A thick horizon of made-ground is present along the northern and southern banks of the river. The transported soils are underlain by a well-developed pebble marker horizon which separates them from the underlying residual soils and bedrock (Dry & Joubert Architects, 1991).

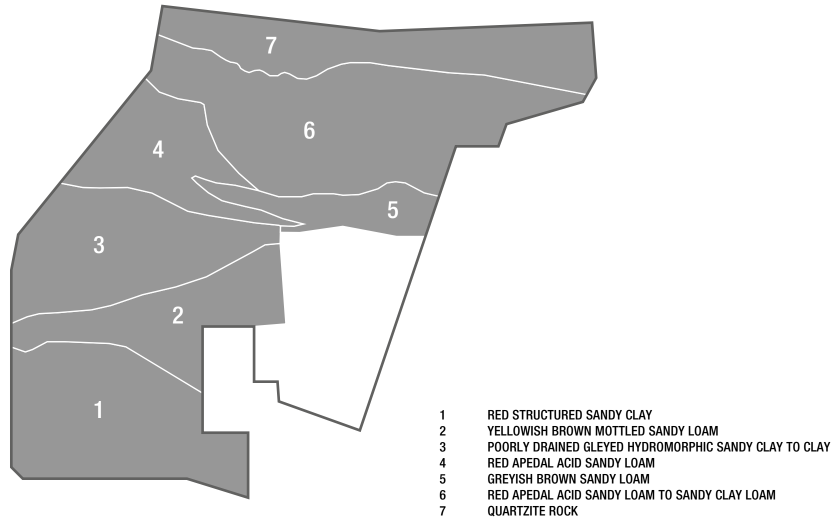
Ground Water

The water table was only encountered at depths of between 1,6 and 2,5m in test pits situated along the southern alluvial floodplain of the Apies River.

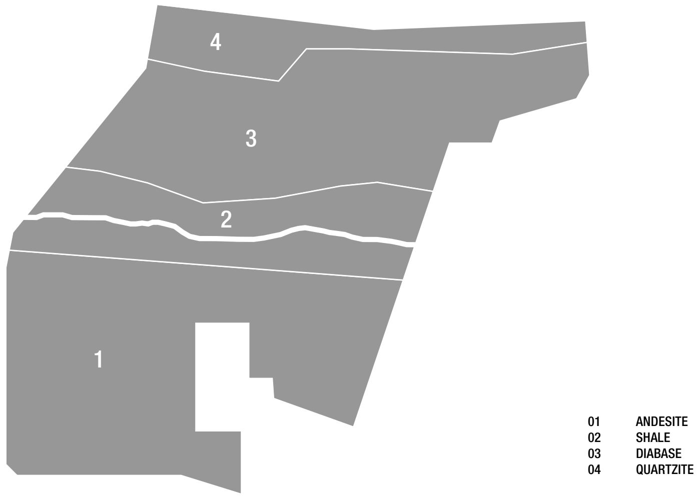
Collapsible Soils

Areas situated near the north-western boundary of the site may encounter potential collapsible soils. Foundations for any structures built in this region should be excavated to a depth of 1,5B, where B is the width of the foundation footing. The excavated material should then be replaced in well-compacted layers, up to the desired foundation depth (Dry & Joubert Architects, 1991).

