DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM for the Proposed Expansion of the Pietermaritzburg Airport

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Institute of Natural Resources

Environmental Management Program for the Proposed Expansion of the Pietermaritzburg Airport

DRAFT REPORT FOR COMMENT

Prepared for

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LIST OF ACRONYMS

CAA	Civil Aviation Authority
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GA	General Aviation
GNR	Government Notice Regulation
ha	Hectares
I&AP`s	Interested and Affected Parties
ICAO	International Civil Aviation Organization
ICT	Information and communications technology
INR	Institute of Natural Resources
MM	Msunduzi Municipality
NCAP	National Civil Aviation Policy
NEM: BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
NPC	Non Profit Company
NWA	National Water Act
PMB	Pietermaritzburg
SACAA	South African Civil Aviation Authority
SANRAL	South African National Roads Agency
SPLUMA	Spatial Planning and Land Use Management Act
WULA	Water Use License Application

1. INTRODUCTION

1.1. Background

Pietermaritzburg Airport (previously known as Oribi Airport) owned by the Msunduzi Municipality (MM) serves the city of Pietermaritzburg and surrounds as well as the outer west suburbs of Durban. To improve the service provision and effectively meet the increasing growth in passenger and cargo volumes and air traffic movements, the MM has proposed the expansion of the Pietermaritzburg Airport. The Institute of Natural Resources NPC (INR) an Independent Environmental Assessment Practitioner (EAP) was appointed by MM to prepare the application and manage the associated EIA process as per the Environmental Impact Assessment (EIA) Regulations of December 2014. The Environmental Impact Assessment Report (EIR) details the proposed project and the associated impacts. In terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), the EIR is essentially supported by an Environmental Management Programme (EMPR) demonstrating the management of the associated environmental impacts identified during the scoping phase, throughout the life span of the project. This Environmental Management EMPR ensures EIA operates and develops the airport in an environmentally sound and responsible manner.

PURPOSE OF THIS EMPR

The purpose of the EMPr is to support the sustainable development of the proposed expansion of the airport by prescribing management and mitigation measures to limit the negative impacts of the associated construction and operations on the receiving environment and optimize the beneficial aspects of the project.

1.2. EMPR Approach and Structure

This section summarises the guiding principles applied in the development of this EMPR and documents the approach taken, also referencing the basis for the approach.

1.2.1. Principles

The following principles have been applied in developing the EMPR and also have relevance to the application of the EMPR over the project life cycle.

i. The EMPR is a Living Document

Factors such as technology, market drivers and legislation change over time and affect how a project is undertaken. The EMPR needs to adjust accordingly to ensure that management measures remains relevant and achieve the objectives. It is for this reason that the EMPR is compiled at a relatively high level, providing the guidance for specific management plans and actions that need to be established.

ii. Environmental Understanding

The EMPR considers impact across the full spectrum elements that comprise the receiving environment. This includes the:

- Biophysical Environment: terrestrial (grasslands and forests) and aquatic (streams, rivers, and wetlands).
- Socio-cultural environment: the residential areas, educational institutions, health centers, places of worship, recreational facilities and cultural heritage.
- Economic Environment: the Central Business District (CBD), industrial and commercial entities.

iii. Implementation

The mitigatory measures in this EMPR are binding to all contractors throughout the life cycle of the project from the construction phase of the proposed development to the operational phase.

1.2.2. Structure

The management programme is structured to account for impacts on the affected components of the receiving environment across all phases of the project life cycle. The approach to the management plan is an 'objectives based approach". This involves setting objectives for each impact identified and indicators that form the basis for monitoring and reporting against the objectives to inform ongoing improved management. Guidelines are then provided for the development of the specific management plans, actions by the various actors responsible for the different phases i.e. project manager, principal contractor and sub-contractors.

- **Identification of environmental aspects**

  The environmental aspects addressed in this EMPR were identified through a review of proposed development activities and specific operations with potential risk to create impacts, considering the current airport environment and surroundings and concerns raised by the Interested and Affected parties (I&APs) during the scoping phase. Aspects deemed to have a significant potential for impact for the stakeholders (internal and external) became the basis for this EMPR.

- **Planning and design Phase**

  Mitigation measures for the planning and design phase have not been included in this EMPr as they were integrated into planning process. The process included a high level evaluation of the potential impacts of the designs and layouts, the recommendations were incorporated to inform and refine the final layout of the proposed development.

- **Construction and Operational Phase**

  This section of the EMPr provides management principles for the construction and operational phase of the project. The bulk of the environmental impacts occur during this phase, therefore environmental actions, procedures and responsibilities required during the construction phase and specific guidance related to the long-term operational activities at the airport.

Table 1 below, summarises the report structure

Table 1 Report structure

CHAPTER	CONTENT
1	Introduction
2	Project description
3	Overview of the receiving environment
4	Impacts identified
5	Implementation
6	The Management plan
7	References
8	Appendices

1.2.3. Content

Table 2 guides where the requirements for the content of an EMPR as outlined in the NEMA EIA Regulations of December 2014[1] have been addressed.

Table 2 Contents of the EMPR as per the EIA Regulations of 2014

REQUIREMENTS OF THE REGULATION	SECTION IN REPORT
Details and CV of the EAP who prepared the EMPR.	Appendix A
A detailed description of the activities to be undertaken as part of the project	Section: 2
A map of the project elements overlaid on the receiving environment.	
A description of the impact management objectives, identifying the impacts and risks that need to managed and mitigated for each pages of the project.	Section: 6
A description and identification of the impact management outcomes.	Section: 6
A description of the management actions proposed for achieving the objectives.	Section: 6
The method for monitoring the impact of the activities.	Section: 5.2
The frequency of the monitoring the impact management activities.	Section: 5.2
The time periods within which the impact management activities must be implemented.	Section: 6
The method for monitoring the impact of the activities.	Section: 6
The time periods within which the impact management activities must be implemented.	Section: 6
A programme for reporting on compliance.	Section: 6
An environmental awareness plan describing how staff will be informed about the environmental risks and how they will be dealt with.	Section: 5.1

1.3. Legal Compliance

The legal requirements in the preceding sections are specific to NEMA and the EIA regulations, under which an EMPR is required. Environmental management however takes place within a much broader legal and policy context. This includes a hierarchy of National and Provincial legislation and their associated regulations, as well as land-use planning which falls within the jurisdiction of Local

[1] National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014. GN 328282, issued 4 December 2014 Appendix 4.

Government. This section describes the purpose of the relevant legal requirements with a summary of the specific requirements for the projects defined in Table 3 below.

1.3.1. Legislation

- **The National Environmental Management Act No. 107 of 1998**
  The National Environmental Management Act No. 107 of 1998 (NEMA) is the parent statute under which a suite of environmental laws and regulations have been developed. NEMA provides principles and guidelines to be considered in environmental planning and development.

- **National Water Act (NWA) No. 36 of 1998**
  The Act provides for water resource planning, the classification of water resources and setting of associated management objectives, the prevention and remedy of pollution and emergency incidents.

- **National Environmental Management: Waste Act, No. 59 of 2008**
  The Act regulates waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

- **Environmental Conservation Act, (ECA) No. 73 of 1989**
  The Act provides for the effective protection and controlled utilization of the environment.

- **National Environmental Management: Biodiversity Act, (NEM: BA) No. 10 of 2004**
  The Act makes provision for the management and conservation of biodiversity within the framework of the NEMA of 1998 to maintain their ecological integrity.

- **National Heritage Resources Act (NHRA) No. 25 of 1999**
  The Act provides for the nurturing, protection, conservation and management of heritage resources and conservation-worthy areas by local authorities so that they may be bequeathed to future generations.

- **Spatial Planning and Land Use Management Act (SPLUMA), No. 16 of 2013**
  The Act provides a framework for spatial planning and land use management and specifies the relationship between the spatial planning and the land use management system and other kinds of planning.

- **Civil Aviation Act No. 13 of 2009**
  The CAA provides for measures directed at more effective control of the safety and security of aircraft, airports and the like. Section 155(m)(iv) makes provision for the general operating rules, flight rules and air traffic rules in respect of civil aviation, including the prevention of nuisances arising from air navigation and aircraft establishments, including the prevention of nuisance due to noise or vibration originating from the operation of machinery in aircraft on or above airports.

1.3.2.Regulations

- **The National Environmental Management Act, EIA Regulations 2014**
- **EIA Listed Activities**

Table 3 below gives an overview of the project specific identified listed activities *"that may have a substantial detrimental effect on the environment"* as per Listing Notice 1, an 3. These activities triggered the EIA process in terms of Section 25 of the NEMA.

Table 3 Listed activities applied for

Listing Notice 1 – GNR 983 – Activities Requiring that a Basic Assessment process if followed		
Activity	**Description**	**Relevant Activity**
19	*The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse;*	*Construction of the new access road from Market road at the point the railway line crosses the stream/riparian area.*
27	*The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation*	*Development of combined new infrastructure on grassed areas.*
61	*The expansion of airports where the development footprint will be increased.*	*Expansion of an airport; Any of the new planned infrastructures will result in physical alteration beyond the existing footprint.*
Listing Notice 2 – GNR 984 – Activities Requiring that an Environmental Impact Assessment process if followed		
Activity	**Description**	**Relevant Activity**
15	*The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii)maintenance purposes undertaken in accordance with a maintenance management plan.*	*Expansion of an airport; Any of the new planned infrastructures will result in physical alteration beyond the existing footprint.*
Listing Notice 3 – GNR 985 – Activities Requiring that an Environmental Impact Assessment process if followed		
Activity	**Description**	**Relevant Activity**
12(b) xi & xii	*12 The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (b) In KwaZulu-Natal: (xi) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose;*	*The clearance of an area of more than 300m^2 of indigenous vegetation in an area reserved for conservation use.*
14 (iii) and (xii) *14 (d)*	*14 The development of- (iii) bridges exceeding 10 square metres in size; (xii) infrastructure or structures with a physical*	*Construction of the new access road from Market road at the point the railway line crosses the stream/riparian area, particularly*

(viii)	*footprint of 10 square metres or more;* *14 The development of-* *(d) In KwaZulu-Natal:* *(viii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;*	*bridges and infrastructure.*

- **The Civil Aviation Regulations**

  The Civil Aviation Regulations, 2011 Part 139.02.25 provides for the maintenance of aerodrome environment management programme in accordance with the provisions of the Environment Conservation Act, 1989 and the regulations made thereunder.

- **International Civil Aviation Organization (ICAO) codes**

The ICAO provides a range of standards, policies and guidance for the application of integrated measures to address aircraft noise and engine emissions embracing technological improvements, operating procedures, proper organization of air traffic, appropriate airport and land-use planning, and the use of market-based options.

- **ICAO Annexure 16** has a set of Standards and Recommended Practices (SARPs) for Environmental Protection. It further makes reference to applicable ICAO documentation dealing with the management of environmental impacts from aviation and associated activities.

- **ICAO: Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes**

The guidelines provides airport operators, air navigation service providers and other stakeholders with environmental assessment guidance to support decision making when analysing proposed air traffic management (ATM) operational changes. The guidance provides high-level environmental assessment principles intended to facilitate the use of a consistent approach for assessing the environmental impacts of operational changes.

1.3.3. Policy Framework

- **Climate Change Policy**

  The Climate Change Policy for Msunduzi Municipality of 2014[1] primarily provides a well-defined direction for responding to climate change risks and challenges. The main goal is to ensure that Msunduzi`s Carbon footprint is reduced and the city is able to adapt to climate change related impacts and ensure the availability of preferences when decisions need to be made regarding adaptation and mitigation. The relevance, effectiveness and implementation of this policy is managed through on-going monitoring, evaluation and review to ensure it reflects the most recent developments in climate change science and technology, and delivers on the Municipality`s statutory responsibilities.

- **Environmental Management Framework**

[1] Climate Change Policy for Msunduzi Municipality, 2014

The gazetting and adoption of the Msunduzi Municipality Environmental Management Framework (EMF) of 20101 as per Chapter 8 of the EIA Regulations of 2014 promulgated in terms of NEMA brings Listing Notice 3, GNR 985 into effect. In principle, the EMF informs development planning that supports sustainable development within the Municipality. Through specialist studies, it provides a good indication of the existing environmental conditions within the municipal area. Its broad objectives include the identification of opportunities and constraints that guide site specific studies such as EIA and will also be used to inform decision making and the development application process for the proposed expansion of the PMB airport. The development and adoption of EMF is detailed in Part 1 of Chapter 8: General Matters of the EIA Regulations of 2014 promulgated in terms of NEMA.

- **White Paper on National Civil Aviation Policy, 2015**

The National Civil Aviation Policy, 2015 (NCAP) focuses on the integration of the airport into its built environment to ensure optimal utilisation of the development opportunities which the airport presents. Chapter 7 of the NCAP addresses the interaction between an airport and its environment and vice versa and provides for all the aspects of land-use, which are not directly related to the operation of the airport. The airport environment in broad terms refers to the vicinity or area of influence of an airport. As such, the area of influence of an airport includes the airside as well as the landside of the airport. It also includes the geographic areas surrounding the airport, which are directly or indirectly affected by the airport or airport operation and vice versa. It therefore follows that the policy under this theme includes integrated development planning, land use on and around the airport and local emergency- and bulk municipal services, and development of the airport precinct and surrounding areas. Chapter 12 particularly deals with the environmental impact of aircraft operations. This impact includes noise and air pollution as well as human-induced climate change.

[1] Msunduzi Municipality Environmental Management Framework, 2010

2. PROJECT DESCRIPTION

As described in chapter 4, the MM is considering the development of the Airport more broadly than in just in terms of Air traffic. The MM has commissioned a range of investigations to inform the optimal development of the Airport and adjoining municipal land in relation to the surrounding Airport 'precinct'. These investigations have been drawn from in defining the project description. Their purpose and outcomes are therefore summarised as context to the project description.

2.1. Feasibility Investigations and Planning

Since the conception of the proposal to expand the Pietermaritzburg airport, numerous studies have been conducted to investigate the feasibility of and develop high level plans. These studies have informed the high level planning and costing of the extent and layout of the various project elements. It is therefore important to understand the background to and purpose of each as context to the project description that follows.

2.1.1. Airport Master Plan

The master plan was commissioned in 2011 and finalised in 2014[1]. The Master Plan (MP) process involved a Status Quo analysis and a demand analysis in defining three development phases namely Phase 1 (2025); Phase 2 (2040), and Phase 3 (2050). These phases were determined by the demand projections which drive when addition/expansion of infrastructure is required to cope with increased aircraft and passenger traffic. The MP presents requirements for each phase in terms of:

- Airside infrastructure
- Landside infrastructure
- Terminal building
- Utilities and other Airport facilities
- Land-use for the rest of the site and other developments

It is important to note that:

- The EIA is only being undertaken for elements defined in Phase 1 of the Master Planning process.
- The layout and elements for Phase 1 in the MP are not what is being applied for. The location, layout and elements for phase 1 have been amended from the initial MP proposal based on:
    - Interaction with and the outcomes of the various studies described in this section.
    - Engagement with Interested and I&APs in the Scoping process.

[1] Delta Built Environment Consultants. August 2014. Pietermaritzburg Airport Master Plan, Final Report. Ref P13096/R2584.

2.1.2. Airport Precinct Plan

The Airport Precinct Plan (APP) of 2016[1] was commissioned by the Municipality in line with the Aerotropolis concept taken forward in larger cities around the world. Smaller cities are pursuing the concept through smaller "Airport City" or Airport Precinct" hybrid models. In these instances these smaller airports are linked to the Central Business District and regional economies. In their quest for finding new ways to increase economic growth, city and airport authorities have recognized that commercial real estate development through Airport Precincts development is useful for maximizing non-aeronautical revenue and stimulating growth.

The Precinct Plan was initiated with this context and aim in mind. The PP was undertaken over the following phases:

- *Phase 1a: Inception Report*
- *Phase 1b: Status Quo and Strategic Assessment* – critical success factors required to be leveraged/created to establish *a sustainable precinct.*
- *Phase 2a: Airport Precinct Concept* – The identification and testing of preferred airport precinct development concept.
- *Phase 2b: Draft Airport Precinct Plan* – Which translates the concept plan into specific and spatially referenced development projects with supporting design and development guidelines as well as cost and options for financing projects.
- *Phase 2c: Implementation and Management Framework* – which translates the concept and plan in to a programme of projects and actions that will lead to the development of capital infrastructure and facilities.

The Precinct and Management Plan has been compiled and will be finalised in January 2017. The extent of the PP study area and concept plan is shown in Figure 2. Figure 3 shows the sub precincts within and adjacent to the precinct study area.

[1] Airport Precinct and Management Plan for the Pietermaritzburg Airport and Surrounds. December 2016. Prepared by Markewicz Redman Partnership, in collaboration with Royal HaskoningDHV and Glen Robbins Prepared for the Msunduzi Municipality.

