

Environmental Management Plan 2020 - 2025



Prepared by the Endangered Wildlife Trust and the Greater Modderfontein Property Umbrella Association

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ACRONYMS

Acronym	Term
AECI	African Explosives and Chemical Industries Ltd (AECI)
АРО	Annual Plan of Operation
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EWT	Endangered Wildlife Trust
FPA	Fire Protection Association in terms of the National Veld and Forest Fire Act (No.1 of 1998)
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographical Information System
GMPUA	Greater Modderfontein Property Umbrella Association
GPAES	Gauteng Protected Area Expansion Strategy
На	Hectares
IDP	Municipal Integrated Development Plan
IUCN	International Union for the Conservation of Nature
MCS	Modderfontein Conservation Society
MOA	Memorandum of Agreement
MOI	Memorandum of Incorporation
MOU	Memorandum of Understanding
NEMA	National Environmental Management Act
NPAES	National Protected Area Expansion Strategy
NPC	Non-Profit Company
NSBA	National Spatial Biodiversity Assessment
РА	Protected Area
SAHRA	South African Heritage Resources Agency
SDF	Municipal Spatial Development Framework
SMME	Small, Micro and Medium Enterprises
SMP	Strategic Management Plan
WfW	Working for Water
WfWet	Working for Wetlands
WoF	Working on Fire

1. Purpose of this plan

Environmental Management Plans (EMP) are strategic documents that provide the framework for the development, management, and monitoring of protected areas. They inform operational management at all levels, from the landowner through to support staff. The purpose of this management plan is to:

- Provide the primary strategic guidance tool for the management and rehabilitation of the Modderfontein Reserve (MR), to ensure that the biodiversity and associated habitats are protected, and that visitors are able to safely enjoy the recreational and ecological benefits of the reserve.
- inform the need for specific programmes and operational procedures.
- provide for capacity building and continuity of management.
- Enable the GMPUA to develop and manage Modderfontein Reserve in such a way that its values and the purpose for which it has been established are protected.
- The purpose of the Modderfontein Reserve Management Plan (MRMP) is to provide guidance and direction for the conservation and rehabilitation of the Modderfontein Reserve (MR) It provides information and protocol around any dangers to human life that may present themselves, for example, veld fires, animal bites and stings, risks associated with recreational activities such as cycling, etc. This will include emergency procedures and contact numbers
- provide a framework to guide and report on various management tools, processes and interventions implemented on the reserve, to generate scientifically robust data, analyse trends and compare to base line recordings. Regular monitoring and evaluation of this plan will determine whether aspects of the management strategy and operations should continue or be adapted based on substantive evidence such as alien species eradication.

Section 1:	Provides an introduction and background to the management plan		
Section 2:	Establishes the context of the Modderfontein Reserve, providing the basis for the strategic and operational management frameworks that follow.		
Section 3:	Sets out the vision and objectives for the reserve		
Section 4:	Describes the environmental characteristics of the reserve and biodiversity and/or ecosystems that require management		
Section 5:	Describes the administrative structure that has been established to assist in managing Modderfontein Reserve		
Section 6:	Sets out the management objectives for the Modderfontein Reserve, and plan to achieve them		
Section 7:	Sets out the implementation and monitoring measures required to determine if management targets are being met.		

Structure of the plan

Section 8:	Describes the components that must be included in the annual
	plan of operation.



Figure 1: Structure of the Management Plan

2. Modderfontein Reserve in context

2.1 Location of the Modderfontein Reserve

The Modderfontein Reserve is located in Modderfontein, in the City of Johannesburg Municipal Area on the East Rand of Johannesburg, Gauteng. The GPS coordinates are: S26°03'59.37" E28°08'00.25". MR is situated on:

- 1. Portion 1 of the farm Longmeadow 296, Registration Division I.R., Province of Gauteng, measuring 247.35(ha), held by Certificate of Registered Title T13870/2013
- 2. Portion 1 of the farm Longmeadow 297, Registration Division I.R., Province of Gauteng, measuring 15,79 ha



Figure 2: Location of Modderfontein Reserve within Gauteng

2.2 Description of the Modderfontein Reserve and its context

Currently, the Modderfontein Reserve consists of approximately 263 ha of land in the AECI land holding. A vast majority of the area is in a disturbed state with approximately 18% being representative of natural vegetation for the area, and the rest containing primarily exotic vegetation and both indigenous and exotic plant species classified as invasive. Some of the more undisturbed grassland areas host various protected and endangered plant species and can be described as ecologically significant.

Within the Modderfontein Reserve there are several habitat types, including open water bodies, wetlands, rocky outcrops, stands of exotic trees, and a variety of different grasslands. The reserve is

also relatively high in the catchment area of the Modderfontein Spruit, which serves as an ecological corridor to other urban open spaces. These connections allow for the extension of habitats beyond the defined boundaries of the Modderfontein Reserve. The reserve's long list of recorded bird species can be attributed both to the availability of diverse habitats within the boundaries of the reserve, and the connection to those outside of them.

However, the Modderfontein Reserve is surrounded by planned and existing developments. These external pressures directly and indirectly affect the reserve, and therefore are considered in management decisions



Figure 3: The Modderfontein Reserve

2.3 The ecological and social value of the Modderfontein Reserve

Gauteng is the smallest province in South Africa, and the most transformed. All this transformation has taken place in one of South Africa's most threatened biomes – the Grassland Biome. Gauteng maintains little pockets of grassland habitat that serve as crucial ecological corridors for the movement of certain threatened species within the province, and Modderfontein Reserve is a steppingstone in this network. The reserve provides a critical green pocket in Gauteng that delivers ecosystem services in the forms of carbon sequestration and provision of oxygen, flood attenuation and social services through activities like Parkrun, picnicking, walking trails and mountain biking. The reserve also has heritage significance and sentimental value to the local community and is useful as an environmental education hub.