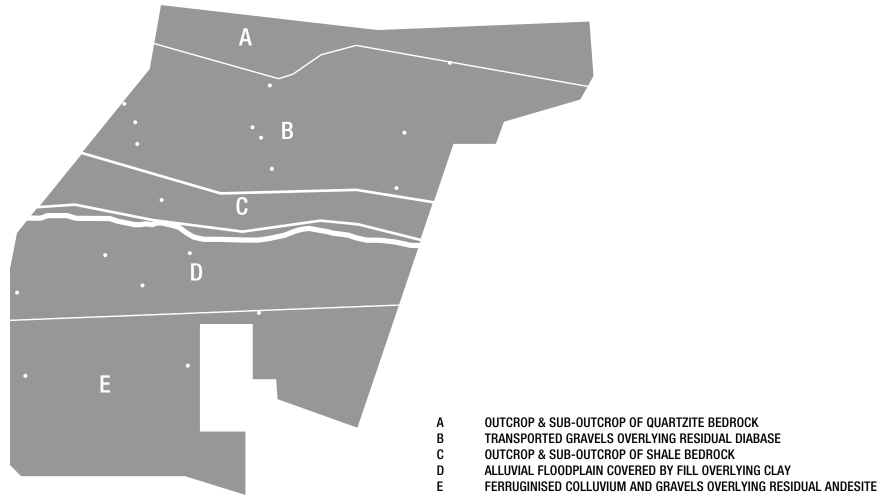
Ecological Analysis Maps



Detail Soil Survey
National Zoological Gardens



Geological Plan
National Zoological Gardens

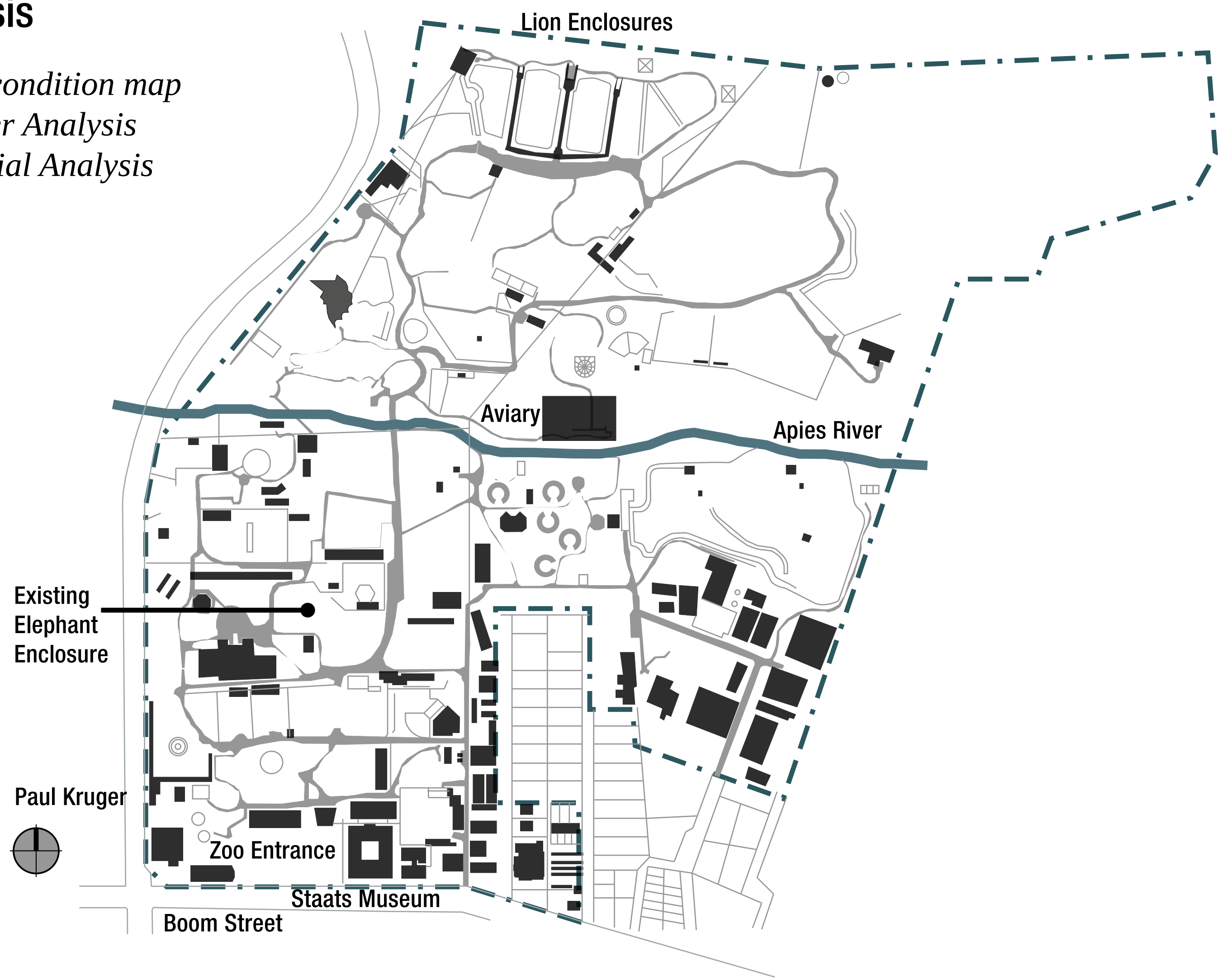


Geotechnical Plan
National Zoological Gardens

Figure 4.12 Map summaries of various ecological conditions

Zoo Analysis

Base condition map
Barrier Analysis
Material Analysis



Latest Enclosure Map

National Zoological Gardens

Figure 4.13 Map summaries of various ecological conditions

Indigenous Animals

01 Leopard
02 African Buffalo
03 Hippopotamus
04 Cape Fur Seal
05 Sable Antelope
06 Lion
07 Wild Dog
08 Black Rhino
09 Giraffe
10 Blesbok
11 African Elephant
12 Plains Zebra
13 Blue Duiker
14 Baboon
15 White Rhino
16 Penguin
17 Cheetah
18 Hyena
19 Ostrich
Sprinkgbok
Impala
20 Kudu

Exotic Animals

01 Axis Deer
02 Mhorr Gazelle
03 Scimitar-horned Oryx
04 Lion-tailed Macaque
05 Hamadryas Baboon
06 Kodiak Bear
07 Takin
08 Tiger
09 Bongo
10 Urial
11 Okapi
12 Red River Hog
13 Chimpanzee
14 Lemur
15 Farmyard
16 Owl
17 Kangaroo
18 Koala Bear
19 Gorilla
20 Reptile Park
21 Aquarium
22 Red Panda

Indigenous Birds

21 Cape Vulture
White-backed Vulture
22 Greater Flamingo