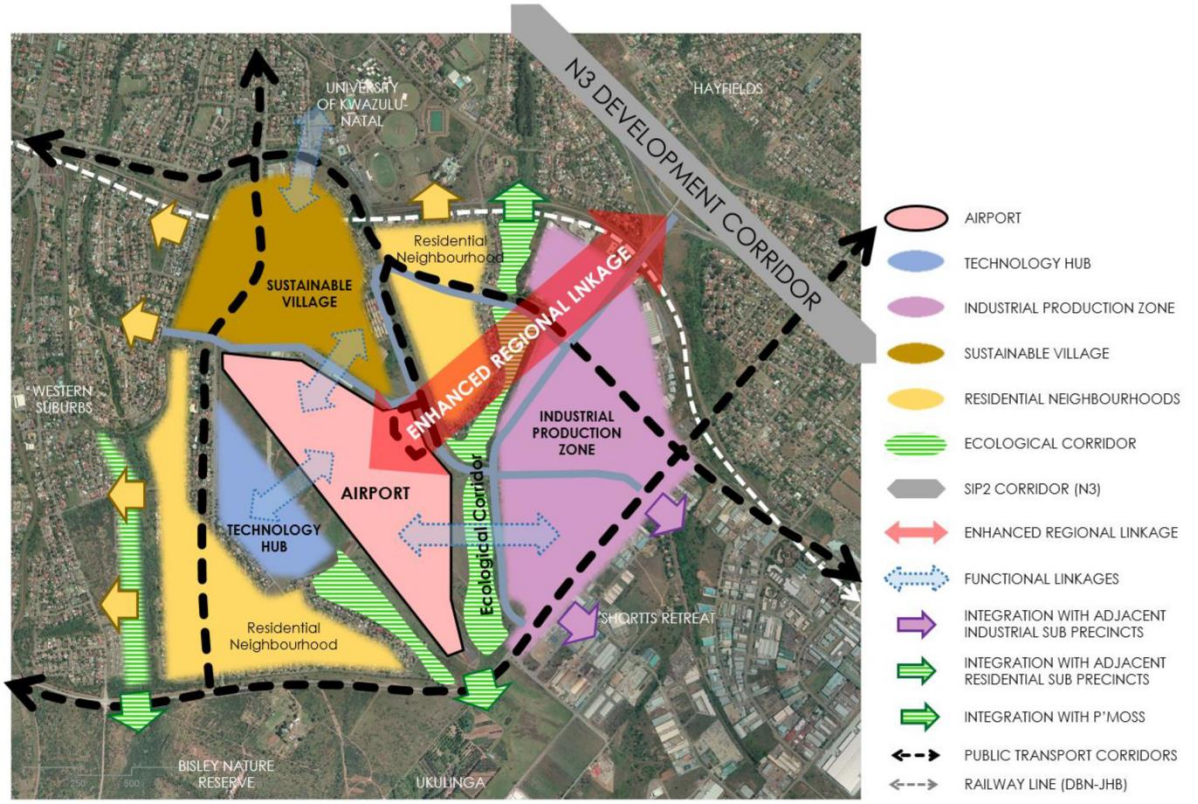


Figure 1 Precinct Plan spatial concept

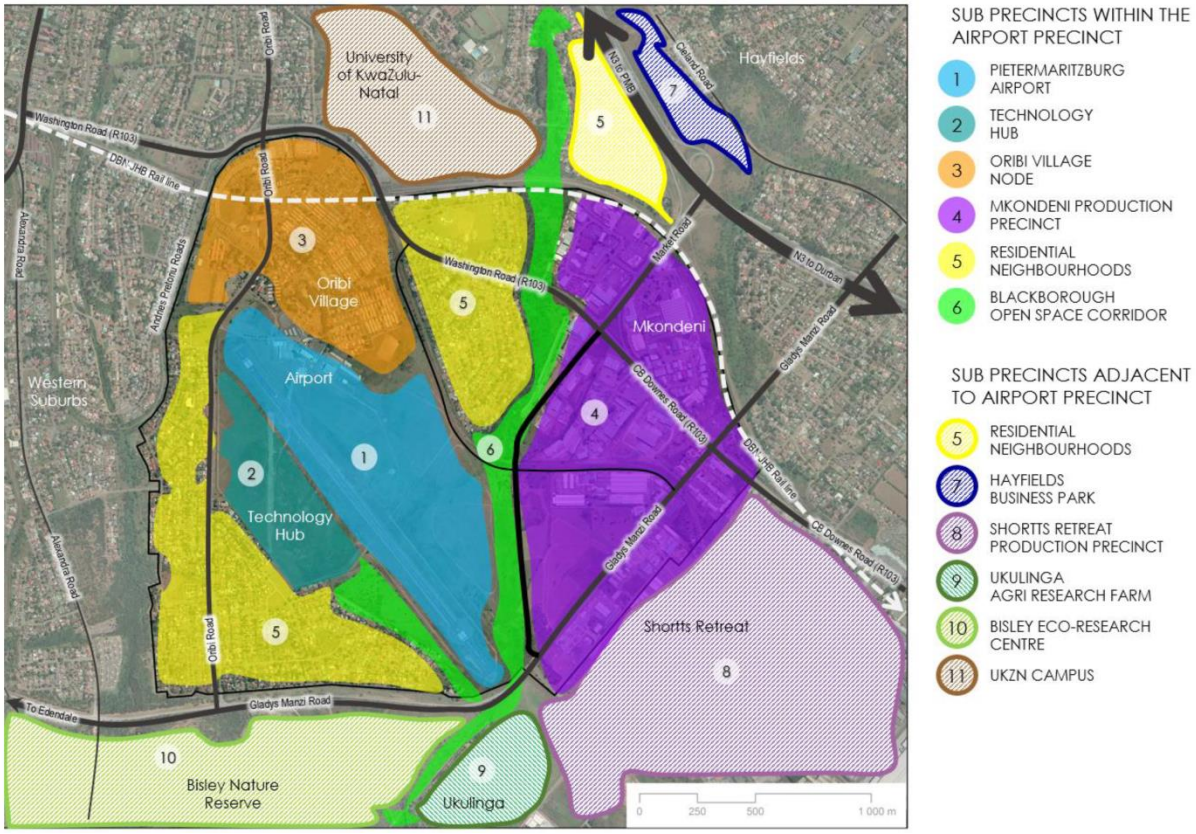


Figure 2 Sub precincts within and adjacent the Airport Precinct

Development frameworks have been developed for the following aspects within the Precinct, namely: Land-use; Access and Circulation; Public Space and Landscape; Built Form; Infrastructure; Environmental. This includes objectives, supporting principles, development guidelines and a spatial structure.

The role of each sub-precinct has also been established, with supporting guidelines for of each of the framework elements. These have been broken down further into lists of projects across the precinct according to phasing and for which high level costings have been developed (Figure 4 – location of projects by phase).

Relationship between the Precinct Plan and the EIA

The relationship between the precinct plan and the EIA is an important one and involved the following integration and linkages:

- Issues, information and understanding of the area generated in the scoping process of the EIA were fed through to the PP team.
- The PP team was involved in key meetings during the EIA process, such as the authorities workshop and site visit.
- The PP and EIA teams engaged with key roleplayers on key issues that affected both processes, such as Transnet with regards the transfer/traversing of the defunct railway line.
- The PP team provided much input into the layout of various elements of phase 1 – notably the access links as part of the broader precinct access framework.
- The EIA team fed through outcomes of the specialist investigations into the PP, such as the outcomes of the noise impact assessment.
- The PP consolidates many of the mitigation measures and provides the mechanism for their implementation from infrastructure improvements that support the generation of the positive economy impacts of the development, to restoration and management plans for the open space.
- The EIA team fed through outputs (costs and final road alignments) from the DBSA Feasibility study and the Traffic Impact Assessment to the precinct planning team.

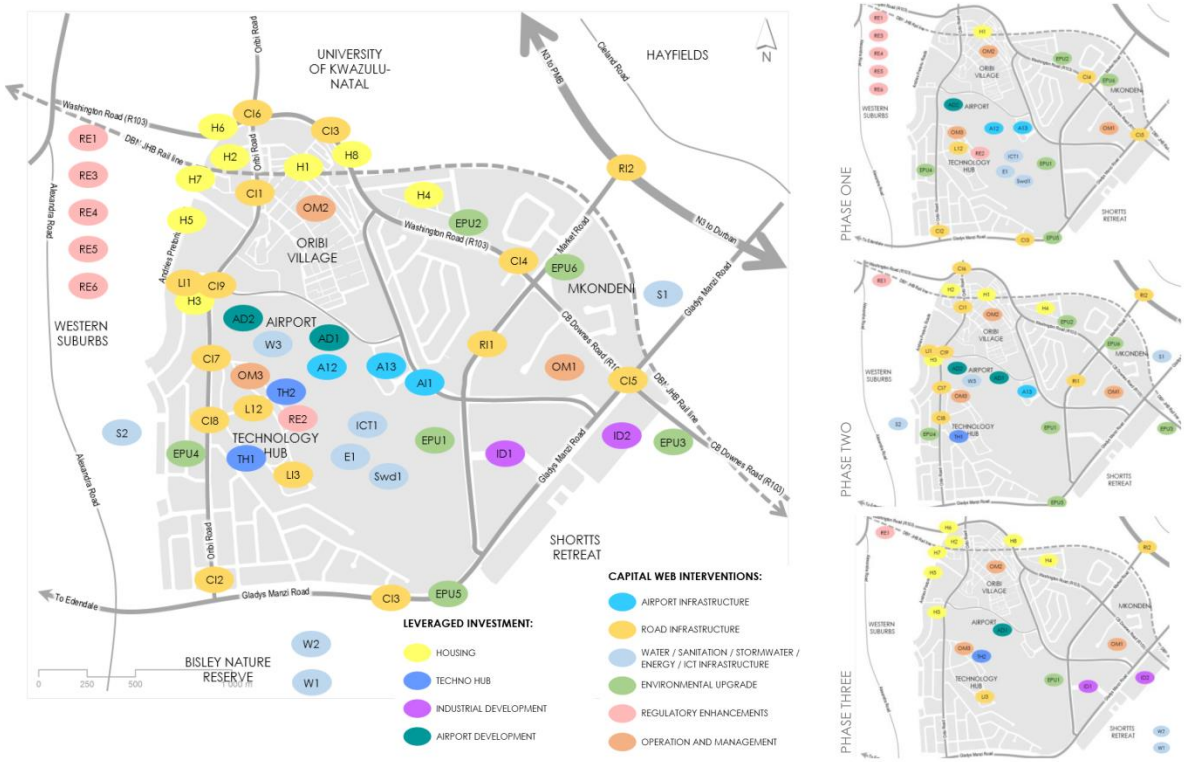


Figure 3 Location of projects by phase across the airport precinct

The Draft Precinct Plan further provides similar spatial outputs to **Figure 2** for the Physical linkages and interventions, Sub-precincts and Environmental Upgrades and enhancements. It also provides guidelines for each of the sub-precincts. In summary, the scoping process for the EIA has informed the Precinct plan and vice versa. As a key example, the access routes to the airport were proposed by the precinct planning team as part of the broader access framework.

2.1.3. Technology Hub Feasibility Study

The definition of a Technology Hub is: "*An enterprise associated with research, design and related activities in the high-technology sector which is accommodated in park type work environment which is specifically created for the industrial needs of the enterprises concerned*".

The Technology Hub concept primarily revolves around the Sustainable Model for a Knowledge Economy, an integration of institution, enterprise and business with the intention of promoting innovation. The four core functions of a technology hub include knowledge, innovation, enterprise and business.

A study[1] was commissioned in 2013 to investigate the feasibility of establishing a Technology hub in the MM. The provincial treasury subsequently secured international funding to initiate the development of Technology Hubs at four locations across the Province namely Richards Bay, Margate, Newcastle and Pietermaritzburg. GWI Project Management Group were appointed to allocate these funds across the four sites depending on the state of readiness for each and have been responsible for establishing the layout and design of the techno-hub provided in this report.

[1] KZN Technology Hub Feasibility Assessment – Msunduzi Value Proposition, 2013

2.1.4. DBSA Feasibility Study

The Development Bank of South Africa (DBSA) provides financial, planning and other project support services to the local municipalities to improve service delivery. The MM secured funding for a feasibility study into two specific elements of the proposed expansion. The DBSA appointed VNA Consulting to undertake the feasibility assessment for:

- The proposed new access routes to the airport and the portion of industrial land to the south west, achieved through the extension of Market Road.
- The development of additional hangars and associated infrastructure to service the demand for additional general aviation.

The outcomes of these investigations were layouts and costs for these infrastructure components. The reports concluded that certain alternatives were not feasible and these have not been taken forward in the EIA assessment – notably the option 2 for the GA area. In addition, the Traffic Impact Assessment (TIA) required inform both the EIA, the feasibility investigation and was undertaken under the DBSA contract. The outcomes of the TIA (road and intersection upgrade projects and costs) also fed into the precinct plan.

2.2. Nature of Development Planning and Roll-Out

With the feasibility and planning studies in 5.1 as context, the following points need to be understood regarding the nature and timing of the project roll out as well as the financing thereof.

- In the case of several of the land-uses such as the industrial zone, the Municipality will provide the bulk services but the cost of the top structure will be at the expense of the private investors.
- In the case of major supporting infrastructure like the Market Road access, this may be financed with support from other institutions or as part of existing government department budgets e.g. Department of Transport. For example, the DBSA may assist in financing the Market Road extension depending on the outcomes of the feasibility study.
- Consequently, the various land-uses and infrastructure will be developed in relation to market demand and the availability of finance over the duration of this phase 1 (to 2025), rather than as a consolidated project over an intense 2-3 year development period.
- The most likely developments to take place first are:
    - GA facilities where there has been a long standing waiting list.
    - Phase 1 of the techno-hub.
    - There has also been ongoing discussion with investors interested in the industrial land, so this area may also be developed sooner rather than later.

The new legal entity being established to operate the airport will be tasked with increasing the sustainability of the airport financial situation and raising revenue for the various projects.

Given that the various projects (industrial, commercial and hotel) will in most cases be developed by the private sector, the MM is only able to apply for environmental authorisation at the level of proposed land-use zoning e.g. (industrial, mixed use) which have restrictions in terms of what use may take place. The specifications of associated infrastructure are also provided in terms of location

and extent (floor space, heights) which are fixed. The investors will be responsible for the detailed designs and getting the necessary building and any other permits.

2.3. Project Location and Extent

The MM is approximately 640 square kilometres in extent and located at the centre of the uMgungundlovu District Municipal, about 80 km North West of Durban along the N3. Figure 4 provides an indication of the extent and locality of MM. The Pietermaritzburg Airport, formerly known as Oribi Airport, is located within the MM boundary. **Figure 5** provides an indication of the location and extent of the Pietermaritzburg Airport in relation to the MM. The Airport is located in the outskirts of Pietermaritzburg, owned and managed by the local MM and serves the city of Pietermaritzburg and surrounds as well as the outer west suburbs of Durban.