2.4 Background

2.4.1 History of the Modderfontein Reserve

In the 1880s there was a rise in the demand for dynamite in the gold mining industry and in 1894, an explosives company was established in Modderfontein by the German De Zuid Afrikaansche Fabrieken voor Ontplofbare Stoffen Beperkt. In 1903, after the Anglo Boer War, the company was passed to the British and became the Nobel Dynamite Trust. In the 1920s African Explosives and the Nobel Trust formed a joint company called African Explosives and Industries Ltd. And registered a formal agreement with the Chamber of Mines for the supply of explosives. In 1932, the construction of an ammonia plant on site saw a significant improvement of ammonium explosives between 1932 and 1942. Due to this development, in 1944, the company changed its name to African Explosives and Chemical Industries Limited. Between 1968 and 1971 there were major advances in technology, resulting in less need for large buffer zones around explosives testing sites (Oryx Environmental, 2005). One such zone was established as the Modderfontein Conservation Park in 1987 (later to become Modderfontein Reserve). It was determined at this early stage that in order for the land to have ecological value, mitigation measures were required to rehabilitate the area after years of mismanagement. In 1993 AECI was restructured and the chemical segment of the business became Kynoch Fertilizer Ltd., and the explosives business AECI Explosives Ltd. The conservation area remained under the management of AECI. The now Modderfontein Reserve was established as the Modderfontein Conservation Park in 1987. It was determined at this early stage that mitigation measures were required to rehabilitate the area due to years of mismanagement.

The Modderfontein Reserve has, for many years, been used for the provision of environmental education programmes catering to school learners and is host to regular nature excursions run by the Modderfontein Conservation Society (MCS).

The Modderfontein Reserve and its immediate surrounds have been owned by African Explosives and Chemical Industries Ltd (AECI) since 1896 to-date and was managed by the former Heartlands Estates, a division of AECI Ltd. In 2011, Heartland Estates approached the Endangered Wildlife Trust (EWT) for aid in the ecological management of the reserve and the EWT began managing the reserve on a full-time basis from 2012 to 2018. Subsequently, the EWT has taken on a more advisory role, with the Developer performing day to day management activities on behalf of the GMPUA.

2.4.2 The roles and responsibilities of the EWT in the Modderfontein Reserve

The EWT is a veritable arsenal of environmental expertise, one of the largest environmental nongovernmental organisations (NGO) in South Africa and highly respected in its field. The organisation is a valuable partner to the reserve, particularly as the EWT Head Office is located across the road from the Modderfontein Reserve and so expert assistance is always on hand

While the day to day management of the reserve was conducted by the EWT's Urban Conservation Programme (UCP), the EWT as a whole consists of various specialised programmes that can potentially contribute significantly to effective long-term management of the reserve and the biodiversity it contains. For example, the Modderfontein Reserve has an abundance of raptors, which presents a wonderful opportunity for bird lovers to frequent the MR. There are, however, many threats to these birds in urban areas, including intentional persecution or poisoning, secondary poisonings should raptors eat poisoned rodents, and collisions with cars and power cables. These threats and their

impact on raptor populations in the reserve need to be carefully monitored and mitigation measures should be implemented and evaluated for their efficacy. The EWT is uniquely positioned to undertake these tasks through their Birds of Prey Programme (BoPP), as well as their Wildlife and Energy Programme (WEP), both of which employ staff with extensive experience in dealing with these issues, and any others that may arise. Similarly, the EWT's Threatened Amphibian Programme (TAP) can provide guidance on any aquatic biodiversity monitoring and water quality assessments. The presence of a pair of Blue Cranes on the reserve is exciting and an indicator that the habitat is improving. The EWT's African Crane Conservation Programme (ACCP) is always on hand for any advice or assistance with crane-related matters.

All monitoring activities that take place on the reserve are guided by the EWT's Conservation Science Unit (CSU), to ensure that methods used are scientifically robust, relevant and conducted ethically. The CSU also employs Global Information System (GIS) experts who can ensure that any spatial representations of the reserve are up to date and accurate. Other EWT programmes that are available to assist where necessary include the Wildlife in Trade Programme (WTP) which deals with wildlife crime such as poaching incidents, of which the reserve has had a few, the Carnivore Conservation Programme (CCP) should any otter or jackal related issues arise, and the Wildlife and Transport Programme (WTP) should there be a need for any studies or mitigation of the impacts that roads may have on wildlife, as the reserve does experience a fair amount of vehicle traffic, particularly over the weekends.

3. Vision and Mission for the Modderfontein Reserve

3.1 Vision

The long-term vision for Modderfontein Reserve is to provide an urban open space that is socially, economically and ecologically sustainable, accessible to all on a controlled basis, and a space for people to connect with nature and embrace the importance of green spaces in our urban areas.

3.2 Mission

The purpose of the Mission is to give effect to the Vision:

- To ensure maximum ecosystem functioning, conservation of biodiversity, and preservation of heritage features in the area, whilst accommodating suitable active and passive recreational and educational usages,
- To proactively ensure that the Modderfontein Reserve is ecologically and economically sustainable by embracing partnerships with and between the surrounding communities and key stakeholders
- Contribute to the long-term connectivity of green spaces in Gauteng as a natural corridor that can maintain gene flow and dispersal, and contribute to carbon sequestration
- To ensure that as far as possible, the Modderfontein Reserve is showcased as an area where best practice methodologies are applied (development, management, and rehabilitation activities) in order to maintain an ecologically fit system
- To ensure, as far as possible, that the Modderfontein Reserve is a safe environment, which can be frequented on a regular basis by the surrounding communities

4. Environmental characteristics of the reserve

4.1 Climate

Gauteng has a temperate climate with average minimum winter temperatures of between 4.0 and 5.5°C, average maximum summer temperatures of between 27.0 and 29.2 °C and is in a summer rainfall area (Natural Resources Atlas, 2006).

Rainfall in the Modderfontein area averages between 600 and 800 mm per year, and predominantly falls between the months of October and March.