23 Lesser Flamingo
24 Goliath Heron
Sacred Ibis
25 Great White Pelican
Egyptian Goose
Wattled Crane
Blue Crane
26 Southern Ground-hornbill

Exotic Birds

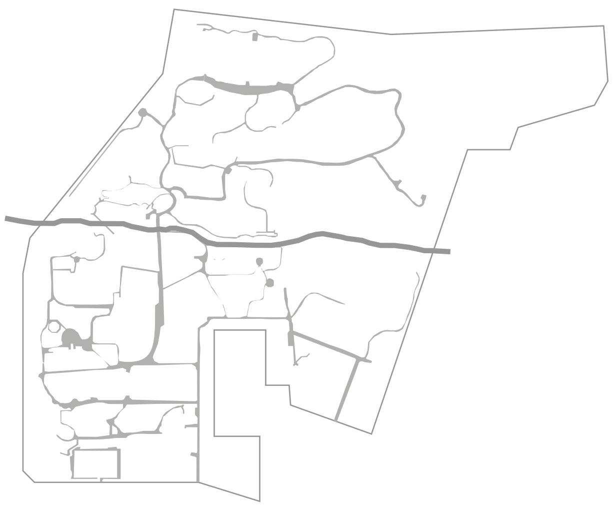
23 Caribbean Flamingo
Chilean Flamingo
24 Sun Conure
Yellow-headed Conure
Waldrapp Ibis
Little Corella
25 Demoiselle Crane
26 Blyth's Hornbill
27 Orange-winged Amazon
Brown-necked Parrot
African Grey Parrot
Red-sided Ecletus Parrot
Abbott's Yellow-crested Cockatoo
Green-winged Macaw
Blue-and-yellow Macaw
Scarlet Macaw
Illiger's Macaw
Major Mitchell's Cockatoo
Blue-fronted Amazon

Animal Catalogue
National Zoological Gardens

Figure 4.14 Map summaries of various ecological conditions

Animal Enclosures
National Zoological Gardens

Accommodation
National Zoological Gardens



Circulation
National Zoological Gardens

Figure 4.15 Map summaries of various spatial conditions

Masterplan

Figure 4.16 Masterplan proposal

Photographic Analysis

Barriers in NZG

Figure 4.17 Photographic collage of various barrier methods in the NZG (Author, 2016).

Photographic Analysis

Material Palette in NZG

Figure 4.18 Photographic collage of different materials and textures found in the NZG (Author, 2016).