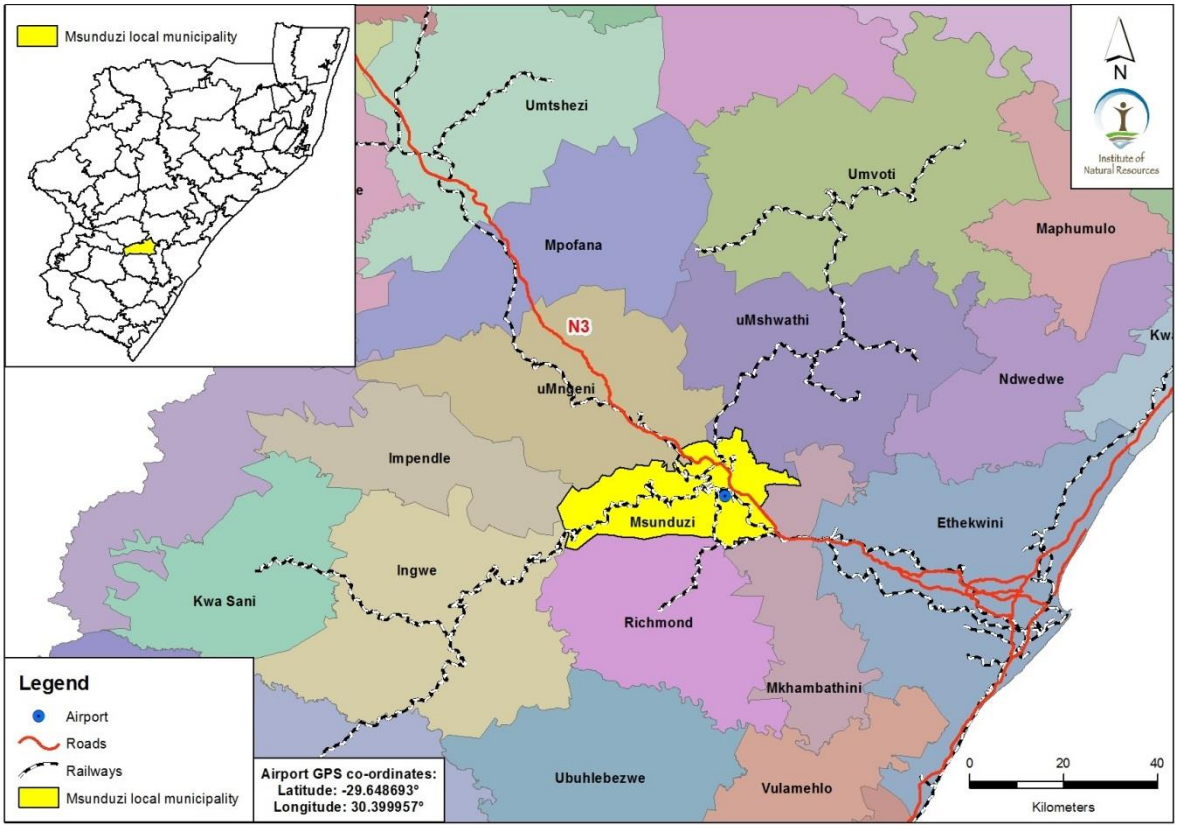


Figure 4 Location of Msunduzi Municipality in relation to Umgungundlovu District Municipality

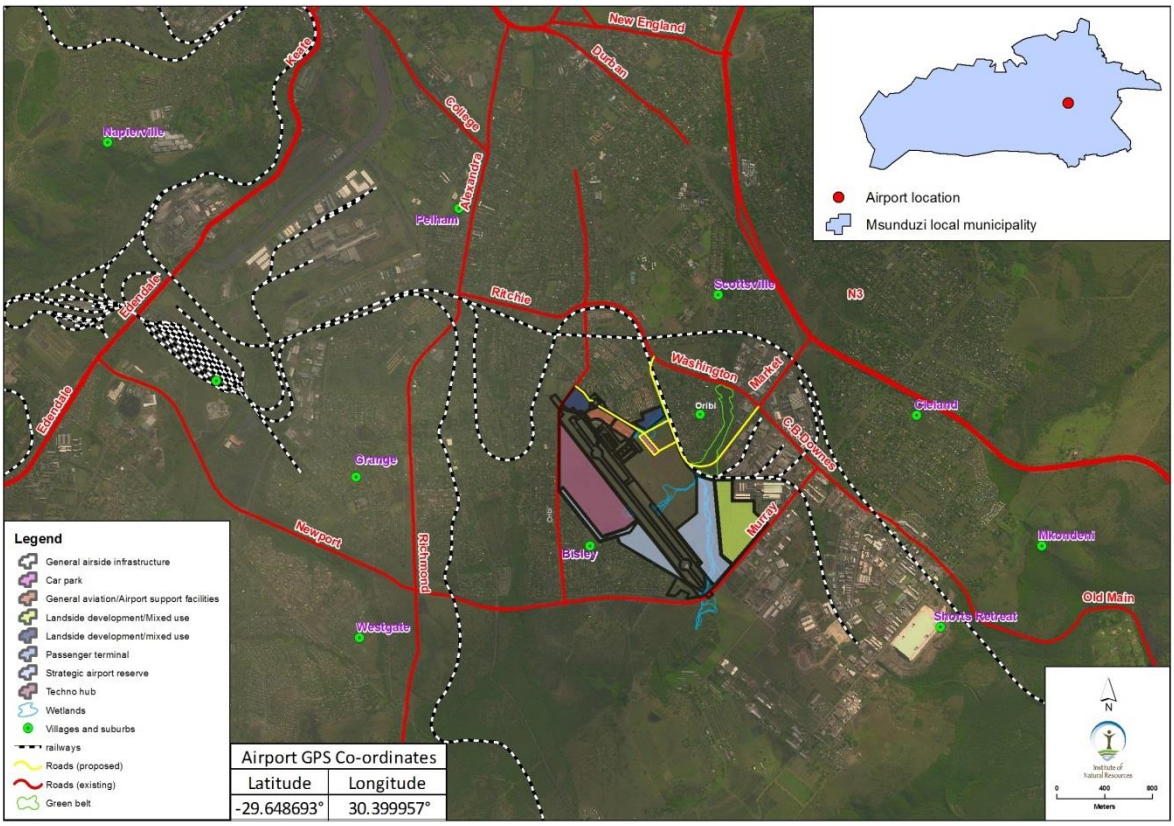


Figure 5 Location of Pietermaritzburg airport in relation to MM

2.4. Land Tenure, Use and Zonation

Expansion is proposed on the existing Airport Property (Remainder of Erf 10 000 and the adjoining properties: Rem of Erf 870, Erf 10159, Rem of Erf 1589, a portion of Erf 1910 all of Pietermaritzburg) as summarised in **Table 4** below. Four of the land portions are owned by the MM except for a portion of Erf 1910 which is owned by Transnet.

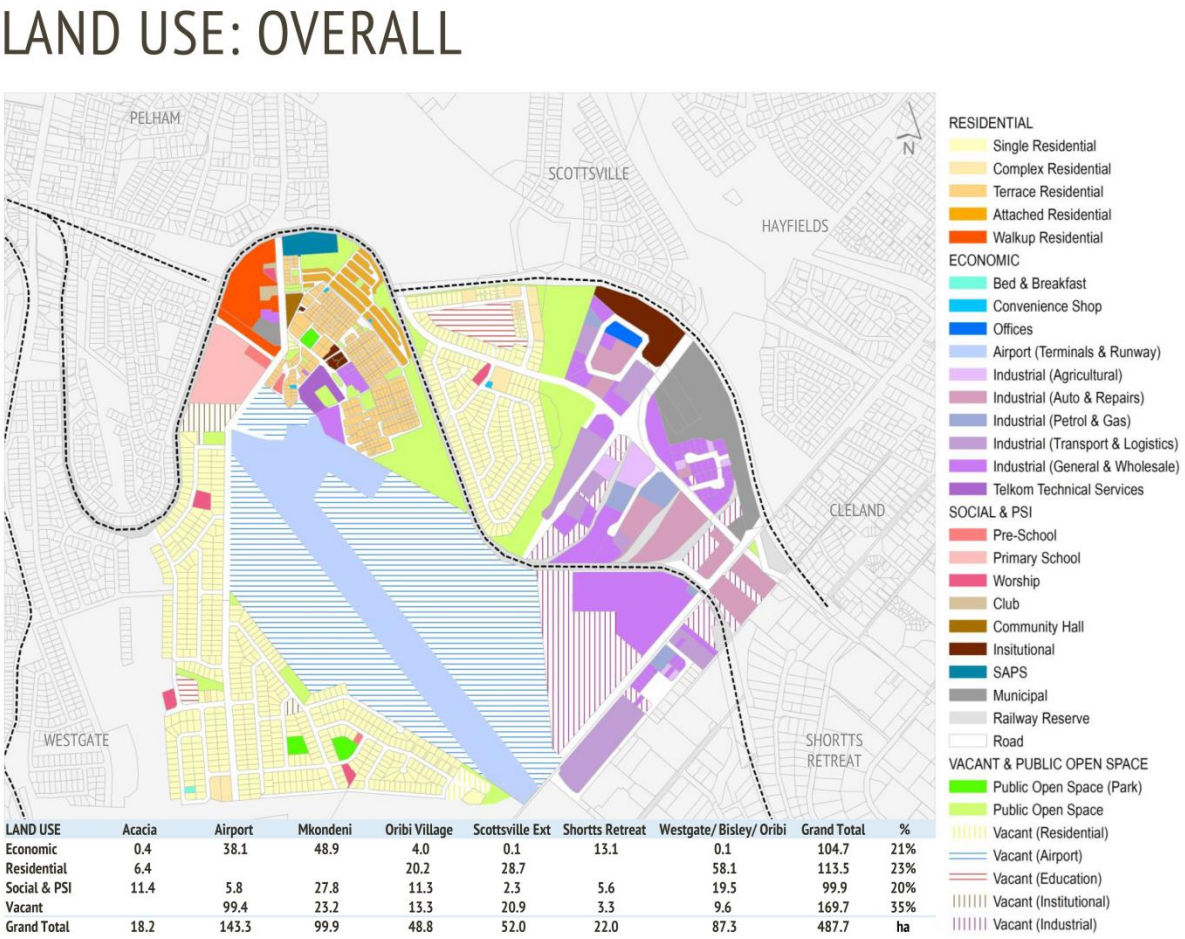
Table 4 Summary of the land parcels

ERF No.								Surveyor General Code																					Area (Ha)
R	E	/	8	7	0			N	0	F	T	0	2	5	8	0	0	0	0	0	8	7	0	0	0	0	0	0	16.1
R	E	/	1	5	8	9		N	0	F	T	0	2	5	8	0	0	0	0	1	5	8	9	0	0	0	0	0	18.1
R	E	/	1	9	1	0		N	0	F	T	0	2	5	8	0	0	0	0	1	9	1	0	0	0	0	0	0	0.45
R	E	/	1	0	0	0	0	N	0	F	T	0	2	5	8	0	0	0	1	0	0	0	0	0	0	0	0	0	145.42
R	E	/	1	0	1	5	9	N	0	F	T	0	2	5	8	0	0	0	1	0	1	5	9	0	0	0	0	0	12.69

According to the MM Planning Department, the properties listed above are zoned for "Airport Reservation". The height restriction within this zoning for office use is 3 storeys and the maximum height restrictive is controlled by 90 degrees right angle. Apart from these specific restrictions, the current zoning does not provide for the various uses planned as part of phase 1. The MM is reviewing their town planning scheme and confirmed that the Airport properties (which form the subject of the EIA application), as well as the broader Airport precinct would need to be rezoned via the processes provided for under the SPLUMA. The Precinct Plan recognizes this need and has included rezoning as one of the regulatory enhancements required to facilitate the implementation

of the Precinct Plan. It further includes costs for running the rezoning process. The SPLUMA process includes consultation and may require additional environmental assessment to address issues across the Precinct, such as visual impact assessment.

The land-use map for the precinct (**Figure 6**) shows the amount of vacant land within and adjacent to the Airport. It is sections within these areas that are proposed for utilization in phase 1 as described below.



LAND USE	Acacia	Airport	Mkondeni	Oribi Village	Scottsville Ext	Shortts Retreat	Westgate/ Bisley/ Oribi	Grand Total	%
Economic	0.4	38.1	48.9	4.0	0.1	13.1	0.1	104.7	21%
Residential	6.4			20.2	28.7		58.1	113.5	23%
Social & PSI	11.4	5.8	27.8	11.3	2.3	5.6	19.5	99.9	20%
Vacant		99.4	23.2	13.3	20.9	3.3	9.6	169.7	35%
Grand Total	18.2	143.3	99.9	48.8	52.0	22.0	87.3	487.7	ha

Figure 6 Land-use within the Airport Precinct (Source: Precinct Plan - Status Quo Report)

2.5. Existing Infrastructure

Figure 7 illustrates the existing infrastructure at the airport including the airside, landside infrastructure and the terminal building. The capacity and condition of the existing facilities, infrastructure, utilities and roads at the airport were some of the influential factors motivating for the expansion of the airport.

2.5.1. Airside infrastructure

- ***Runway:*** The portion of the runway that represents the full structural pavement strength is 1 597m, with a stopway of 190m, giving a total length of 1 787m. This equates to an ICAO classification 2C airport. The stopway is, however, an area beyond the runway which can be used for deceleration in the event of an aborted take-off and should provide capable

support without causing structural damage to the aircraft. SA Airlink utilises the stopway when departing from Runway 34 to gain distance for take-off for their Jetstream 41.

- ***Taxiway:*** The gradient of the main taxiway, connecting the apron to runway is steep and undesirable, and a limited number of jets can be catered for on the runway and taxiway at a time.
- ***Apron areas:*** The insufficient parking/apron area is a safety concern for the commercial aircraft as it can only accommodate one plane at a time for departure, passengers cannot board while another plane is preparing for departure. Its current position of the apron area and taxiway in front of the terminal building is a development constraint for expansion.
- ***Navigation Aids, Visual aids and Signage:*** Recently added are the VOR/DME, NDB's, GNSS Let-down procedure and airfield ground lighting, PAPI's at thresholds, which has improved airport's efficiency.

Figure 7 Existing infrastructure layout

2.5.2. General Aviation

There is a long-standing waiting list of 34 users [1]wishing to locate their GA business at the Airport. Demand for hangar space at the Pietermaritzburg Airport is growing, partially due to the King Shaka Airport reducing its General Aviation obligation in favour of commercial flights, and the imminent closure of the Virginia Airport.

[1] List provided by Msunduzi Municipality

2.5.3. Landside Infrastructure

- ***Access Roads:*** The airport is located approximately 6km south of the CBD of Pietermaritzburg, and is 3.5km from the N3 freeway and 2km from the R56. Direct access into the airport is through Pharazyn Road off Oribi Road.
- ***Parking Areas****:* Servest Parking is responsible for the facility which houses the seven car rental firms and the private shuttle service. The location of the current designated drop-off and collection area is viewed as being unsuitable by some users; however, the preferred area is restricted and defined by the concession terms.

2.5.4. Terminal Building

The terminal building covers an area of about 1 200m^2 in public amenities including check-in counters, arrival and departure lounges, a VIP lounge, a cargo office, an airport management office, an ATM, a coffee shop and ablution facilities as shown in **Figure 8** below. The layout and facilities within the terminal building were upgraded as part of the capacity of the terminal building had been deemed insufficient based on the growth in passenger numbers at the airport. Table 5 below summarises the extent of the different facilities in the terminal building.

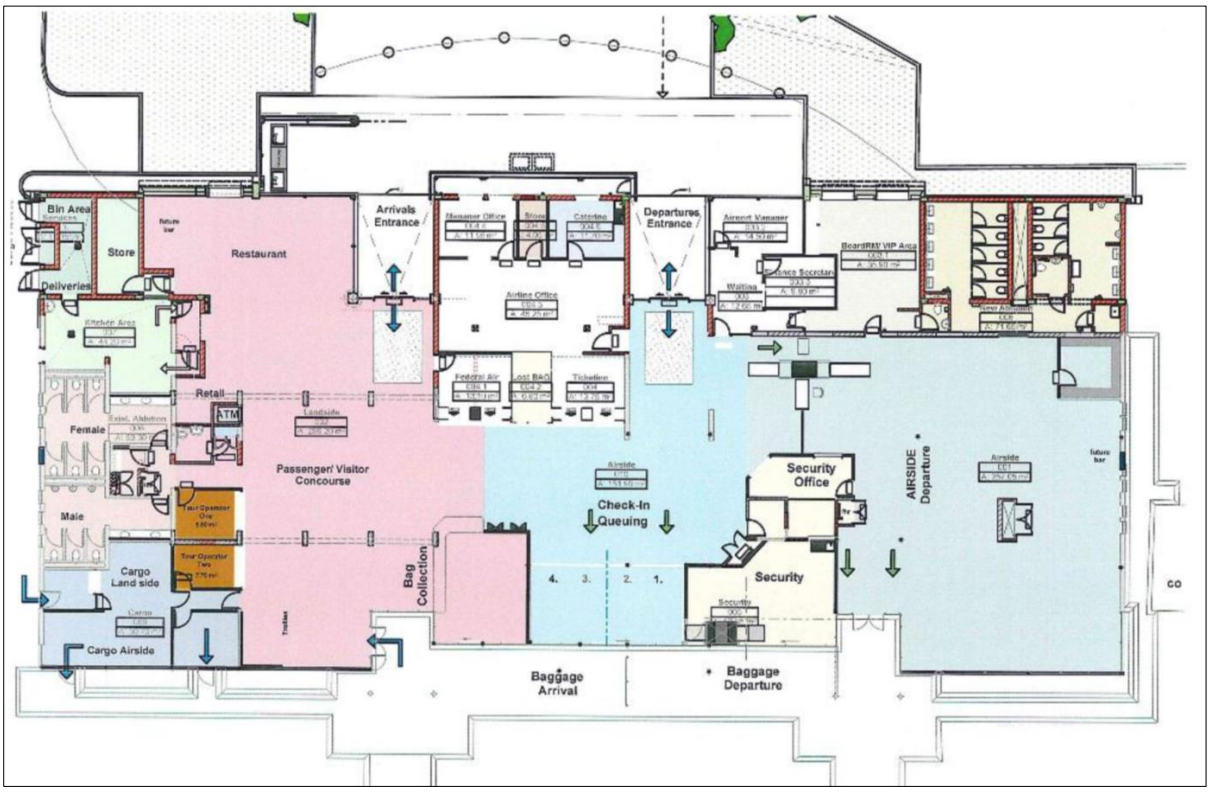


Figure 8 Layout of the existing terminal building

Table 5 Extent of the facilities in the terminal building

AREA	FACILITY	SUBDIVIDED AREAS (M²)	TOTAL AREAS(M²)
Offices	Airline Offices (Federal Air) Airport Management Boardroom/VIP Tour operators Security	107.60 36.95 35.90 16.30 58.85	255.60
Ablutions	Old New	59.30 71.65	130.95
Kitchen	-	57.35	57.35
Arrivals	Restaurant/Future bar Arrival Concourse Baggage Claim	173.20 *95.00 *28.00	296.20
Departures	Check-in counters Queuing Open Space Airside Lounge	*30.50 *60.00 61.40 257.05	408.95
Cargo	-	50.70	50.70
Total area			**1 200**

2.5.5. Other facilities and utilities

The other facilities and services at the airport site which were assessed include;

- Control tower
- Fire and rescue facility
- Fuel
- Car hire facility
- Hangars
- Utilities assessed included:
    - Electricity
    - Water
    - Sewerage
    - Communication

2.6. Proposed Infrastructure and Land-use

The project involves the expansion or addition of the following components which are detailed below:

- **Airside Infrastructure:** Extension of the taxiway to service an extension of the aircraft apron.
- **General Aviation:** Reconfiguration of existing hangars, and expanded facilities for aircraft maintenance and repair.
- **Terminal Building:** Site allocated for future expansion of the terminal building.
- **Landside Infrastructure:** Improved access via a link to Washington and/or Market Roads and associated link through the Industrial Zone to Gladys Manzi Road. Site for new parking area and drop off zone; an industrial zone, and mixed commercial zones.
- **Technology Hub:** Located between the runway and western boundary of the airport (Oribi Road) that provides for the following zones: special sports, mixed use/commercial, mixed use residential/hotel, aviation hub, education/techno-hub, and light industrial.
- **Open Space/Conservation:** Assigned to sensitive riparian systems and open space.