4.2 Geology

The geology underlying the Modderfontein Reserve is classified as "Halfway House Granite," consisting of Granite and Migmatite, as well as secondary intrusions of Diabase dykes and sills (Oryx Environmental, 2005). The reserve itself appears to have been bisected by such a Diabase dyke. On closer examination of the geology of Modderfontein Reserve it was found to have sections of Ferricrete as well. The geology of the reserve tends to be visible in small rocky outcrops and scattered boulders.

Such a geological combination produces coarse, shallow soils, but the combination of these and the wetland areas results in quite a diverse array of habitats in the reserve. The soil associated with this geology and landscape is susceptible to erosion and long-term land rehabilitation is necessary for the successful revegetation of indigenous plants in disturbed areas. The presence of weathering Diabase, wet conditions, and abundance of organic matter from exotic woodlands, all contribute towards sections that have higher clay content and that are more fertile.

The elevation of the reserve begins at 1472 m above sea level and at its highest measures 1568 m above sea level.

4.3 Flora

The reserve is situated within the Grassland Biome of South Africa and was classified as Rocky Highveld Grassland by Low and Rebelo (1996) and as Egoli Granite Grassland by Rutherford & Mucina (2006). There is, however, very little natural grassland remaining in the province; a large portion of it was transformed and fragmented by agriculture, industry and development. The reserve has over the years been utilised for various purposes and is adjacent to a factory so has in the altered and disturbed in some way and is covered predominantly in alien vegetation. The area is considered to be a transitional zone between the high inland plateau and the bushveld of the lower inland plateau. Grassland areas are considered to be a fire-maintained vegetation community, without which woody species will invade and transform the area into Savanna.

4.4 Fauna

More than 260 bird species have been recorded on the reserve, including the African Fish Eagle, Long Crested Eagle, Blue Crane, Ovambo Sparrow-hawk and Secretary Bird. The rare Green Sandpiper was recorded in 2015.

The reserve is frequented by both Spotted-necked and Cape Clawless otters, smaller antelope like Steenbok, Common Duiker and Common Reedbuck, and is home to Water Monitors, small carnivores such as Black-backed Jackals, genets and a variety of mongooses, as well as snake species such as Rhinkals, mole snakes and Brown House Snakes.

4.5 Activities available in the Modderfontein Reserve

4.5.1 Birding

The reserve's long and diverse list of birds recorded in the reserve attracts a lot of birders. Four bird hides have been strategically placed along the watercourses and are accessible from the walking trails. Guided walks can be arranged through the Modderfontein Conservation Society.

4.5.2 Walking

The Modderfontein Reserve offers six different walking trails, demarcated by coloured footprint markers, and points of interest are identified along each route. Infographic maps are available for R10.00 each and one can book guided walks through the Modderfontein Conservation Society.

4.5.3 Cycling and running

The Reserve offers various cycling and running routes ranging from 10 km to 40 km, managed by Trailwolf.

4.5.4 Fishing

Fishing is allowed in the reserve strictly on a catch and release basis and requires a permit.

4.5.5 Picnicking

Dam 3, otherwise known as "Fish Eagle Dam", is a designated picnic spot with lapas, an ablution block and braai facilities. This spot is ideal for visitors to the reserve to relax, braai and socialise with family and friends.

4.5.6 Parkrun

Parkrun is a health and fitness initiative which takes place on the reserve and adjacent property every Saturday between 08:00 and 09:00. People have to be enrolled through Discovery to take part in the weekly 5 km run. This initiative creates an opportunity for greater appreciation of our natural environment - resulting in people returning to take part in other activities on the reserve. This particular Parkrun is one of the most popular in South Africa according to their statistics and is managed on a volunteer basis.

5. Administrative structure established to manage Modderfontein Reserve.

The successful operation of the reserve is a direct result of a number of strong partnerships that allow for such a diverse array of activities to run concurrently.

5.1 Institutional framework for Modderfontein Reserve: Organisations and their roles

Organisation	Role
Greater Modderfontein Property Umbrella Association (GMPUA)	GMPUA is the registered Non-Profit Company that serves as the governing body that oversees all management and administrative aspects relating to the common properties in the Modderfontein area and including the Modderfontein Reserve. The members of this NPC is the Developer, AECI, the conservation society and all the surrounding owner's association in the Modderfontein area. The members of this association contribute levies towards the upkeep of the Reserve. The NPC is managed and administered as per the registered MOI.
Taroko Development	Taroko Development is the controlling member of the GMPUA Board and the developer of the surrounding Modderfontein area, and provides assistance to the GMPUA with day to day running and Management of the reserve.
AECI	AECI owns the land the reserve is situated on. The Property Services division of AECI - Acacia (formally a part of Heartland), are custodians of the water bodies on the reserve and conduct the maintenance and management of selected water courses and the dams on the reserve. Represented on the reserve steering committee.
Endangered Wildlife Trust (EWT)	The EWT oversees the environmental management of the reserve and offers environmental expertise, guidance and custodianship where needed.
GEMS	GEMS is an outsourced service provider that has been appointed by the GMPUA and is responsible for financial management, administration and bookkeeping for all reserve transactions, the generation of purchasing orders, payment for services rendered and procurement of goods. GEMS also oversees the Corporate Governing affairs of the GMPUA.
Modderfontein Conservation Society (MCS)	The Modderfontein Conservation Society plays a significant role in reserve operations, as they serve as its eyes, ears and an indispensable historical archive. The society also raises funds for infrastructure development and members volunteer their time and resources to aid in management activities. The Society also plays an important role in monitoring the flora and fauna and specifically alien vegetation.
Imvula security	Imvula is an outsourced security service provider which provides the manpower on the reserve for the following activities: fence patrol, reaction unit and game scouts.