Current hippo pool

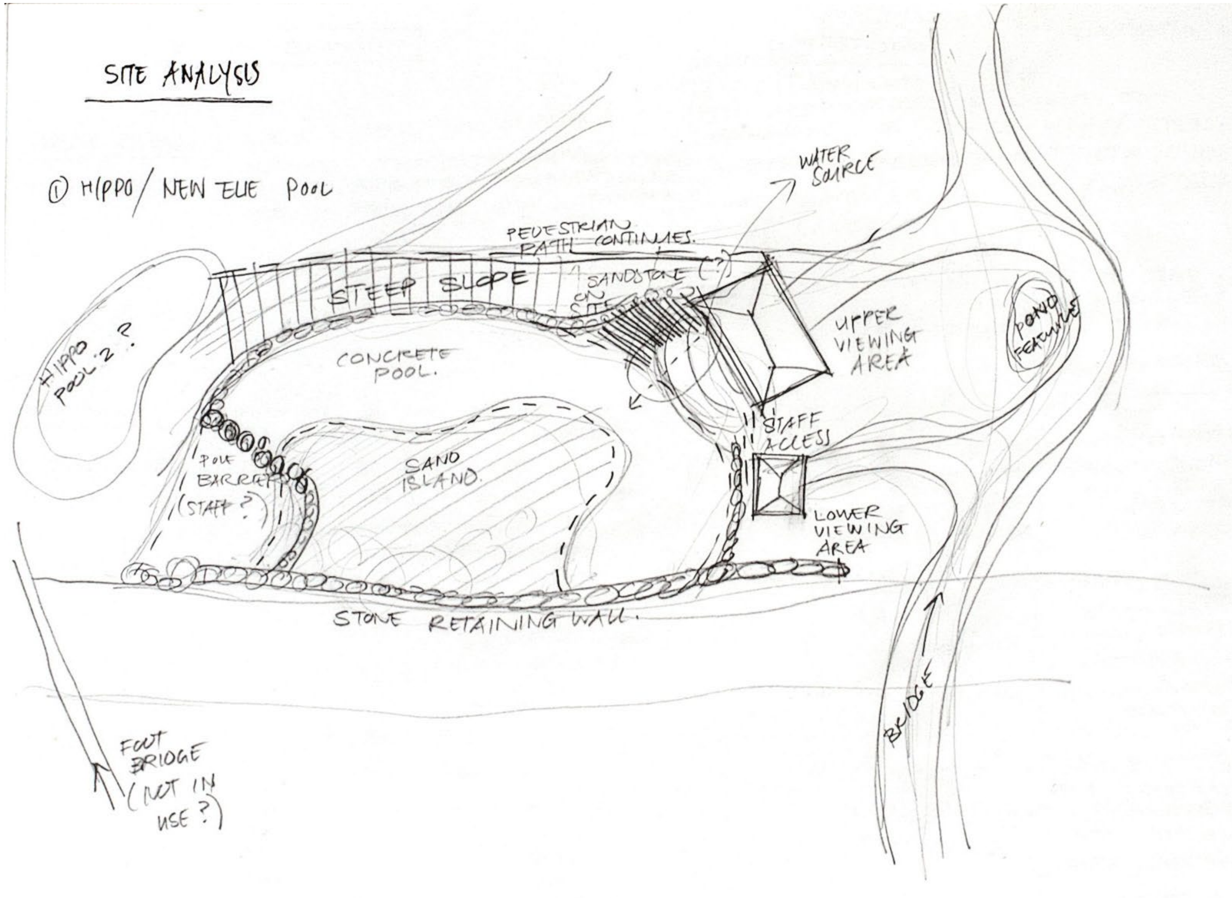


Figure 4.19 Site analysis sketch of current hippo pool to be converted for elephants (Author, 2016).

Existing elephant enclosure critique

Lack of Space

The current enclosure is not compatible for elephants due to the lack of space. The three elephants residing at the zoo do not have the freedom to roam and meander beyond the small confines of their enclosure, despite plenty of wasted and unused space in the zoo. Companionship of other elephants and allowing for a larger herd to live together is also unattainable due to the limited space of the enclosure. Elephants in the wild are typically active for 18 hours a day, most of which is spent roaming vast distances, socialising with their herd, and expressing their natural behaviours such as foraging for fresh food and vegetation, playing, bathing and spraying themselves with water from rivers and waterholes and traveling as far as 50 kilometres (PETA, 2016) – all of which are currently-impossible within their small and unvaried enclosure. Therefore the boundaries of their enclosure need to be expanded drastically while simultaneously giving them the opportunity to explore the varied terrain that the zoo has to offer, with plenty of water sources, ponds, pools, mud wallows, trees and hills, for the sake of their physical and psychological health and well-being (PETA, 2016).