2.6.1. Airside Infrastructure

The airside infrastructure consists of the following elements shown in Figure 9.

2.6.2. Runway

No extensions to the existing runway are required. The total length of the existing runway is 1597m with a stop way of 190m; the classification of the runway will therefore remain an ICAO Code 2C runway; however the length does cater for certain code 3C aircraft to be able to operate at this airport. The runway is adequate to serve the aircraft mix within Phase 1.

2.6.3. Taxiways

For planning purposes the taxiway infrastructure including the relevant clearances have been laid out for full ICAO Code C aircraft (up to 36 m wingspan), this to cater for the possible long term future introduction of this aircraft category. An initial parallel Taxi Way will be developed to serve the extended apron.

2.6.4. Aprons

The new apron will be parallel to the runway on the eastern side. This phase incorporates a flexible extension of the existing apron where the indicated area allows for several parking configurations to be determined and implemented as per actual demand. However, for planning purposes six ICAO Code B aircraft stands and three ICAO Code C (e.g four AVRO RJ 85) stands have been provided. It will have an area of 14 000m^2 (200m wide and 70m deep). It is noted that currently the airport is used by smaller code C aircraft with a wingspan of around 26 m only. The indicated parking arrangement is therefore indicative. The proposed modular arrangement can be easily extended in future if demand dictates so. Between the several apron stands associated apron taxi lanes have been planned, further land reservation has been made for apron service roads.

2.6.5. Navigation Aids

Navigation aids will be upgraded and implemented concurrent with the terminal building, runway and taxiway system extensions to be compliant with ICAO's and CAA's standards.

2.6.6. Visual Aids and Signage

With the extension of the taxiway system and the new terminal building, the visual aids and signage need to be upgraded to be compliant with ICAO's and CAA's standards.

Table 6 lists the land use facilities including a brief description of the function served by Airside facilities.

Table 6 Description of the airside infrastructure

Main Category	Typical Facility Type	General Description
Airside Infrastructure	Runway Infrastructure	Asphalt runway pavements and associated pavement marking, Airfield Ground Lighting elements, ducting and manholes, special airport systems equipment, metrological equipment and storm water drainage elements. Intended use: Aircraft, controlled access.
	Taxiway Infrastructure	Asphalt taxiway pavements, associated pavement marking graded (grass) taxiway strips, airfield ground lighting elements, ducting and manholes, storm water drainage elements: Intended use: Aircrafts, controlled access.
	Apron Infrastructure	Concrete or asphalt pavements, associated markings, floodlighting masts, ducting and manholes, drainage elements. Intended use: Aircraft, Airport Service Vehicles, passengers, restricted access.

2.6.7. General Aviation

The expansion of the GA facilities will take place within two phases, within the overall phase 1 expansion.

- The first phase will involve the reconfiguration of the existing GA hangar facilities (indicated in pink in Figure 10) to optimize this area. In addition, new GA infrastructure will be developed adjacent the existing area (shown in blue in Figure 10).
- Once the terminal building and parking area moves to the new location indicated in Figure 9, the existing terminal facilities can be reconfigured for use by private and business aviation as well. **Table 7** lists the land use facilities for including a brief description of the function served by the GA facilities.

Table 7 Description of the General Aviation infrastructure

Main Category	Typical Facility Type	General Description
General Aviation	Aircraft Hangars	Hangars to be used for parking of privately owned aircraft. Building heights for hangers are up to 8m for code B and 15m for Code C.
	Aircraft Maintenance and Repair facilities	Aircraft Maintenance and Repair activities are assumed to be mostly related to General Aviation although if scheduled flights intensify at some stage limited routine line maintenance services might be provided for by the airlines. MRO facilities are assumed to be located in the areas indicated for GA. These facilities will consist of hangars with workshops and warehousing for storage of equipment and parts.
	Aero Club facilities / Flight School	The current PZB Aero Club has facilities on the existing airport, During the development of the airport activities of the Aero club and Private Pilot Training Activities are assumed to continue and expand. Facilities like a club house, instruction rooms and hangars are assumed to be retained and located within the areas indicated for GA.

Figure 9 Layout and extent of the elements comprising of the Phase 1 of the project

2.6.8. Landside Infrastructure

- ***Mixed-Commercial Use:*** Mixed use area reservations are proposed on the northern end of the airport. A 75-125 room Hotel is proposed for the area between Oribi Road and the existing Airport entrance. The hotel buildings will be a maximum of two storeys supported by parking facilities for guests and staff. A second mixed use/commercial zone is proposed in the area adjacent immediately adjacent Oribi Village along the proposed new access road that links into Washington Road.
- ***Industrial Zone****:* The first phase will accommodate a new industrial zone of approximately 17 hectares which will accommodate land uses and activities similar to those in the existing and adjacent industrial estate (i.e. manufacturing, logistics, warehousing).

2.6.9. Airport Access

The current airport access road (Pharazyn Way) off Oribi Road will be retained as an access point to the General Aviation portion of the airport once the other access routes are established. The following additional airport access is proposed:

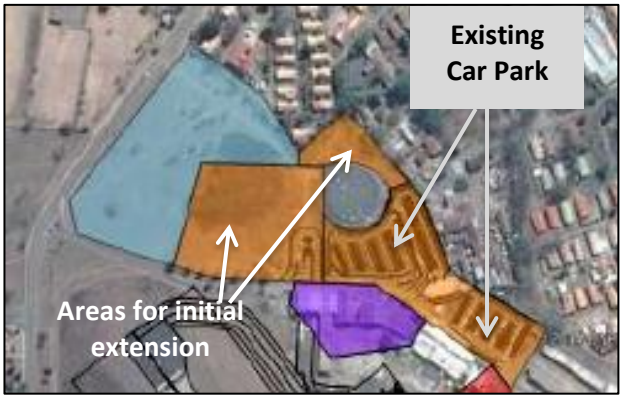
i. A new access road off Oribi-Road. This will run along the boundary with Oribi Village and extend to the new parking area and terminal building once they are established.
ii. A new road that links the new access off Oribi Road to Washington Road providing a 'loop' system'.
iii. A new access road connecting the airport directly with the N3 via an extension of Market Road which currently culminates in a dead-end to the east of the service railway. This road (Market Road extension) will also provide access to the light industrial area and link through to Gladys Manzi (Murray) Road. This link will also tie into the Washington Road access.

Three new intersections are proposed off Oribi Road to access to the Techno-hub. These will be opposite existing access roads off Oribi road to the residential area.

2.6.10. Parking

A new parking area is proposed adjacent to the proposed position for the new passenger terminal building. This parking area will be used for staff, passenger and VIP parking. The car rental offices can also be relocated to this location. A section of the existing parking area will remain as such for this phase which could provide additional parking dedicated for the GA related facilities and airport staff. It should be noted that Servest, who manage the parking area have a contract until 2024 with an option to extend by 5 years. In terms of this contract they have an agreement with the Municipality to extend the parking area by approximately 12 800m^2 towards Pharazyn Way and adjacent the water reservoir in the area identified for the hotel. This area is shown in the following diagram and the extension is likely to commence in the short term.

The timing of a move for the parking area to the new site adjacent the new terminal building shown in adjacent figure is dependent on when alternative access is developed and the terminal building needs to move. These options are described further under the section dealing with alternatives.



- ***Drop-off / public transport curbs Public Parking**:* At the main access road a loop is to be provided to maintain flow of traffic, while parking and drop-off zones remain connected. Terminal frontage roads with kerb for drop-off and pickup of passengers will be provided here with a bypass.
- ***Car hire facilities:*** Car rental parking and offices are located in the parking area. The timing and design would be undertaken in collaboration with the holders of this concession and in terms of their lease agreement.

Table 8 lists the land use facilities including a brief description of the function served by the land-side Infrastructure

Table 8 Description of the landside Infrastructure

Main Category	Typical Facility Type	General Description
Landside infrastructure	Access roads and circulation roads	Dual lane (bi-directional) airport access roads (asphalt) and single lane circulation roads (one direction). Street furniture and street lighting elements, storm water drainage elements. Intended use: Secondary arterial classification.
	Passenger and Staff Parking	Ground level, passenger car parking, asphalt or concrete block parking pavements, walkways, street furniture, gate house, drainage elements and street lighting.
	Drop-off/public transport curbs	Terminal frontage roads with kerb for drop-off and pickup of passengers.
	Car hire facilities	Car rental parking and offices

- Considered planning of the mixed uses should encourage movement of people as well as innovation through potential synergies.
- Buildings embody the aspirations of businesses as world leaders and innovators through their architectural expression and forms.
- The human mind is encouraged to test perceived boundaries through “creative space”.
- Traditional office typologies with confined or restrained spaces are to be avoided. Generous natural lighting, ventilation, form, colour, and open spaces are to be encouraged.
- In terms of energy efficiency and design, buildings should as a minimum comply with the requirements of SANS 204.
- Green Star and LEED certification of buildings are to be encouraged.
- Sources of renewable energy should be investigated and integrated in the planning of the hubs.

2.6.11. Passenger Terminal Building

The passenger terminal building currently provides an acceptable service level based on recent upgrades of the existing building. The Master Plan projected that current terminal building can be expanded to a maximum of approximately 2 360m^2 in phase 1. The Master Plan projected that a new passenger terminal would be required once the phase 1 threshold of 250 000 Pax is reached i.e. phase 2. It projected an increase in floor space to approximately 4 100m^2 and that the building be centrally located around the expanded airside facilities. So while the new terminal building is required in Phase 2, the site for this facility has been included in the phase 1 application. This is because, if the new access is developed via the Washington/market Road the terminal building would need to move to align with the new access and associated parking areas. **Table 9** lists the passenger terminal building facilities for including a brief description of the function served by the passenger terminal building.

Table 9 Description of the passenger terminal facilities

Main Category	Typical Facility Type	General Description
Passenger Terminal Facilities	Passenger Terminal Building	Passenger Terminal Building where passengers board and alight flights. Consisting of: a central arrival/departure hall, commercial concessions (bars/restaurants shops) check in area, waiting lounges, airport and airline offices, and ablution facilities. A two storey passenger building is envisaged.

- ***Electricity:*** For Phase 1, the supply will remain to the terminal building, however, it may need to be augmented should the power required exceed the existing capacity. Further reticulation will be required for apron lighting and for the proposed GA area. Sufficient capacity should be provided to allow for future phases of the GA facilities.
- ***Water Supply:*** The nearest bulk reservoir is adjacent to the existing passenger terminal. It is understood that the bulk water system has sufficient capacity; however, pressure is a concern due to the relative elevations of the airport and reservoir. For Phase 1 the reticulation to the terminal should be upgraded to meet the additional requirements and address the current issues relating to the existing infrastructure. Additionally, a new supply will be required for the GA area, which is anticipated to be connected from the adjacent residential network.
- ***Wastewater:*** The Municipality has indicated that sufficient bulk supply is in place (or at least planned) in terms of wastewater trunk mains and treatment capacity. For Phase 1, the existing supply to the terminal will need to be upgraded to meet the additional demand. Reticulation will need to be provided for the GA areas.
- ***Storm Water:*** For Phase 1, improvements to the current storm water arrangements will need to be designed and form of part of a storm water management plan that takes into account the entire development area based on more detailed designs of the infrastructure.

2.6.12. Technology Hub

The definition of *Technology Hub* is "An enterprise associated with Research, development, design and related activities in the high-technology sector which is accommodated in a park-type environment which is specifically created for the industrial needs of the enterprises concerned".

From an environmental perspective, to note is the institution design incorporating environmental principles into the design process, to reduce the overall human health and environmental impact that may arise across the techno hub`s life cycle. These include:

- Large areas of green space are retained for the benefit and recreation of the employees and building occupants.
- Public spaces become informal outdoor boardrooms where networking and socialisation takes place.
- Provision of services, entertainment and recreation facilities, and proximity to accommodation can make hubs self-contained micro cities.
- Full integration with universities, tertiary institutions, and research institutes encourage growth in research and development.
- Research and development rich environments attract businesses investment in the hub through linkages with learning institutions.

The site set aside for the Technology hub is about 25 Ha. The table below depicts the conceptual zones envisaged for the technology hub of Msunduzi. This plan is based on a specific model formulated for this hub. The concept involves six specific zones, each with a sub zone. The six zones and sub zones are tabulated below with related functions.

Table 10 Summary of uses within the techno-hub zones

Zone	Sub-zone	Function
Mind Zone	Education - Research Zone	Laboratories (analytical, science and computer)
	Education - Student Zone	Studios (for Master and PHD students) and an interpretation centre which could be used by schools as a part of science education to instil an innovation culture in school children
Innovation Zone	Light Industrial - Testing Zone	Experimentation, materials and products testing for innovations designed
	Light Industrial	Laboratories for simulation, CAD, CFD, IT and product design
	Light Industrial	Consists of a learning factory for rapid prototyping, workshops and CNC Machining as well as product development
	Light Industrial	LAN lab with Computational Capacity and Product Testing and a server farm with unlimited connectivity and bandwidth.
Enterprise Zone	Enterprise Zone	Hub Management & Marketing/Branding is to be located in this zone and is the heart of the daily operations of the entire technology hub. Functions include: 1. Business Management & Marketing 2. Business Development & Planning 3. Consulting 4. Enterprise Finance a. Venture Capital b. Training and Mentoring 5. Skills Transfer

Zone	Sub-zone	Function
		6. International and national business networking and linkages between research centres, industries, international technology parks, are created by the management body. 7. Property management function It also serves as the interface for the Mind/Innovation/Business zones.
	Enterprise Zone	The start-up zone consists of the following services: 1. Start-up Incubator 2. Innovator/Entrepreneur Development Program 3. Central Services a. Reception & Secretarial b. Boardrooms c. Video Conferencing d. Meeting Spaces e. Computer Lab f. IT Services g. Telecommunications 4. Studios a. Hot Desk (for ICT services) b. Small Tenants c. Medium Tenants
Public Zone	Mixed use Commercial	The convention sub zone is equipped to involve a multi-functional space for: 1. Skills transfer 2. Information & Knowledge Dissemination 3. Multifunctional Conference Spaces 4. Exhibition Space 5. 300+ Seat Auditoria / Cinema
	Mixed use Commercial – Life Zone	The life sub zone consists of the following retail support services for tenants and employees: 1. Cafes & Restaurants 2. Retail Services a. Convenience Store b. Banking & Post c. Hair & Beauty
	Sports – Body Zone	The body sub zone includes the following in order to create a multifunctional and mixed use environment servicing the everyday needs of people. 1. Gym 2. Sports & Recreation
	Mixed use/Residential/Hotel - Accommodation	• Short to Long Stay (hotels) • Spa
Business Zone	Mixed use commercial – Multi tenanted buildings	This sub zone allows for office or other space to be taken up by small to medium existing enterprise
	Mixed use commercial - Single-tenanted Buildings	This sub zone allows for office or other space to be taken up by medium to large existing enterprise.
Energy Zone	Solar Roof Zone	• Roof Mounted Solar Panel Farm
	Solar Terrestrial Zone	• Ground Based Solar Panel Farm

Zone	Sub-zone	Function
		• Energy Capacity • Power Security
Other	The spatial concept allows for parking, landscaping and interactive open spaces including a lake. A transport zone for shuttle services and taxi and bus drop offs is also compensated for within this plan.	

Phase 1A of the Techno-hub is proposed as shown below in **Figure 10**. It comprises:

- Bulk infrastructure (roads, storm-water, sewer and water reticulation) to service this initial phase but also the remainder of this section of the Techno-hub in order that these don't need to be expanded in future.
- A new fence between the site and the runway.
- Gatehouse and entrance security.
- An information centre and associated parking.

The cost of the bulk infrastructure for this phase is approximately R29 million. Detailed design, costing and tender documents have been developed for the infrastructure component of this phase i.e. not the top structures.