6. Management plan

6.1 Adaptive management

Ecosystem management is a complex and dynamic process that is best achieved using an adaptive management approach. The principle of 'Adaptive Management' (Bell 1984, Walker 1998) is a systematic approach where, based on present and often incomplete knowledge of the operation of the system, clearly defined objectives are established, and the most appropriate management methods are identified, compiled in an Annual Plan of Operation (APO) and implemented to achieve these objectives. The management methods are documented and evaluated, and the results inform the annual review and adaptation of the APO.

The preparation of the Modderfontein Reserve Management Plan (MREMP) has been undertaken based on these guiding principles of adaptive management, and these principles will be integrated into various aspects of reserve management. For example, the eradication of alien and invasive plant species is a mammoth and costly exercise and if easier and more effective methods can be used, resources can be better managed. Monitoring and evaluation will therefore provide substantial evidence for whether a method or practice employed is effective or not. Learning through systematic trial and error is critical for effective management, and this philosophy is integrated into this plan wherever possible.

Adaptive management enables landowners and managers to:

- i. Learn through experience
- ii. Take account of, and respond to, changing factors that affect the biodiversity stewardship site
- iii. Develop or refine management processes
- iv. Adopt best practices and new innovations in biodiversity conservation management
- v. Demonstrate that management is appropriate and effective



Figure 4: The adaptive management cycle (Management Strategy Evaluation, 2009)

6.2 Environmental objectives

The following environmental objectives have been identified for the MREMP:

- 6.2.1 Formulate and implement an action plan for the removal and control of invasive alien plant species areas
- 6.2.2 Prevent loss of topsoil in Modderfontein Reserve
- 6.2.3 Rehabilitate disturbed and degraded areas
- 6.2.4 Manage the risk of uncontrolled fires and identify areas that require fire breaks or planned ecological burns.
- 6.2.5 Reduce disturbance in natural areas of the reserve and rehabilitation of habitats to support populations of indigenous wildlife species for education, biodiversity and leisure purposes.
- 6.2.6 Use the Modderfontein Reserve to conduct applicable research that benefits the reserve as well as students and the broader Gauteng environment
- 6.2.7 Monitor, document and analyse changes in key features, species present and ecosystem services provided in the Modderfontein Reserve resulting from the implementation of the APO.

6.3 Social objectives

The following social objectives have been identified for the MREMP:

- 6.3.1 Provide a safe and accessible urban green space for people to use for approved activities;
- 6.3.2 Ensure for optimal use of the reserve for educational and leisure purposes.
- 6.3.3 Preserve important historical infrastructure and other heritage features in the Modderfontein Reserve

7. Monitoring and evaluation

The section on M&E serves as a means of dialogue on development and its progress between all stakeholders. The following objectives link back to the annual plan of operational (APO), and are accompanied by means of verification identified.

Objective	Key performance indicator	Means of verification
Habitat Management		
Formulate and implement an action plan for the removal and control of invasive and alien plant species.	 Conduct vegetation surveys for absence and presence annually (using line transects and quadrant methods) Map and quantify the amount of hectare cloared per annum 	 Evidence of the control of the five target species and the continued elimination plans. A minimum area of 40 hectares cleared per annum.
Prevent loss of topsoil in Modderfontein Reserve	 Analyse fixed point photography on rehabilitated sites. 	 The surface area of bare soil is reduced to 25% (of the area in 2015, baseline) by 2022 through rehabilitation programmes.

Objective	Key performance indicator	Means of verification
Rehabilitate disturbed and degraded areas	 Measure area taken up by trees and shrubs planted. Monitor the survival rate and potential 	 A maximum of 5 hectares will be replanted with trees and shrubs that used to occur per annum 90% of trees planted survive
Manage the risk of uncontrolled fires and identify areas that require fire breaks or planned ecological burns.	 Quantify the areas exposed to uncontrolled burns during fire season annually by means of map and GPS to quantify size. 	 Area undergoing uncontrolled burns is reduced.
Biodiversity Management		
Reduce disturbance in natural areas of the reserve and rehabilitation of habitats to support populations of indigenous wildlife species for education, biodiversity and leisure purposes.	 Quantify species diversity and population density of identified terrestrial species. Quantify birds recorded on the Reserve by bird groups and Apps. E.g. BirdLasser, Big birding day. 	
Research, monitoring and	evaluation	
Use the Modderfontein Reserve to conduct applicable research that benefits the reserve as well as students and the broader Gauteng environment	 Document the number of approved research proposals by the Research committee. Record the number of attendees at talks and workshops. Maintain a database of research priorities Collate all publications resulting from research on the reserve 	 Number of research permits issued to students as recommended by research steering committee. Number of talks/ workshops that incorporate the reserve regarding research and work done with a target of 3 annually. Number of publications produced using data emanating from research on the reserve with a target of 1 every second year.
Monitor, document and analyse changes in key features of the Modderfontein Reserve resulting from the implementation of the APO.	 Establish and maintain a centralised database of all reserve-related monitoring and research data 	• Database developed to record all habitat and biodiversity data and potential trends to inform the annual review of the APO
Human use and developme	ent	

Objective	Key performance indicator	Means of verification	
Provide a safe and accessible urban green space for people to use for approved activities	 Monitor points of weakness in security measures and address accordingly. Maintain an updated crime inventory 	 Reduction of poaching incidents to by 50% by 2022. Reduction in theft incidents to 0 by 2018 (cable, equipment). Reduction of poaching incidents. 	
	 Keep records of individuals trained on all health and safety procedures 	 All reserve staff, honorary rangers and MCS receive training on health and safety procedures annually. 	
	Keep records of fire drills conducted	 At least two Fire hazard warning drills are conducted annually 	
	 Disaster Management Plan is approved by all stakeholders and implemented. Keep records of individuals trained 	 All reserve staff, honorary rangers and MCS receive training on the disaster management plan annually 	
Ensure for optimal use of the reserve for educational and	 Conduct regular inspections of 	 All infrastructure is clean and functional 	
leisure purposes	 infrastructure. Maintain a database of schools that visit the reserve, and the purpose behind their visit. 	• A minimum number of 12 groups that utilize the reserve annually (birding, school and tourist groups).	
	 Record number of visitors using the reserve through Interpark 	 Number of individuals that visit the reserve within targeted limits. Limits will be revised annually by management. 	
	 Maintain records of Scout activities in the reserve 	 A minimum number of 12 groups that utilize the reserve annually (birding, school and tourist groups). 	
		• A minimum number of 5 major events per annum hosted on the reserve (minimum of 500 people at the event).	