Most elephants living in captivity are deprived of their most basic needs – being able to live in natural, matriarchal herds with extended social relationships, and the freedom to roam long distances, both of which occur naturally in the wild (PETA, 2016). Lack of sufficient exercise and long hours spent each day standing on dry, hard surfaces contribute to their many foot and arthritis problems, the leading causes of their significantly short lifespans as opposed to their wild counterparts. The enclosure consists of only dry, hard compacted earth with no other variation in substrate, contributing to their poor foot health.

Lack of water

Elephants depend greatly on water for drinking, cooling down and for general skin health and hygiene. The apparent waterhole is far too shallow to be used effectively for bathing and cooling; and the actual water itself is dirty and polluted.

The only other water source visible in the outdoor space is a sprinkler on far edge of the enclosure, closer to the building, and does not reach far enough into the enclosure to be of any use to the elephants. Grass growing in the barrier trench is greener and unfortunately out of reach to the elephants.

Mud baths, an option not currently provided, serve as a critical prerequisite for elephants to protect them from the harsh African sun, heat and UV radiation. Aside from cooling them down, mud helps to form a protective barrier from harmful sun rays as their skin is surprisingly sensitive and susceptible to getting sun burnt. In the wild, elephants are used to coating themselves in plenty of mud and dust whilst seeking shade (Witvrouwen, 2012).

Lack of Shade

As neither mud nor loose sand or dust is provided for the elephants to coat themselves, it is intolerable that they do not have ample tree shade or artificial cover either. The only trees found in their enclosure are palm trees which do not provide any shade - despite the abundance of diverse trees found in the zoo, particularly north of the river. To add to the elephants' distress, the large doors to their night houses are closed during the day to force the elephants to remain outdoors for public viewing and amusement – despite their own needs being so blatantly ignored. The extent of the damage from the lack of natural and artificial shade protecting them from direct sunlight, is evident in the severity of their poor skin health.

Lack of stimulation

No attempt of mental or physical enrichment is evident, leaving the elephants looking severely bored and unstimulated. This profound deprivation and lack of stimuli is evident in their repetitive swaying back and forth, an abnormal behaviour indicative of poor welfare and health (San Rafael, 2015).

Elephants feed from hay on the ground. There have been no visible attempts from the staff to design any innovative methods of feeding or devices used that encourage natural foraging behaviours and actions. This is especially unforgiveable as many elephants bred and living in captivity never learn to fully use all the muscles in their trunks, as wild elephants would when searching for food. This may result in them never being able to lift their trunks above their heads and being able to use them to their full potential.

Unsafe Barriers

The current barrier design is dangerous and can lead to potential injuries if an elephant attempted to escape. The barrier trench is built from brick wall construction with electrical fencing along the perimeter; this is problematic due to the small width of the trench, the vertical brick walls and no slope within the trench. Requirements state that any dry moat design should ensure that the trench be wide enough to allow an elephant to turn around and comfortably walk back up the slope without any difficulties or risks of injuries.

Architecture

The only positive feature in the outdoor enclosure is the artificial rocks. Due to their grouping, large size and colouring, they easily resemble the African elephants themselves and help camouflage them as they move through or behind them – but only when viewed from the southern edge of the enclosure. These rocks attempt to function as visual barriers but do not sufficiently provide enough privacy for the elephants to shy away from the public's glare.

Privacy & Noise

The enclosure does little to protect the elephants from any disturbing noises. Elephants have sensitive hearing and can detect sounds as low as 14 to 16 Hz (human low range is 20 Hz); therefore low frequency noise needs to be minimised due to their sensitivity to these sounds.

Photographic Analysis

Current elephant enclosure & barriers

Figure 4.20 Photographic collage of existing elephant enclosure at the NZG (Author, 2016).

Figure 3.1 During the Middle Ages, artists had known of the existence of elephants having heard stories and descriptions from other travellers. Various paintings and illustrations were done based on these descriptions, despite the artists having never actually seen an elephant (Sunny Skyz, 2016).

Figure 4.21 Panorama of the existing elephant enclosure

Figure 4.22 Panorama of the existing elephant enclosure

"At a time of greater awareness of the plight of elephants in the wild, who are dying for the illegal ivory trade, it is shocking that captive elephants continue to suffer and die prematurely at the very zoos that are claiming to help save these species"

-Toni Frohoff, Ph.D.,
Elephant and Cetacean Scientist for IDA.

Figure 4.23 Photo of new site for proposed elephant enclosure (Author, 2016).