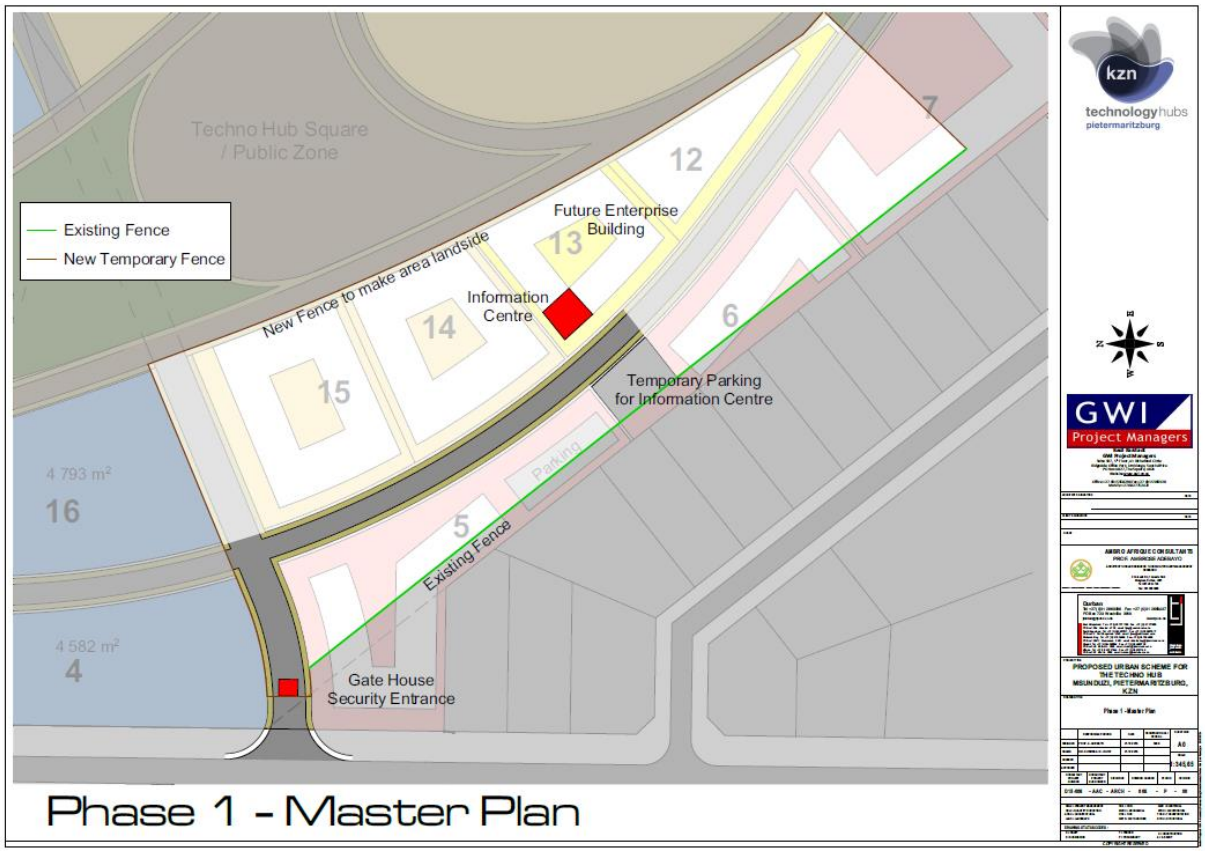


Figure 10 Layout for Phase 1A of the Techno-hub

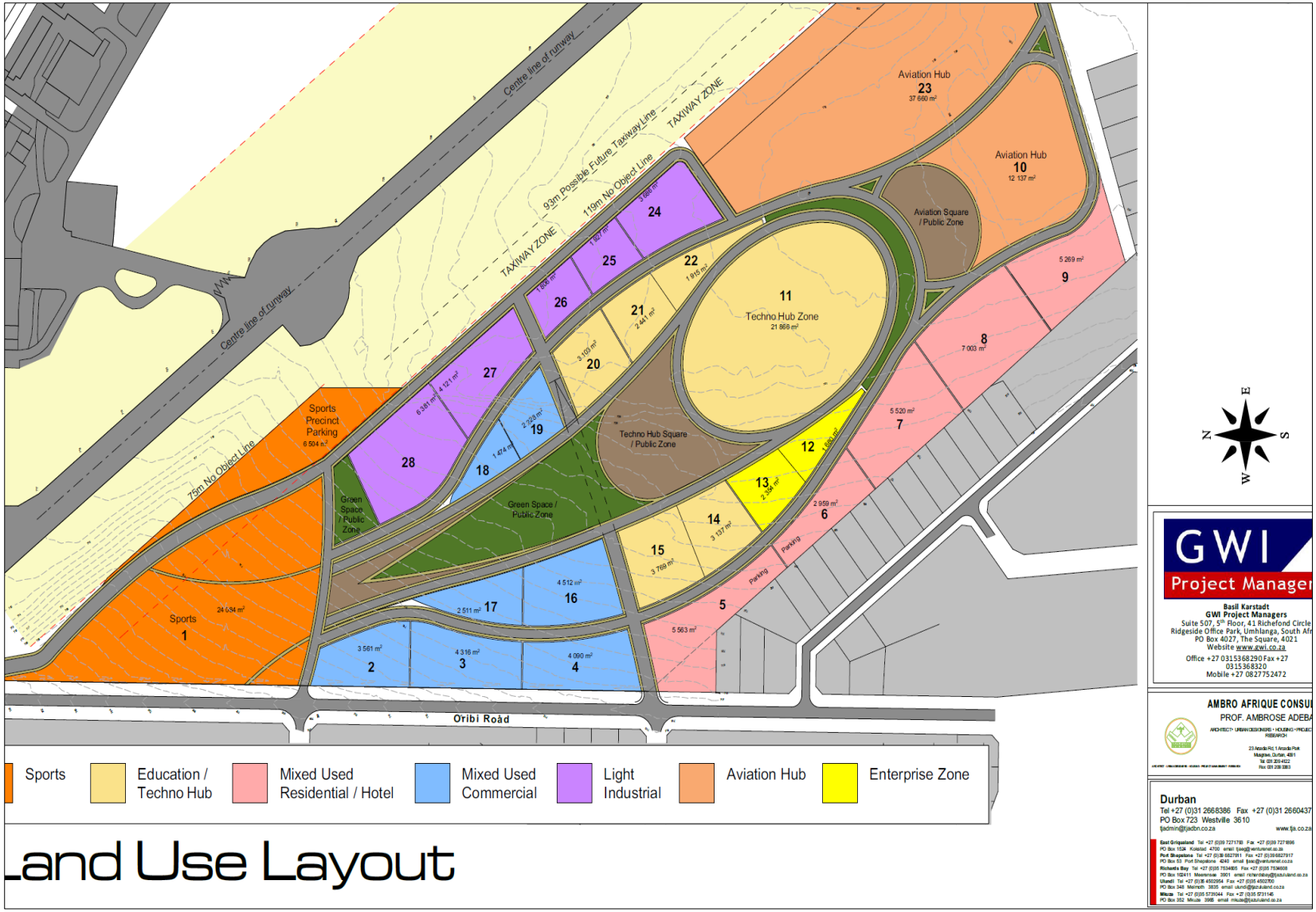


Figure 11 Layout of the proposed land-use within the Techno hub

2.7. Open Space

Like any development well-managed open space protects the natural green infrastructure, preserving important environmental and ecological functions such as storm-water runoff, amelioration of water quality issues, and erosion control. The MM EMF identifies conservation priorities throughout the municipality, and wetland and grassland systems areas are regarded as sensitive areas which have to be preserved protected and free from intensive development.

- ***Conservation Zones and Buffer zones:*** Conservation zones relating to sensitive areas and habitats have been included in the overall land-use plan for the airport proper. A significant portion of the land parcel comprising wetland and grassland has been set aside as strategic reservation in order to ensure the protection of a healthy system. The reserve is primarily an important riparian corridor along, and around the water bodies. It serves as a physical link to and between significant sources of biodiversity (from the Bisley nature reserve south of the airport extending all the way up to Msunduzi River past the Hayfields reserve) to prevent local species extinctions in the Msunduzi Municipal Area. Specific buffers have been delineated in the EIR to protect the system and inform future development. In addition the Precinct Plan has defined the corridor as a sub precinct and included costs for rehabilitation actions as a key project within the overall plan.

2.8. Institutional Structure

The municipality has 4 municipal entities, one of which is the Airport Entity. Municipal Entities are established on the same basis as State Owned Enterprises, where the companies established have a majority shareholding from government. In the case of the Airport Entity, it is envisaged that a “mini ACSA” will be established to operate and manage the airport. The entity will be managed by an independent Board comprising of Executive and Non-Executive Directors, with Non-Executive Directors in the majority, and the chairperson being a Non-Executive Director. One of the areas of management for the entity will be the development of vacant land in the airport, and in the precinct around the airport. The Technology Hub project will be one of the first development projects that will be managed by the Airport Entity. A Property Development division is proposed in the organizational structure of the new entity, and a process will be developed for the management of the Techno Hub, including a dedicated sub-unit that will manage the marketing of the site, and tenanting and other issues.

2.9. Alternatives

The EIA regulations define *alternatives* as: “different means of meeting the general purpose and requirements of the activity, which may include alternatives to the: Site (location of property), Type of Activity to be undertaken; Design or Layout; Technology to be used”.

It is a specific requirement of the EIA regulations that the SEIR process includes the identification and consideration of feasible alternatives in the scoping process for assessment in the EIR phase of the process. The value of this requirement is that alternatives are a form of mitigation, in that certain options may avoid or reduce the nature, extent or duration of one or more impacts, on one or more aspects of the receiving environment. The following section presents an outline of the

alternatives which were identified in the scoping process, the motivation therefore and why certain types of alternatives were not considered.

2.9.1. Alternative Site

No alternative site is proposed for assessment on the basis that the proposed site:

- Is owned by the Municipality,
- Is an operational and licensed airport and has been for over 75 years.
- Is zoned for Airport and associated activities,
- As discussed, the MM has identified opportunities to improve the financial sustainability of this enterprise and increase its contribution to the local and regional economy. The implementation of certain of these opportunities and improvements since 2010, has seen a marked improvement in the sustainability of the Airport. There is also interest from investors and funders to take up the various other opportunities provided through the proposed expansion. Considering any other site would undermine the progress made in this regard.
- The costs of establishing a new airport when there is growth in the performance of the current Airport motivates against considering this.

Lastly, it should be noted that there have at points in recent years been motivation from various parties that any further development of Pietermaritzburg Airport is flawed because of the topographical constraints and length of the runway which prevents larger planes from landing there. This reduces the potential for growth and competition which leads to high ticket prices. Based on these arguments, it has been proposed that an alternative site be considered in the Camperdown region. The proposed site falls within the neighboring Municipality to MM. Given that the Municipality is not able to invest beyond its geographical borders, this site is not an option. Furthermore, the improvements to navigation aids and other developments have increased the size of planes that can land, with a concomitant increase in scheduled passengers (numbers have approximately doubled between 2010 and 2015).

2.9.2. Alternative Type of Activity

As the site is designed, zoned for and has a license to operate as an Airport, the consideration of alternative 'core' use is not an option. While the core function of the airport has not changed, the application of the "Airport City" concept has seen the addition of alternative land-uses within the adjacent land. The selection of these land-uses is in response to market demand and zoning of this land, and they are complimentary to other uses in the Airport Precinct or the Airport itself. They are therefore considered appropriate Land-use/types.

2.9.3. Alternative Layout

There are two elements of the proposed expansion for which alternative layouts/alignments were identified in the scoping process. The reason for and detail of each is described below.

Alternative Site for the Extension of General Aviation Infrastructure

There has been considerable demand for additional GA facilities, notably "hangar space' for some time. A longstanding concern of the existing GA users at the Airport is that the GA and commercial aircraft and activities are not separated. As described at the Airport Users Focus Group meeting (See appendix 4) the users explained that 'mixing' commercial and light aircraft presents safety risks. Through the scoping process, the Airport User Group identified the site shown as "New GA Alternative II". The site is located between the two wetlands in the open space corridor and would require new access off Gladys Manzi/Murray Road, proposed to be routed along an existing dirt track.

Figure 12 Project layout showing GA alternatives

This site was identified as beneficial by the users because it would separate the GA and Commercial aircraft, hereby reducing current issues. The location of the site would also mean that lighter aircraft would not have to taxi the full extent of the runway which is currently the case and unnecessary use of 'runway time'.

The preferred alternative site for the expanded GA area is shown in **Figure 12** as 'New GA alternative I'. It is located adjacent to the existing GA facilities. It is preferred because it will be an extension of the existing developed area and so the cost will be lower.

The technical feasibility and associated costing for each option was investigated as part of the DBSA funded feasibility study. The outcomes of this study were that Alterative 2 is not feasible for the following reasons:

- It requires access to Murray road, at a location where there is no sight distance. Authorisation of this would be unlikely.
- An alternate access will be off the new Market Road Extension, which will sterilise a prime industrial property that is greatly in demand in the area, and a catalyst for the road extension.
- It will require a remote access to the airport, thus increasing the security risk at the airport, both on landside and airside.
- There is potential to interrupt line of site requirements from the control tower.

In addition to the technical aspects:

- Alternative 2 is considerably more expensive than option 1 because bulk services would need to be provided, including the new road and bridge. The earthworks would also be more expensive. The cost of Option 2 is estimated to be approximately R36 000 million more than the preferred alternative 1.
- The ecological impacts are higher.
    - The access road would require an additional wetland crossing, thereby adding to the cumulative impact on the already highly impacted system.
    - The site is located in the core grassland area identified in the ecological specialist study, thereby adding to the cumulative impact on grasslands.

The EIA regulations require that feasible alternatives are taken forward in the assessment. Given that alternative 2 is not considered technically feasible and has additional negative ecological and economic consequences, it was not taken forward into the assessment phase.

Alternative Access Routes

Access to the Airport is currently poor with only one entry point which is reached after navigating through the margins of the congested Mkondeni industrial area and several residential suburbs. It is a very indirect route from the main access route, the N3.

The Precinct Planning team proposed new access routes as part of the broader "Access Framework" in the Precinct Plan with the aim being to create more direct access to the Airport and adjacent industrial area, and also improve the general traffic flow within the broader Airport precinct.

The proposed routes are shown as 'proposed roads' in **Figure 13**. The improved access includes:

- An extension of the Market Road over the disused service railway via a bridge to a traffic circle.
- The road extends from the traffic circle to the south-east and links to Gladys Manzi Road, thereby providing access to the industrial land, and links through to this area to improve traffic flow.
- The road also extends in a northerly direction from the traffic circle to provide access to the airport and new parking area via internal roads. It also continues along the route of the railway and crosses over the railway to provide a loop system that links into Washington Road.

A new access road is also proposed adjacent to the boundary of the Oribi Village. This road ties into the Market-Washington Road loop system.

Figure 13 Layout of proposed new road infrastructure

These proposed additions to the road network will provide improved/direct access to the Airport and a total of 3 access points which will facilitate improved traffic flow through the broader precinct.

The alternatives within this system relate to the relationship between the proposed new roads and the disused service rail-line which is owned by Transnet. Transnet have confirmed that:

- The line has not been used in more than 10 years.
- There is the option to transfer the property to the Municipality and for the decommissioning of the line. Such transfers take place via a Transnet defined process. It also involves a cost which has yet to be defined.

Given the above situation the options for the Market-Washington Road extensions are:

- Option 1 – Market-Washington Road Extension on Rail Line Route - Under this option, it is assumed that the rail reserve **WILL** be transferred to the Msunduzi Municipality. The proposed Market Road Extension will follow the route of the existing railway line, using the existing rail platform, and will link back into Washington Road.
- Option 2 -Market Road Extension adjacent to Rail Line
  Under this option, it is assumed that the rail reserve **WILL NOT** be transferred to the Msunduzi Municipality in the foreseeable future. Under this option the proposed Market Road Extension will run parallel to existing railway line on the airport side, and will link back into Washington Road.
  The new internal roads will be constructed within the Pietermaritzburg Airport to link the Market Road Extension with the airport internal roads.

Option 1 is preferred because:

- It enables the use of the existing rail platform which reduces the need for the earthworks required to develop the road, and negates the need for the bridge over the railroad berm at where it joins Market Road. There is a consequent cost saving of approximately R30 million.
- It frees up additional land/reduces the area of grassland impacted.

2.9.4. Alternative Design/Technology

As described in section 2.6 the level of information provided detailed designs will be the responsibility of developers who take up the opportunities created by the new Municipal entity. It will be their responsibility to investigate alternative technology and design to achieve a more sustainable outcome. The options they consider will be guided by the EMPR developed as part of the EIA, and other municipal policies.

2.9.5. No-go Option

This is a standard requirement of the EIA process and considers the situation where none of the proposed development elements takes place and the Airport continues in its current form and level of operation in terms of infrastructure and air traffic.