Objective	Key performance indicator	Means of verification
Preserve important historical infrastructure and other heritage features in the Modderfontein Reserve		 No loss of important historical infrastructure, according to Modderfontein Conservation Society baseline assessment in 2015.

8. Annual Plan of Operation

Each year an annual review of the MREMP is conducted in order to achieve the following:

- Finalise the annual report, as part of the annual management plan review.
- As part of the annual review, determine the need to modify any of the management plan's objectives, strategic outcomes, management activities or targets.
- Determine management activities and goals for the coming year, based on the key performance areas set out in the management plan.
- Update the APO in accordance with the findings of the review, revised objectives under key performance areas, and budget allocated for the reserve management each year.



Figure 5: Processes for the implementation of management plans

8.1 Resources and regulations required to implement the management plan

8.1.1 Staff and equipment

MR APO must consider available staff and equipment available to undertake the following activities:

- Administration and management of the site.
- Patrolling of the site and its boundaries.
- An annual burning programme and firefighting response to wildfires.
- An on-going invasive plant species control programme.
- An on-going soil erosion control and rehabilitation programme.
- Ecological monitoring and data capture.
- Maintenance of roads, paths, fences, and water reticulation infrastructure within the site.
- Capture of visitor information and statistics.
- Environmental interpretation and education.

A register of all requirements per activity is required for budget and procurement processes.

8.1.2 Health and safety procedures and regulations

Regulations for the health and safety of staff and visitors are being revised to incorporate considerations regarding the COVID 19 pandemic, and will be displayed at information points as soon as finalised.

8.2 Modderfontein Reserve Annual Plan of Operation

Key Performance Area	Objective	Task	Monitoring	Responsible	Schedule
Habitat Management					
Alien and invasive vegetation control	Formulate and implement an action plan for the removal and control of invasive and alien plant species, and subsequent rehabilitation of disturbed and degraded areas	 Plan control activities according to a grid map, to ensure that monitoring is more accurate (Appendix E: Management Grid for Modderfontein Reserve) Regular monitoring of cleared/treated sites to inform alien eradication strategy (monitor and evaluate for the two-year target) 	 Conduct vegetation surveys for absence and presence annually (using line transects and quadrant methods) 	EWT	Quarterly
		 Removal of Robinia, Black Wattle, Pom Pom weed, Bugweed, Prickly Pear and Syringa Follow up with herbicide on the above species to ensure long-term removal 	 Map and quantify the amount of hectare cleared per annum, as per grid map. 	GMPUA, EWT GMPUA	Jan-Mar Dec
		 Remove selective large pieces of wood to access areas for follow up (some wood to be left to form micro-habitats) Maintain control of other invasive species to prevent re-establishment 		GMPUA GMPUA	June Ongoing
Erosion control and habitat rehabilitation	Prevent loss of topsoil in Modderfontein Reserve	• Maintain erosion "dams" in the three most important erosion sites to prevent loss of topsoil	 Analyse fixed point photography on rehabilitated sites. 	GMPUA	Sept
		 Identify new erosion sites and construct erosion "dams" to prevent topsoil loss 		GMPUA	Aug

MODDERFONTEIN RESERVE | Environmental Management Plan

Key Performance	Objective	Task	Monitoring	Responsible	Schedule
Area					
Habitat Management					
		 Identify new or potential erosion sites by driving or walking around the reserve. 		GMPUA	Ongoing
		 Construct and maintain mitres and culverts on all sand roads to avoid erosion 		GMPUA	Aug
		 Monitor potential eroding and recovering sites 		GMPUA	Ongoing
	Plant indigenous grass, trees and shrubs in the Modderfontein Reserve to replace alien vegetation.	 Revegetate cleared areas accordingly 	 Measure area taken up by trees and shrubs planted. Monitor the survival rate and potential contributing factors. 	GMPUA	
Fire management	Manage the risk of uncontrolled fires and identify areas that require fire breaks or planned ecological burns.	• Service fire fighter units	 Quantify the areas exposed to uncontrolled burns during fire season annually by means of map and GPS to quantify size. 	Contractor	Мау
		• Take the team on fire-fighting courses		GMPUA	May
		 Prepare fire breaks by tractor and brush cutters 		GMPUA	Мау
		 Burn fire breaks to protect key structures and planted trees 		GMPUA	Jun
		 Planned block burns to assist in alien vegetation control and revegetation 		GMPUA	Sep-Oct

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Key Performance	Objective	Task	Monitoring	Responsible	Schedule
Habitat Management					
		 Monitor and identify alien invasive vegetation in burned areas, and prioritise removal 		GMPUA	Sept
Biodiversity Manager	nent				
Habitat for indigenous wildlifeReduce disturbance in natural areas of the reserve and rehabilitation of habitats to support populations of indigenous wildlife 		 Maintain sightings records of indigenous wildlife to inform research priorities and management 	 Quantify species diversity and population density of identified terrestrial species. Quantify birds recorded on the Reserve by bird groups and Apps. E.g. BirdLesser, Big birding day. 	EWT	Ongoing
Research, monitoring	and evaluation				
Research	Use the Modderfontein Reserve to conduct applicable research that benefits the reserve as	 Convene regular Research Steering Committee (RSC) meetings 	 Compile minutes and attendance registers of meetings convened. 	EWT and RSC	Quarterly
	well as students and the broader Gauteng environment	 Identify research gaps and opportunities in a 5-year research plan 	• Maintain a database detailing research priorities.	EWT and RSC	May
		 Circulate research opportunities to academic institutions 		EWT and RSC	July-Nov
		 Facilitate research activities identified by the Research Steering Committee 	• Document the number of approved research proposals by the Research committee.	EWT and RSC	Ongoing

Key Performance Area	Objective	Task	Monitoring	Responsible	Schedule
Habitat Management					
Monitoring and evaluation		 Conduct fixed point photography at identified sites to monitor vegetation changes over time 	 Log quarterly fixed-point records to observe changes in landscape resulting from management actions Establish and maintain a centralised database of all reserve-related monitoring and research data 	EWT	Mar, Jun, Sept, Dec
		 Set up and implement an avifaunal monitoring programme 		EWT	August
		 Investigate the potential for remote monitoring of vegetation 		EWT	September
		 Collect rainfall and temperature data and maintain long-term database 			Daily
		 Monitor birds such as raptors and also do Coordinated Water-bird Counts CWAC 		EWT	Biannual
		 Monitor development in and around reserve 		EWT, GMPUA	Quarterly
Human use and devel	opment				
Safety and security	Provide a safe and accessible urban green space for people to use for approved activities	 Conduct anti-poaching and trespassing patrols to identify and remove snares and implement mitigation measures such as increased security or fixing fences at target areas. 	 Maintain an updated crime inventory and identify points of weakness in security measures 	GMPUA and MCS	Weekly

Key Performance	Objective	Task	Monitoring	Responsible	Schedule
Habitat Management		I			
		 Develop general health and safety regulations and install relevant signs throughout the reserve, and train staff, honorary rangers and MCS on the regulations and procedures. 	 Keep records of individuals trained on all health and safety procedures 	GMPUA	As needed
		 Install a fire hazard warning system to inform visitors of fire danger 	 Keep records of fire drills conducted 		
		 Develop a disaster management plan procedure for the reserve, and install relevant signage in all recreational areas throughout the reserve 	 Disaster Management Plan is approved by all stakeholders and implemented. 	All	
		 Train all reserve staff, honorary rangers and MCS to implement it when necessary, and install relevant signage. 	 Disaster Management Plan is approved by all stakeholders and implemented. Keep records of individuals trained 	All	
Management of recreational spaces, procedures, and infrastructure	Ensure for optimal use of the reserve for educational and leisure purposes	 Maintaining picnic sites and infrastructure 	 Conduct regular inspections of infrastructure. 	GMPUA	weekly
		• Install a fire hazard warning system to inform visitors of fire danger		GMPUA	Мау
		 Maintain public safety and erect signage 		GMPUA	as needed

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Key Performance	Objective	Task	Monitoring	Responsible	Schedule
Area Habitat Management					
		• Establish a school environmental educational programme to host at least 10 groups a year	 Maintain a database of schools that visit the reserve, and the purpose behind their visit. 	EWT, MCS, and GMPUA	Ongoing
		• Develop innovative, interactive and informative programmes and displays that will enhance the understanding of the ecological functions of the Modderfontein Reserve in the context of an urban environment;	 Record number of visitors using the reserve through Interpark 	EWT, MCS, and GMPUA	Ongoing
		• Engage with scout groups to encourage them to visit the reserve and conduct activities on MR	 Maintain records of Scout activities in the reserve 	Scout warden	Ongoing
		Clean and maintain EC and lapa		GMPUA	Fortnightly
		Maintain walking trails		GMPUA	Fortnightly
		 Monitor and advise on impacts of development in surrounding areas 		EWT and GMPUA	Ongoing
		• Fishing permits		GMPUA	Ongoing
		 Convene meeting with Honorary Rangers to plan activities for the upcoming year 		EWT	Feb
	Preserve important historical infrastructure and other heritage features in the Modderfontein Reserve	 Identify and map all historical features 		MCS and AECI	Ongoing

9. Definitions of terms

Term Definition		
Alien species	Species or genotypes, which are not indigenous to the MR and the surrounding area including, hybrids and genetically altered organisms.	
Biodiversity	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems (as per the National Environmental Management: Biodiversity Act, 2004 [Act No. 10 of 2004]).	
Bioprospecting	In relation to indigenous biological resources, means any research on, or development or application of, indigenous biological resources for commercial or industrial exploitation, and includes – the systematic search, collection or gathering of such resources or making extractions from such resources for purposes of such research, development or application (as per the National Environmental Management: Biodiversity Act, 2004 [Act No. 10 of 2004])	
Buffer zone	An area surrounding a protected area that has restrictions placed on its use or where collaborative projects and programmes are undertaken to afford additional protection to the nature reserve.	
Co-management	The term 'Co-management' must be understood within the context of Section 42 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003).	
Cultural heritage	As defined in Article 1 of the World Heritage Convention (UNESCO) 1972, 'cultural heritage' is considered as "monuments, architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of () value from the point of view of history, art or science, groups of buildings, groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of significance from the point of view of history, art or science, sites, works of man or the combined works of nature and man, and areas including archaeological sites which are of () value from the historical, aesthetic, ethnological or anthropological point of view." For the purpose of this IMP, living heritage features such as mountains, pools, rivers, boulders, etc. as well as palaeontological features are included under this definition.	
Ecotourism	The travel to natural areas to learn about the way of life and cultural history of people, the natural history of the environment, while taking care not to change the environment and contributing to the economic welfare of the local people (adapted from a definition of ecotourism by Hecto Ceballos Lascurain).	
Ecological integrity	The sum of the biological, physical and chemical components of an ecosystem and its products, functions and attributes (as per the National Environmental Management: Protected Areas Act, 2003 [Act No. 57 of 2003]).	
Ecosystem	A dynamic complex of animal, plant and micro-organism communities and their non- living environment interacting as a functional unit (as per the National Environmental Management: Protected Areas Act, 2003 [Act No. 57 of 2003]).	