2.9.6. Alternative Sequencing of Developments

As discussed in section 2.6, the timing and rollout of the various elements in the proposed plan is dependent on demand and more importantly the finance to initiate the development. These unknowns affect when the various elements being established, effectively alternative sequencing.

The timing for the development of the new access roads is a key determinant in the sequencing of the other infrastructural elements. Moving the terminal building to the new site, and therefore the parking area because it needs to be located adjacent the terminal, is dependent on finance being obtained to develop the new access roads to Washington and/or Market roads. In the event that these roads are not constructed the terminal building may not need to move before the end of phase 1 – i.e. 2025. If the parking area did move before then, the Municipality is obliged in terms of the contract with the tenant to pay for the costs of such a move.

2.9.7. Alternative Flight Paths

Engagement with ATNS during the EIA investigation confirmed that there are no alternative flight paths due to the topographical constraints of the approaches to the airport, in combination with the weather patterns (notably the prevailing winds).

2.10. Project Costs

The total projected costs for the infrastructure associated with the Phase expansion are shown in **Table 11**. As explained, the majority of the project elements have been defined at a high level (low level of detail) via feasibility level investigations. Certain aspects, such as phase 1A of the Techno Hub, have involved detailed design to the level of tender documents being developed. The accuracy

in the associated costs varies accordingly. It should also be noted that certain feasibility investigations developed costs excluding VAT, and certain included VAT. To standardize, VAT was added to arrive at a final cost.

In reviewing the overall costs, the following should be noted:

- Given the high level nature of the values presented and the fact that the development will take place in a piece meal fashion over approximately 10-15 years, these costs will change.
- The preferred option for the proposed new road infrastructure results in a saving of approximately R30million.
- These costs only account for the development of the phase 1 infrastructure. The Impact assessment lists various mitigation and management measures and actions that will have cost implications. Certain of these have been taken forward in the Precinct Plan which includes a summary of projects that serve as mitigation e.g. rehabilitation of the Blackborough aquatic corridor and development of a storm water plan.
- The costs are substantial. As discussed extensively in the Economic Impact Assessment specialist report, the benefits of the project are dependent on the sourcing of this funding, and the successful establishment and operation of Municipal Entity set up to market and manage the Airport going forward.

Table 11 Summary of the infrastructure costs for phase 1 expansion

Infrastructure	Estimate Cost (incl. VAT)	Source of Costs
Taxiways and Aprons	R13,852,020	VNA
Control Tower	R790,818	Master Plan 2014
General Aviation (hanger cost)	R29,875,000	VNA
Mixed-Commercial Use	R7,377,686	Master Plan 2014
Industrial Zone	R23,730,876	Master Plan 2014
Road option 1 (on rail)	R51,795,510	VNA
Road option 2 (adjacent to rail)	R80,976,910	VNA
Parking	R13,262,760	Master Plan 2014
Passenger Terminal Building	R44,403,000	Economic Impact Assessment
Technology Hub – Top structures	R1,355,810,000	Economic Impact Assessment
Technology Hub (Basic Infrust and Bulk Services)	R262,590,933	GWI
Buffer Zone	R5,134,096	Master Plan Revised
Total: Full with Option 1 (Roads)	R1,808,622,699	
Total: Full with Option 2 (Roads)	R1,837,804,099	
Total: Option 1 (Roads), Phase 1A Techno-hub	R219,652,766	

NOTE: Technology Hub (Phase 1A only): R29,431,000 (Source – GWI)

3. OVERVIEW OF THE RECEIVING ENVIRONMENT

This section provides an overview of the key characteristics of the biophysical, socio-economic and cultural/historical heritage environment within the project and surrounding area. The description of the affected environment is drawn from:

- A range of available information sources which are referenced throughout.
- Two specialist investigations undertaken in 2011 when the EIA was originally commissioned these being wetland delineation and functional assessment, and a Heritage Impact Assessment.
- The various reports prepared as part of the Precinct Planning contract by the Markewizc - Redman Partnership (MPP).
- Unpublished information provided by I&APs during the PPP.

3.1. Topography

The airport has latitude and longitude coordinates of 29°38'48"S 30°23'54"E, at an elevation of 2423 feet (739 meters). A slope analysis conducted for the municipality in 2009[1] concluded that the land to the south of the runway is gently sloping with a gradient less steep than 1 metre in 3 metres (1:3). The 5m contours are also shown in **Figure 14** and indicate the land sloping away from the higher flat on which the runway is located towards the wetland and Blackburough Stream system. A detailed topographical survey[2] has been conducted as part of the planning for the Techno-hub site, which also includes small portions of the site to the East of the runway. The topographical survey informed the engineering designs for the various infrastructural elements. It also informed the geotechnical survey.

[1] Msunduzi Consolidated SDF Review July 2009

[2] Survey of the Pietermaritzburg Airport for Technology Hub Development. August 2015. Prepared by Global mapping South Africa for GWI.

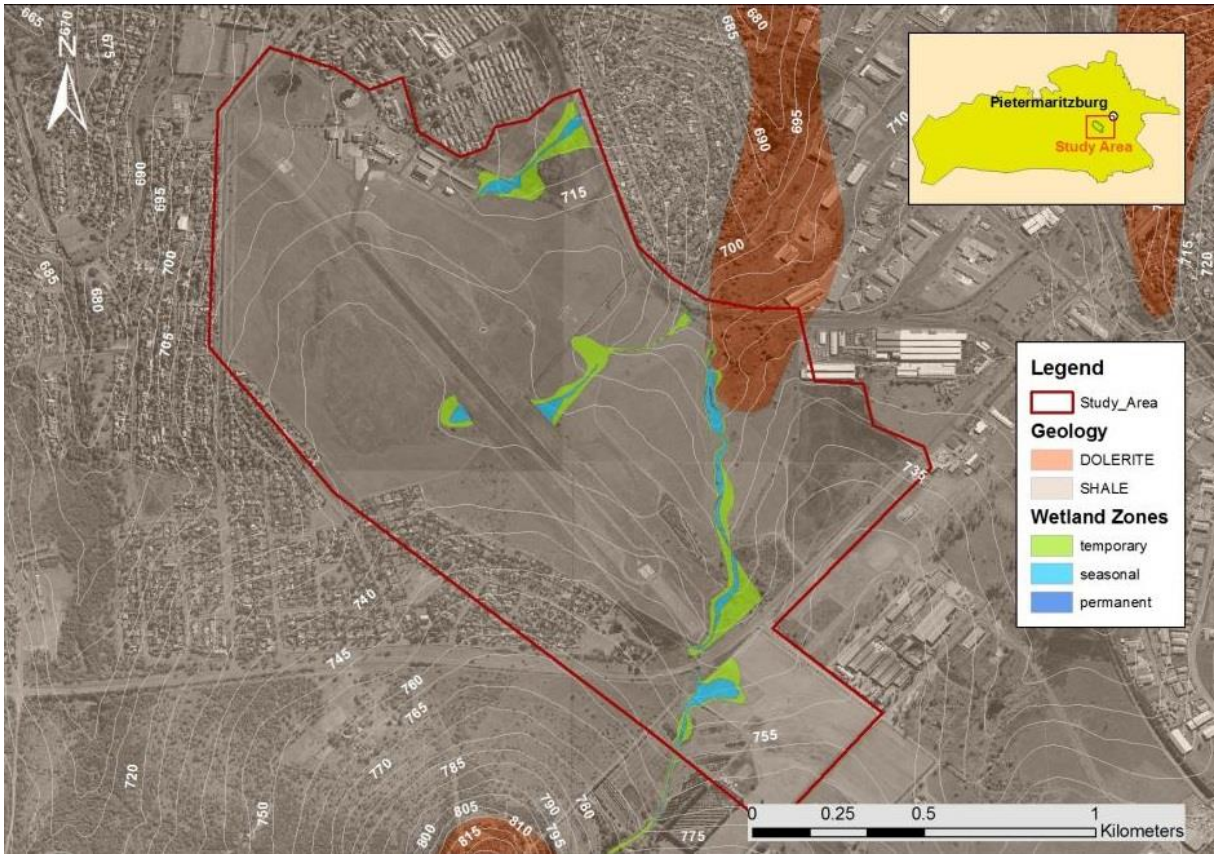


Figure 14 Geology and Topography of the study site

3.2. Geology

According to the 1:50 000 Geological Series Map No. 2930CB, Pietermaritzburg, the site is underlain by the Pietermaritzburg Formation (Pp). The Pietermaritzburg Formation is intruded by Jurassic aged Dolerite (Jd), dolerite bedrock was not intersected during the investigation. On site the shale bedrock is overlain by unconsolidated, residual and transported horizons. Structural lineaments in the forms of faults or dykes were not identified during the desktop investigations nor were these observed during the field investigations undertaken as part of the specialist geotechnical survey. The geotechnical defined the following subsoil profile, the spatial extent of which is illustrated in Figure 16, summarized as follows:

- ***Fill***: A fill horizon was generally described as a slightly moist, dark-reddish brown, soft to firm, intact sandy silty CLAY with dump rock and concrete. The fill varied in depth, extending between a depth range of 0m – 1m below the ground level.
- ***Colluvial Horizon:*** A colluvial horizon was identified and is described as a slightly moist, dark-greyish, loose but intact clayey silty SAND. This horizon generally extended from a depth of 0.00m to 0.30m below NGL.
- ***Alluvial Horizon***: Is associated with the wetland areas and is described as moist, dark brown, soft, intact, sandy and silty CLAY. The alluvial horizon extended from 0.30m to 0.5.m.
- ***Residual Shale Horizon:*** A residual shale horizon was described as slightly moist, yellowish-orange-brown, loose to medium dense, intact, fine gravelly shale fragments in a slightly clayey SAND matrix. The residual horizon generally extended to a depth of 0.3m to 0.50m .

- ***Shale Bedrock***: Shale forms the basal bedrock unit and was described as a light yellowish-brown stained orange, completely to highly weathered, fine grained, laminated with occasional infillings of clay gouge, soft to medium hard rock strength shale. Excavation refusal occurred on a medium hard rock strength shale variant. Shale rock was intersected at ground level in several areas with bedrock extending to beyond trial pit base depths.

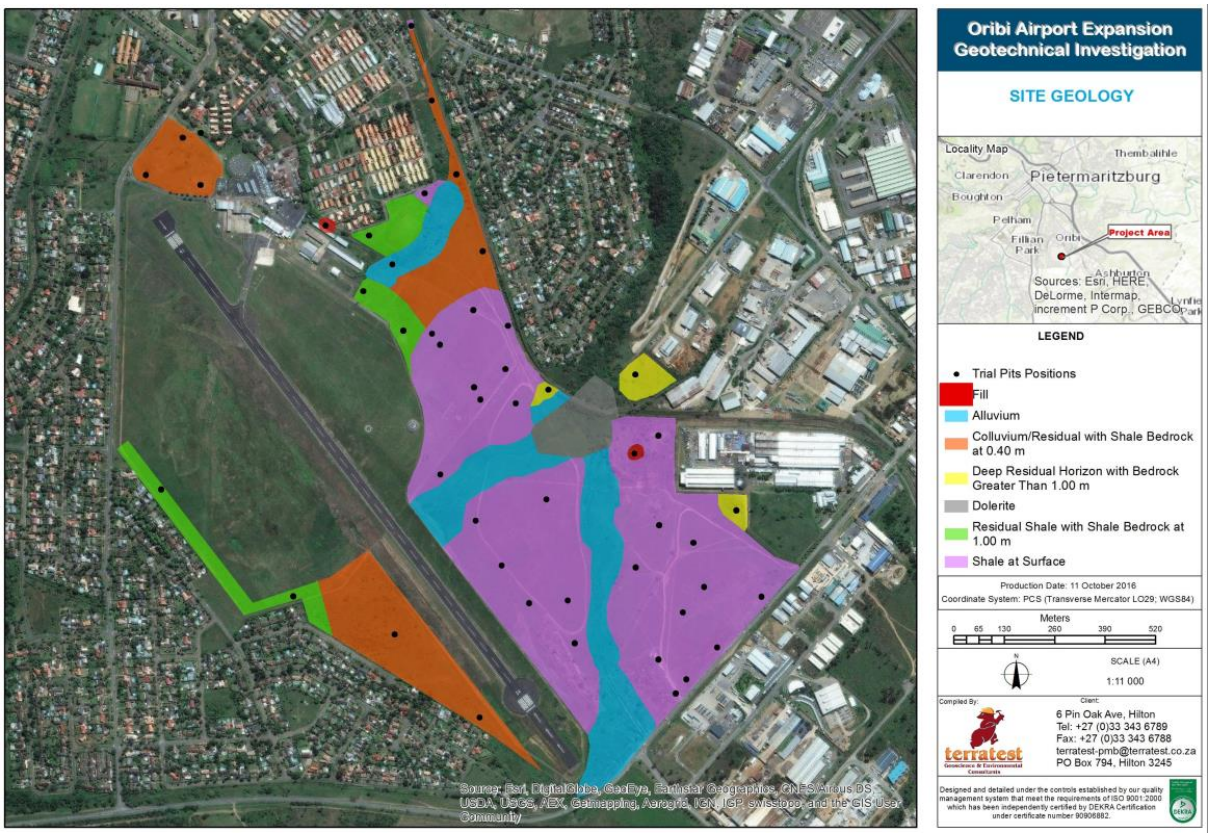


Figure 15 Site geology and soil profile

The geotechnical investigation (Terratest, 2016) drew the following conclusions relevant to development of the site:

- ***Ground stability:*** The shale bedrock generally extends to depth sin excess of 0.4 m below NGL and is generally shallow dipping, dipping (08^0/WSW). Occasional clay gouge is disseminated within laminations of the shale bedrock. This fabric and discontinuity is persuasive to the development of near horizontal shallow planar slip planes.
- ***Excavation Conditions****:* 'Soft' excavation conditions can be anticipated during stripping of the colluvial, alluvial and residual horizon and soft shale bedrock, which extend to various depths, generally between 0.0m to 0.4m below EGL. 'Intermediate' excavation conditions can be expected in the medium hard rock strength shale which generally extended from a depth of 0.4m to beyond the trial pit base depths.
- ***Construction Material****:* Where pavements are required the ferruginized shale horizon is only suitable for use in lower subgrade layer works. The completely weathered, shale bedrock is only suitable for use in the lower subgrade layerworks. Higher quality material required for the base and subbase layers will have to be sourced from a commercial quarry. Ashburton quarry is the nearest to the project site.

- ***Cut and Fill****:* The presence of shallow bedrock is favourable for founding, thus it is not envisaged that major engineering platforms will be required, this is however dependent on the design of the structure. Fill may be required and this must be imported from a commercial source.
- ***Groundwater and Subgrade Drainage****:* The groundwater table was not intersected during the investigation. The general, flat, impermeable nature of the site promotes surface run-off which is channeled via a network of natural drainage conduits and wetlands. The proposed roads should be designed with an appropriate storm water drainage management system.

The concluding summary is that: *The site is underlain by shale bedrock, which presents favourable founding conditions for structures. The site is considered suitable for the proposed development, provided that the design recommendations provided in the specialist geotechnical report are implemented to account for the certain geotechnical constraints.*

- The presence of clay gouge within the rock mass are inherent zones of weakness, foundation footing should be placed on competent bedrock devoid of clay.
- The transported horizons are considered unsuitable for founding structures due to the soil's variability in consistency and nature.
- Detailed geological investigation should be carried out once the layout pland and type of structures (lads) have been finalized, which may necessitate the need for geotechnical drilling and DPSH testing in order to provide a more detail evaluation of the shale rock mass.

3.3. Climate

The climate of the study site is seasonal, with hot and wet summers (December to February) and warm and dry winters (June to August). Rainfall in the study area is highly seasonal, typically highest in February and lowest in June. In the region, rainfall in the last couple of years has been very low and erratic as shown in **Figure 16**. Temperature is less seasonal and is highest during January and February and lowest during June and July as shown for Pietermaritzburg Airport (**Table 12**).