Term	Definition
Ecosystem services	 As defined in Section 1 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) as "environmental goods and services" meaning: a. Benefits obtained from ecosystems such as food, fuel and fibre and genetic resources. b. Benefits from the regulation of ecosystem processes such as climate regulation, disease and flood control and detoxification. c. Cultural non-material benefits obtained from ecosystems such as benefits of a spiritual, recreational, aesthetic, inspirational, educational, community and symbolic nature;"
Environmental degradation	The deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the loss of species or undesirable reduction of species population numbers from a specific area from an environmental health perspective
Indigenous species	In relation to a specific protected area, means a species that occurs, or has historically occurred, naturally in a free state of nature within that specific protected area, but excludes a species introduced in that protected area as a result of human activity (as per the National Environmental Management: Protected Areas Act, 2003 [Act No. 57 of 2003]).
Invasive species	Means any species whose establishment and spread outside of its natural distribution range –
	a. Threaten ecosystems, habitats or other species or have a demonstrable potential to threaten ecosystems, habitats or other species.b. May result in economic and environmental harm or harm to human health.
	(As per the National Environmental Management: Protected Areas Act, 2003 [Act No. 57 of 2003]).
Joint management	The agreed co-ordination of management and/or management actions by landowners and/or mandated managers on their individual or combined properties in order to achieve common management objectives.
Local community	Any community of people living or having rights or interests in a distinct geographical area (as per the National Environmental Management: Protected Areas Act, 2003 [Act No. 57 of 2003]).
Management	In relation to a reserve, includes control, protection, conservation, maintenance and rehabilitation of the reserve with due regard to the use and extraction of biological resources, community-based practices and benefit sharing activities in the area in a manner consistent with the Biodiversity Act (as per the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
Monitoring	The collection and analysis of repeated observations or measurements to evaluate change in status, distribution or integrity in order to track the impacts of directed management implemented to achieve a stated management objective.
Neighbouring community	the communities and people permanently living in the local municipal area/s bordering onto the reserve.

Term	Definition		
Natural heritage	As defined in Article 2 of the World Heritage Convention (UNESCO) 1972 'natural heritage' is as: "natural features consisting of physical and biological formations or groups of such formations, which are of () value from the aesthetic or scientific point of view, geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of () value from the point of view of science or conservation, natural sites or precisely delineated natural areas of () value from the point of view of science of this IMP, this would include the required ecological integrity of the protected area for the production of ecosystem services.		
Partnerships	A co-operative and / or collaborative arrangement between the landowners / reserve management / and a third party that supports the achievement of the reserve management objectives.		
Protected areas	Means any of the protected areas referred to in section 9 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003).		
Stakeholders/ interested parties	These are interested individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public. According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), "stakeholder" means a person, an organ of state or a community contemplated in section 82 (1) (a), or an indigenous community contemplated in section 82(1) (b).		
Surveillance	The collection and analysis of single or repeated measurements to establish status or distribution or integrity at a point in time in the absence of a specific management context or objective.		
Sustainable	In relation to the use of a biological resource, means the use of such resource in a way and at a rate that would not lead to its long-term decline; would not disrupt the ecological integrity of the ecosystem in which it occurs; and would ensure its continued use to meet the needs and aspirations of present and future generations of people (as per National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).		

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Appendix A: Modderfontein Reserve Management – Rules & Regulations

Modderfontein Reserve is intended to be an urban open space, which is socially, economically and ecologically sustainable. It is therefore intended to find a balance between ecosystem functions with active and passive recreational and educational usage, while also recognising the heritage features in the Reserve.

In order to ensure that the above vision is realized and to ensure a safe and joyful visit to the reserve, kindly adhere to the following rules and regulations. Transgression of these rules and regulations, as summarized below, may result in prosecution and or penalties.

- 1. CONSERVATION FEES: Daily conservation fees are payable by each visitor before entering the reserve.
- 2. THE MAXIMUM SPEED LIMIT Please take careful note of the speed limits applicable in the various areas of the reserve. The speed limit is 40km per hour unless otherwise stated.
- 3. DRIVE SAFELY General rules of the road apply within the reserve. It is an offence to drive on any road without a recognized driver's license or under the influence of alcohol. Driving or operating any vehicle in a reckless or negligent manner or in a deliberate disregard for the safety of a person, animal or property is a serious offence.
- 4. ADHERE TO GATE TIMES Gate times must be strictly adhered to.
- 5. The reserve borders a NATIONAL KEY POINT, and very strict procedures, as signposted, apply in certain areas.
- 6. DRIVING AREAS Vehicles must remain on the designated roads at all times and off-road driving or driving on closed or no-entry roads is a serious offence.
- 7. WALKING AREAS Walking trails are provided throughout the reserve and must be adhered to at all times so as to avoid disruption of vegetation and animal communities.
- 8. CYCLING AREAS Cycling trails are provided throughout the reserve and must be adhered to at all times so as to avoid disruption of vegetation and animal communities.
- 9. SCIENTIFIC RESEARCH AREAS Walking and cycling through these areas is prohibited unless it is for scientific purposes and under the guidance of an authorized individual.
- 10. FEEDING OF WILDLIFE IS PROHIBITED The feeding or intentional disturbance of wildlife is a serious offence. By feeding any wildlife you are potentially signing their death warrant, as they may become dependent on humans and can become aggressive and dangerous, and thus have to be exterminated. This includes all bird species.
- 11. FLORA & FAUNA No plant, animal, wildlife or any natural or cultural items may be removed from the park without permission. To cut, damage, destroy or be in possession of any plant or part thereof, including dry wood or firewood is a serious offence. Importing of any specimen of an alien or listed invasive species into the reserve is prohibited.
- 12. PETS No pets (dogs, cats, birds or any other) may be brought into a Park. Guide dogs for visually impaired guests are one exception, but only in consultation with reserve management.
- 13. LITTER-FREE ZONE Littering is prohibited. Depositing or leaving of any litter except in receptacles provided for that purpose will result in a fine
- 14. DECLARE FIREARMS AT GATE All firearms/dangerous weapons of any sort, any explosive, trap or poison must be declared upon entry.