Table 12 The monthly average minimum and maximum air temperature for the Pietermaritzburg Airport region for the period 2008-2016 (Source: SASRI weather web)

Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Max	27	28	27	24	24	21	21	23	25	24	24	26
Min	17	17	16	13	12	9	9	10	12	13	14	16

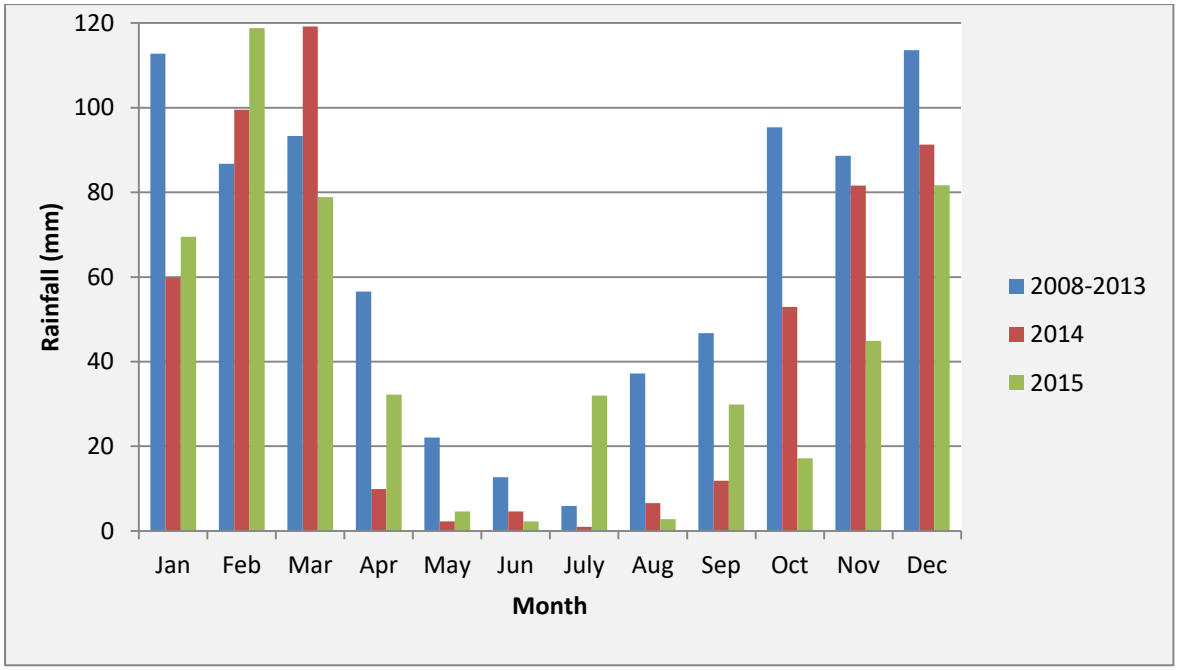


Figure 16 Average monthly total rainfall for the Pietermaritzburg Airport during 2008-2013 and 2014-2015. A noticeable decline in rainfall from 2014-2015 is discernible. (Source: SASRI weather web)

3.4. Air Quality

The climate and local weather in Msunduzi are strongly influenced by topography; the higher lying areas in the north and west of the municipality are colder and receive more rainfall than the lower lying areas in the south and east. The Pietermaritzburg city is located in a hollow formed by the valleys of the uMsunduzi River and its tributaries. On clear winter nights cold dense air flows down slope into the city bowl, much like water. This fills the valley floor with cold, dense air creating an inversion that prevents pollutants from escaping. This air movement also brings pollutants from the entire municipal area into the valley where it remains trapped by the inversion layer. The majority of industry within Msunduzi has developed within this inversion layer as this land is both flat and in close proximity to both road and rail transport routes. As a result the city suffers short-term peaks in pollution despite relatively few heavy industries.

There are a number of industries in Mkondeni industrial area, which lies within the airport precinct area. Mkondeni is an industrial hub with aluminum and steel production and factories among others, with emissions contributing to the degraded air quality within the area. There are no heavy polluting industries proposed as part of this project. The primary cause of additional air pollution will be in the form of additional vehicular traffic.

3.5. Natural Systems and Biodiversity

The Msunduzi Environmental Management Framework (SRK, 2010) is the primary informant of areas of biodiversity value and environmental issues such air and water pollution as well as environmental risk such as flooding. It also highlights natural areas and systems that supply levels of ecosystem services. These have all been combined in the establishment of an integrated development

constraints map. As indicated in **Figure 17**, the airport site is identified as an area posing high development constraints.

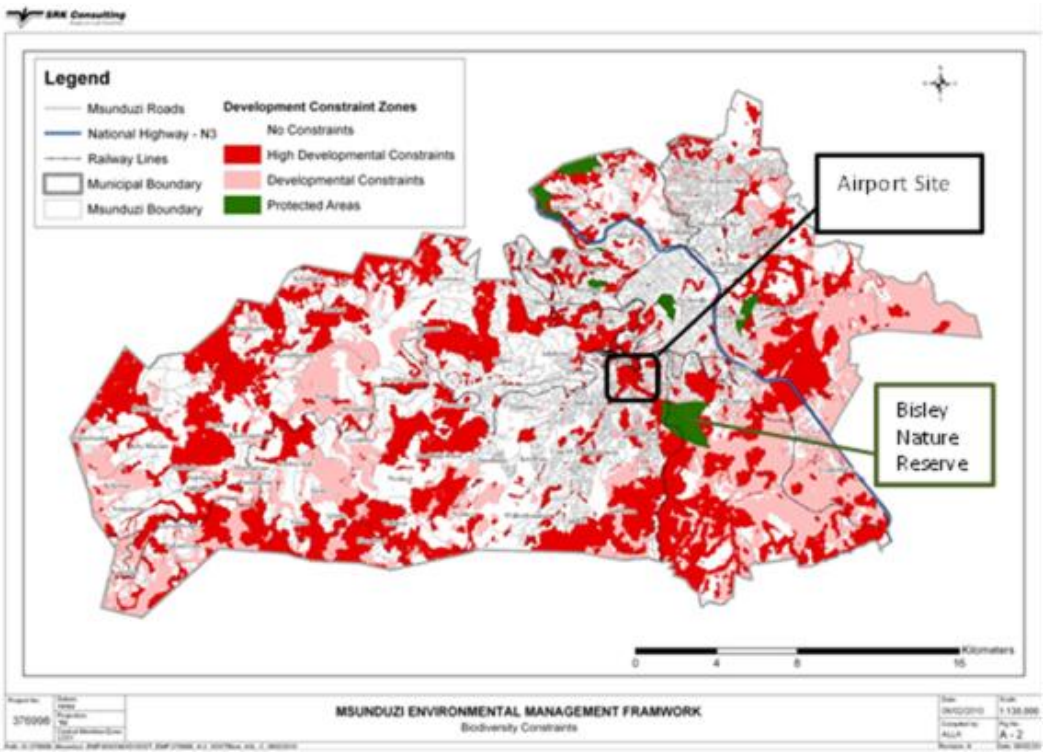


Figure 17 Development constraints within MM (Source: SRK, 2010)

Figure 17 also shows the close proximity of the development site to the Bisley Valley Nature Reserve. Bisley Valley Nature Reserve is situated on the western side of Pietermaritzburg airport on Murray Road going toward Mkondeni. This thorn veld reserve is 250 ha and managed by the Msunduzi Municipality and includes a variety of habitats including grassland, open and closed woodland, and thickets. There is a variety of bushveld birds, giraffe, impala and zebra. The proposed expansion will not impact directly on the Nature Reserve, the close proximity and forms a small part of the catchment for the stream system running through the Airport, there is a need to consider ecological linkages via the aquatic system between the Reserve and downstream systems.

Further analysis of the EMF report for the area indicates that the trigger for this category of constraint in terms of biodiversity is the occurrence of wetlands and grasslands on the site (**Figure 18**).

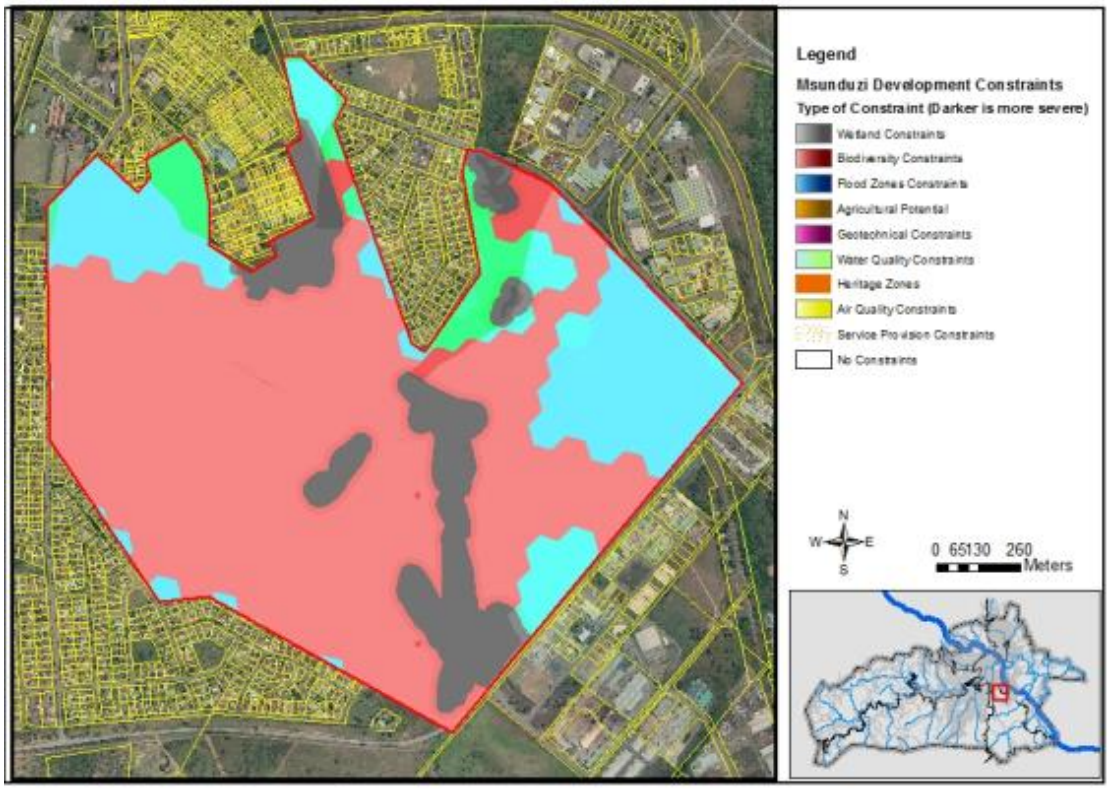


Figure 18 Environmental Constraints (Source: SRK, 2010)

Figure 18 shows the extent of wetland and grassland on the project site which is considerable, particularly in the case of grassland. It is these areas in which the various projects components and infrastructure will be developed.

3.5.1. Terrestrial Biodiversity

Vegetation

The regional vegetation type occurring on the study site is KwaZulu-Natal Hinterland Thornveld Mucina and Rutherford (2006). KwaZulu-Natal Hinterland Thornveld falls within the Savannah Biome and the vegetation is characterized by open thornveld dominated by Acacia spp. on undulating plains found on upper margins of river valleys. The vegetation unit is listed as vulnerable with a national conservation target of 25%.

A site assessment involving sampling at 3 sites within the airport fence and 4 in the adjacent area was undertaken. The aim of the investigation being: to map the vegetation units; establish the condition of the vegetation units; develop a species list (including both red data and invasive alien species). The assessment concluded that:

- ***Grassland condition***: Apart from one section towards Murray Road which is degrading the grassland areas were considered to be in relatively good condition. The fenced-in areas are in better condition compared with the grassland areas outside of the perimeter fence. This finding is based on the relatively good plant diversity identified at the sample sites within the fenced-in area. Other habitat types, apart from the various grasslands, included degraded bushveld and wetlands.

- ***A combined species list***: for the whole area was compiled (120 species), with presence recorded for each of the seven sites. It was noted that this list is incomplete due to limitations in timing available to sample.
- ***Red List plant species***: 5 red data species were identified on site, all of them either listed as declining or vulnerable; *Boophone disticha, Brachystelma franksiae, Crinum bulbispermum, Hypoxis hemerocallidea and Woodia verruculosa.*
- ***Invasive Alien Plant Species****:* The un-mowed, unburnt areas in the airport are being invaded by alien invasive woody plant species. *Lantana camara*, *Solanum mauritianum* (Bugweed), *Litsea sebifera*, *Melia azedarach* (Syringa), *Gleditsea triacanthos* (Honey locust) and *Tecoma stans* (Yellow bells) are species that require an active alien invasive control programme in this area. Other alien species are present throughout the study area with a full list of alien species being found in the specialist report.
- ***Medicinal Plants***: of the species identified 3 are commonly used for various medicinal purposes.

Fauna

This desktop study identified seventeen potential faunal species of conservation concern that may be found within or adjacent to the study area (INR, 2008). These range from millipedes, earthworms and frog species to several bird species. All of the faunal species listed are largely cryptic species which made it difficult to confirm their absence or presence. An assessment of the 'likelihood of occurrence' was therefore made based primarily on the availability of suitable habitat.

In terms of birds, a study undertaken at Pietermaritzburg Airport by Byron and Downs (2002) looked at the bird presence of the area. The article noted that Pietermaritzburg Airport is one of the worst airports for birds striking aircrafts, with Hadeda Ibis (*Bostrychia hagedash*) and the Crowned Plover (*Vanellus coronatus*) the most common birds hit by aircrafts at Pietermaritzburg Airport. Of all the bird species observed only the Lanner Falcon (*Falco biarmicus*) is on the Red Data Bird List (Near-Threatened in South Africa).

3.5.2. Aquatic Systems

Given the linear nature or aquatic systems, it is necessary to consider the systems within a project site in relation to the catchment up and downstream of the study site. The study site is located in the Msunduzi catchment. According to the EMF (2010), this catchment is highly modified with no absorption capacity which can be loosely translated to poor water quality. To ensure catchment rehabilitation to an acceptable level as per municipal requirements, there is need for catchment management interventions prior to any further development within the catchment **Figure 19** shows how the project area forms the headwaters of the stream which links the site to the Msunduzi River.

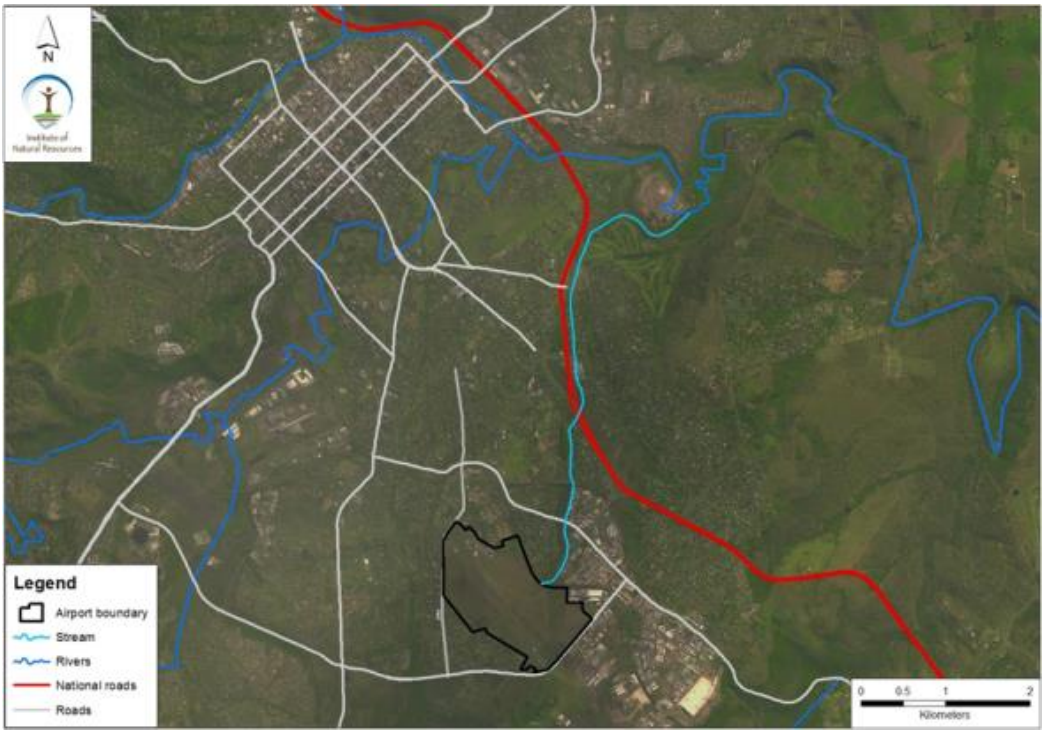


Figure 19 Overview of the drainage system

3.5.3. Wetlands

Wetlands are specialized systems valued for the range of ecosystem services they supply. A wetland delineation was undertaken to map these systems. The outcomes are shown in **Figure 20**.