- 15. NO KILLING OF ANIMALS Poaching, killing, injuring and persecution or disturbance of animals is strictly prohibited
- 16. FIRE HAZARD Starting or causing of any fire, whether it be intentional or unintentional, other than with prior consent from reserve management and in a fireplace or container purposely made available.
- 17. SMOKING Please take note of the smoking regulations applicable in the reserve. Smoking may only take place in DESIGNATED SMOKING AREAS
- 18. BEHAVIOUR Behaving in an offensive, improper, indecent or disorderly manner including the playing of any radio, compact disc player, music system, musical system or instrument, or in any way cause of any noise in any manner likely to disturb any species or specimen or other person is strictly prohibited and will be fined if not adhered to. The hindering, intimidating or obstructing of an authorized official in the execution if his/her duties or the performance of his/her functions will not be tolerated.
- 19. VANDALISM Buildings and sites of historical and cultural value exist within the reserve and these must be treated with respect at all times. Vandalism of any buildings or infrastructure is strictly prohibited.
- 20. FISHING Fishing in any of the dams or bodies of water within the reserve is strictly controlled and is on a catch and release basis only. Fishing permits must be obtained through Reserve Management.
- 21. SWIMMING Swimming or wading in any of the dams or bodies of water within the reserve is strictly prohibited unless doing so is necessary to fulfil a prescribed management objective.
- 22. BOATS The use of boats of any kind in any of the dams or bodies of water within the reserve is strictly prohibited unless doing so is necessary to fulfil a prescribed management objective or an agreement has been made with reserve management.
- 23. WASHING Washing of clothes, dishes, or any item (This includes one's body), in any of the dams or bodies of water within the reserve, is strictly prohibited

Appendix B: Legislation pertaining to fire management

National Veld and Forest Fire Act 101 of 1998

Purpose

'The purpose of the Act is to prevent and combat veld, forest and mountain fires throughout the Republic.''

Firebreaks

In terms of section 12 and 14 every landowner must prepare and maintain a firebreak as determined in section 13. Failure to do so is an offence in terms of section 25(3), unless he has been exempted by the Minister in terms of section 15.

Fire-fighting preparedness

There is also a further duty on landowners to have equipment, protective clothing and trained personnel available in the eventuality that there may be fire on their property (section 17). Failure to meet this requirement is an offence in terms of section 25(4) of the Conservation of Agricultural Resources Act, 1983 (No 43 of 1983).

Legislation pertaining to alien species

CARA is an act of the National Department of Agriculture and makes provision for the conservation of the natural agricultural resources of South Africa through:

- Maintaining the production potential of land;
- Combating and preventing erosion;
- Preventing the weakening or destruction of water sources;
- Protecting the vegetation; and
- Combating weeds and invader plants.

Appendix D: Legislation regarding removal of alien vegetation

There are three categories of alien and invasive species (according to the Conservation of Agricultural Resources Act (CARA) Act 43 of 1983:

Category 1 – Declared weeds: Prohibited plants, which must be controlled or eradicated (except in dedicated areas) that serve no economic purpose and are possibly harmful to humans, animals and the environment (Bromilow, 2012). E.g. Pompom weed (*Campuloclinium macrocephalum*)

Category 2 – Declared invader plants with a commercial or utility value: Plants that possess certain useful properties, such as soil stabilisation, fodder etc. "Allowed in demarcated areas under controlled conditions and in biocontrol reserves" (Bromilow, 2012). E.g. Black Wattle (*Acacie mearnsii*)

Category 3 – Mostly ornamental plants: Proven invaders, of which no further planting is allowed, except with special permission, and trade in propagative material is prohibited. "Existing plants may remain (except those within the flood line of watercourses or wetlands or as directed by the executive officer) but must be prevented from spreading" (Bromilow, 2012). E.g. Jacaranda (*Jacaranda mimosifolia*)

Alien / Invasive Species	Common name	Category	Control Method Recommended
Robinia pseudoacacia	Black Locust	2	Foliar application (Spray) for < 2 m; Popping/ Cut Stump for > 2 m
Campuloclinium macrocephalum	Pompom Weed	1	Foliar application (Spray). To experiment with bio control
Acacia mearnsii	Black Wattle	2	Foliar application (Spray) for < 2 m; Popping/ Cut Stump for > 2 m
Solanum mauritianum	Bugweed	1	Popping (mechanical removal) and follow up or cut-stump method using <i>Tricopyr</i> in the form of <i>Timbrel</i>
Cirsium vulgara	Spear Thistle	1	Foliar application (spray)
Opuntia ficus-indica	Sweet Prickly Pear	1	Chemical control with MSMA or Glyphosate. Preferably biological control only for established populations
<i>lpomea</i> sp.	Morning Glory	3	Mechanical removal
Pennisetum clandestinum	Sweet Prickly Pear	1	Foliar application (spray)
Tagetes minutal	Khakibos	-	Foliar application (spray) pre- and post- emergence
Bidens bipinnata /B. pilosa	Black Jack	-	Mechanical removal

Table 1: Control methods for common alien and invasive species

Alien / Invasive Species	Common name	Category	Control Method Recommended
Mimosa pigra	Giant Sensitive tree	3	Mechanical removal or foliar application with glysophate
Populus X canescens	Grey Poplar	2	Foliar application
Eucalyptus spp.	Blue gum species	2	Cut stump
Solanum incanum	Thorn Apple/Bitter Apple	1	Cut stump and popping
Melia azedarach	Seringa	3	Cut stump
Phragmites australis	Common Reed	-	Mechanical removal
Arundo donax	Giant Reed	1	Foliar application
Pinus spp.	Pines	2	Cut stump method



Appendix E: Management Grid for Modderfontein Reserve

Appendix F: Species lists (plants, birds, mammals, Herpetofauna)

To be finalised