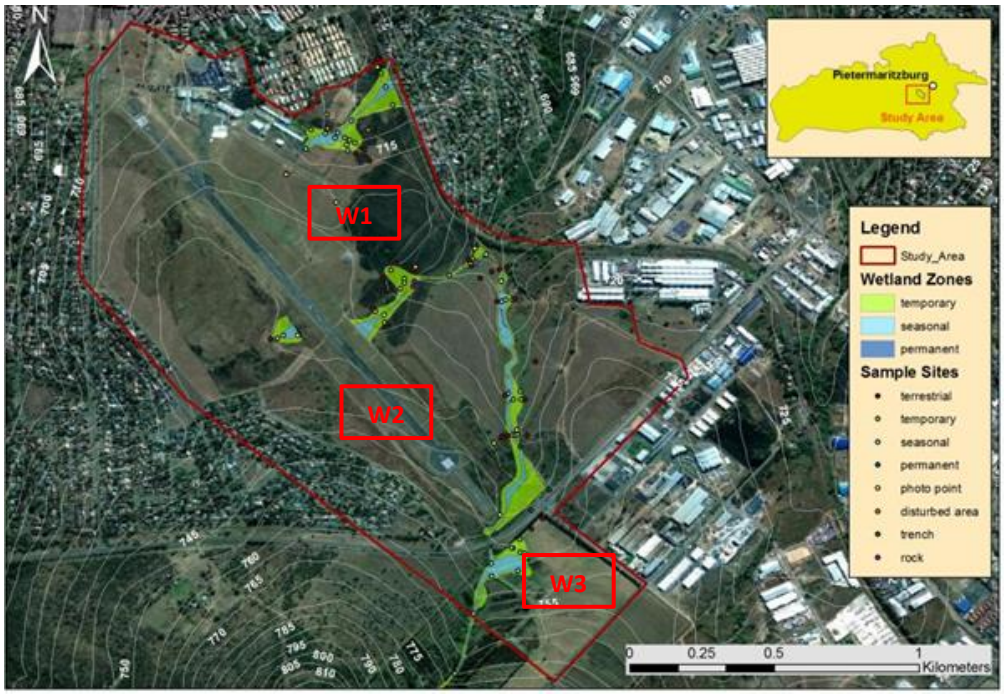


Figure 20 Wetlands within the study site

In addition a WET-Health and WET- Ecosystem services assessment were undertaken which concluded the following regarding the state and value of the three wetlands:

Wetland 1

This is a disturbed valley head seepage wetland, which has been extensively transformed through a range of anthropogenic activities not limited to the following which are shown in :

- The construction of the existing Pietermaritzburg Airport infrastructure and associated infrastructure (increased inputs into the wetland);
- Oribi village and sports fields at the village (portion of the wetland has been cleared for a soccer field);
- Photo 1 - Fencing;
- Photo 2 - Construction of channels / drains within the wetland to drain storm water runoff from the airport (this includes water from the apron and a car wash facility);
- Photo 4 - The on-going cutting and burning of vegetation in the vicinity of the airport for safety purposes;
- Photo 5 - The dumping of rubble and litter within the wetland;
- Photo – 6 Alien vegetation; and
- Photo 3 - The construction of a railway bridge, which has resulted in a 'pinch' in the wetland. It should be noted that downstream of this railway bridge is an urban area where the wetland has been largely destroyed and in some places replaced with a canal.

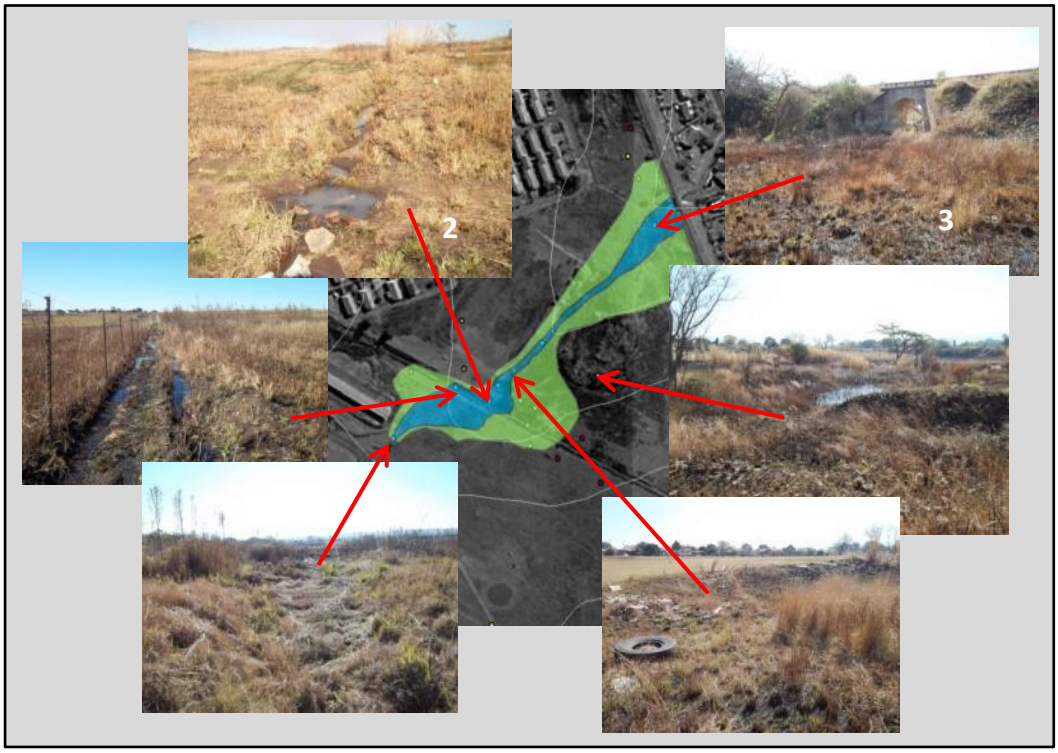


Figure 21 Map of Wetland 1 and impacting issues

Based on the level of transformation the health, importance and sensitivity of the wetland was assessed to be the following:

- ***Health Category***: E (Seriously modified - The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable).
- ***Ecological Importance & Sensitivity****:* The EIS score for the wetland was determined to be less than **1**. This means that the EIS is rated as **LOW** (Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers).
- ***Ecosystem Services:*** Due to extensive disturbances, wetland ecosystem services scored poorly. Hillslope / valley head seeps generally slow the movement of water through the catchment, which has a number of benefits, such as enhancing the quality of water. However, this wetland has been artificially canalized to accommodate storm water runoff from the airport precinct. In addition, the adjacent urban area has resulted in the loss of a significant portion of the wetland, i.e. through the clearing of soil / levelling of an area for a soccer field, etc. Flood attenuation scored the highest, which is indicative of the natural functioning of a seepage wetland (particularly early in the rainy season). Limited streamflow regulation, sediment trapping, enhancing of water quality and erosion control is still provided by the small portions of remaining seepage areas (i.e. portions not canalized). Water supply for human use only scored a 'relatively' high score due to its association with streamflow regulation.

Wetland 2

Wetland 2 is a disturbed valley head / hillslope seepage wetland, which has been transformed through anthropogenic activities, including but not limited to:

- Photo 5: The construction of the Pietermaritzburg Airport runway directly through the upper portion of the wetland;
- Photo 1 and 2: The canalization of the wetland downstream of the culverts under the runway;
- Photo 3: The removal of wetland soils within portions of the wetland (i.e. particularly upstream of the runway); and
- Photo 4: The reduction in vegetation cover through either burning and / or cutting

Based on the level of transformation the health, importance and sensitivity of the wetland was assessed to be the following:

- ***Overall Health: D (Largely*** modified - A large change in ecosystem processes and loss of natural habitat and biota and has occurred).
- ***Ecological Importance & Sensitivity:*** The EIS score for the wetland was determined to be 1.6. This means that the EIS is rated as **MODERATE** (Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers).
- ***Ecosystem Services****:* Due to the disturbances to this wetland ecosystem services in general scored poorly. Hillslope / valley head seeps generally slow the movement of water through the catchment, which has a number of benefits. However, water flows through a culvert under the runway and the

wetland is largely canalized downstream of the culvert. Flood attenuation and streamflow regulation scored the highest, which is indicative of the natural functioning of a seepage wetland (particularly early in the rainy season). Limited erosion control and enhancing of water quality is still provided by the portions of remaining seepage areas. Note: Water supply for human use only scored a 'relatively' high score due to its association with streamflow regulation.

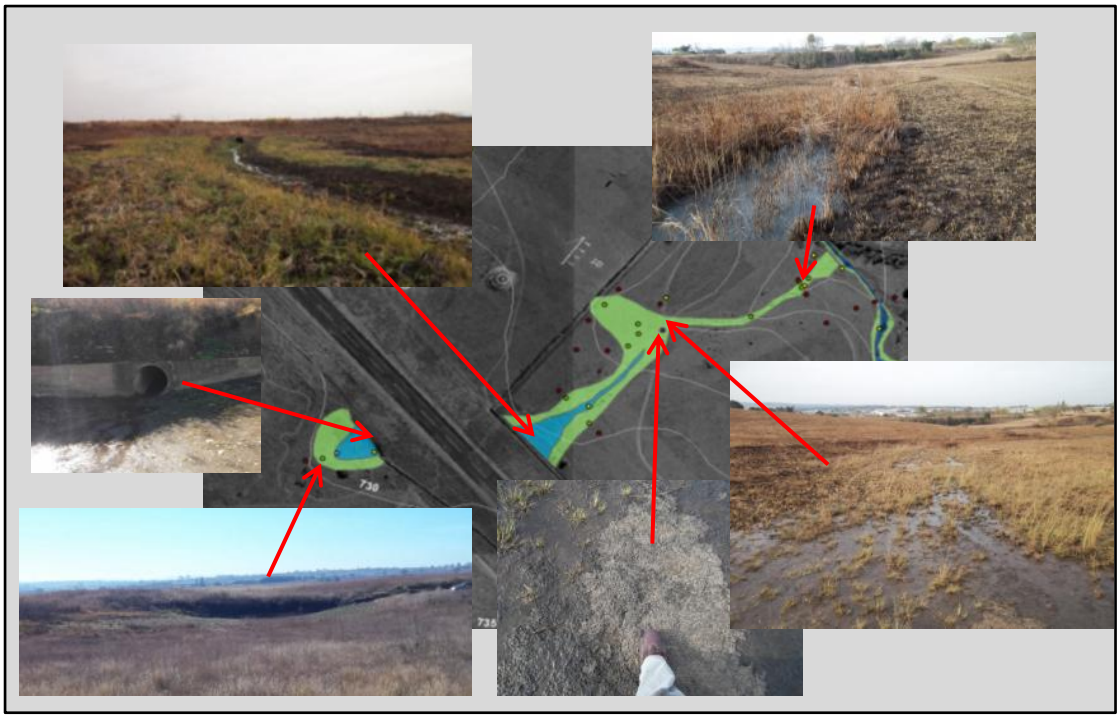


Figure 22 Map of Wetland 2 and impacting issues

Wetland 3

Wetland 3 is a disturbed channelled valley bottom wetland, which has been largely transformed through anthropogenic activities, including but not limited to:

- Photo 1: Farming activities in the catchment and the upper reaches of the channel. These include the converting of wetland areas to pastures and clearing for the cultivation of various crops;
- A tarred road (Gladys Manzi), which cuts through the top portion of the wetland;
- A light industrial area within the catchment. Storm water runs directly into the wetland;
- Photo 3: Deep trenches have been dug for water pipelines adjacent to the Gladys Manzi road. These trenches run directly through the top portion of the wetland and also along it;
- The dumping of rubble and litter within the wetland, primarily downstream of the Gladys Manzi road;
- Photo 4: Earth works, i.e. trenches, directly downstream of the Gladys Manzi road;
- Photo 5: Alien vegetation; and
- Photo 6: The construction of a railway bridge, which has resulted in a 'pinch' in the wetland, i.e. the toe of the wetland.

Based on the level of transformation the health, importance and sensitivity of the wetland was assessed to be the following:

- ***Overall Health:*** E (Seriously modified: The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable).
- ***Ecological Importance & Sensitivity:*** The EIS score for the wetland was determined to be **1.6**. This means that the EIS is rated as **MODERATE** (Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers).
- ***Ecosystem Services:*** Due to the existing disturbances to this wetland ecosystem services in general scored poorly. Water supply for human use scored the highest, which was due to the presence of all three wetland zones and limited use for agricultural purposes, i.e. water from the wetland is not used for irrigation purposes but crops and pastures within and adjacent to the wetland still benefit from the moist conditions. There is a level of erosion control in the upper portion of the wetland, where the vegetation cover is largely intact, however, directly above the toe of the wetland gullies have formed, which is likely due to the underlying geology and the 'pinch' in the system where the railway crossing was constructed. Carbon storage also scored relatively high, which is likely due to the presence of all three wetlands zones, although permanent zones are limited. As indicative of a channelled system there is some provision for flood attenuation and streamflow regulation

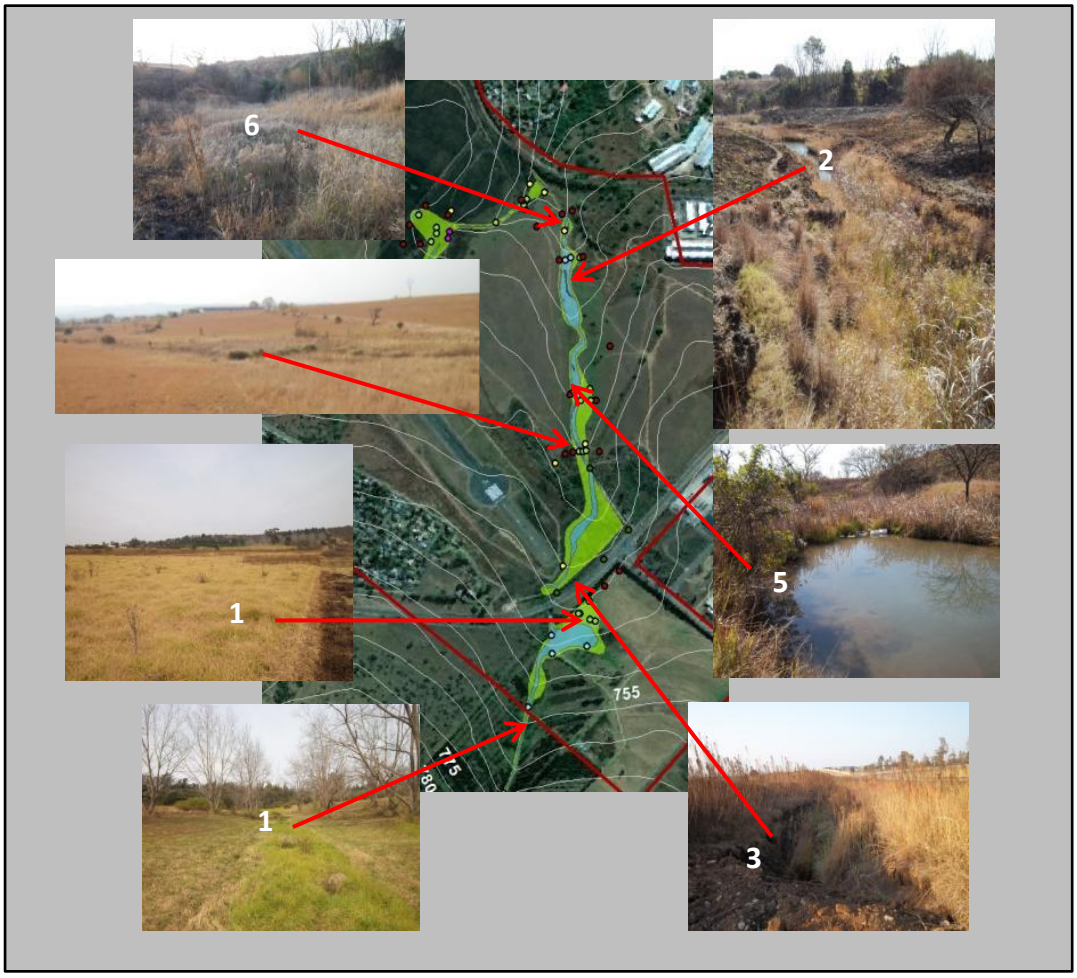


Figure 23 Map of wetland 3 and impacting issues

It should be noted that while all three wetlands within the study site are moderately to highly degraded, they still perform a level of various functions and their capacity to support associated biodiversity and perform other services can be improved through rehabilitation actions and

improved management going forward. The proposed expansion will add to the existing impacts. The nature and significance of these issues is assessed, which involves recommendations for mitigating the existing a new impacts on these important systems.

3.6. Socio-Economic Environment[1]

It is necessary to understand the socio-economic characteristics of the affected receiving environment for contextualizing issues identified and establish those of potentially high significance. The areas potentially affected by the proposed development is categorized spatially into:

- Regional context (Msunduzi Municipality) and
- Local context (airport and its precinct, and areas along the flight path) areas of influence

The MM is likely to experience impacts of a more indirect nature, predominately economic impacts. The local area of influence is the Pietermaritzburg airport and its surrounding suburbs, as well as the suburbs along the commercial/scheduled flight path which are directly impacted as a result of noise generated by aircraft on their approach and departure from the airport. The area surrounding the airport is inclusive of the area referred to as the Airport Precinct, for which a development plan has been developed that encompasses Phase 1 expansion of the Airport (The Precinct Plan).

3.6.1. Regional Socio-Economic Environment

The MM is located in the Umgungundlovu District Municipality, and is home to the Capital and second largest city on KwaZulu-Natal, Pietermaritzburg. Situated approximately 45 minutes' drive from Durban, the MM is astride the N3 corridor, one of the busiest development corridors in the country, which connects the Durban and Gauteng economic hubs. The MM is one of seven local municipalities in the District, and contributes 8% and 70% to the Gross Value Added (GVA) of the KZN province and District Municipality respectively. The MM consists of 37 wards, coving an area of approximately 590.6 km^2, and predominantly urban to peri-urban in nature, with some rural residential areas. The table below summarises the key statics of the MM.

Despite the MM hosting a few major sporting events such as the Dusi Canoe Marathon, the Comrades Marathon and World Downhill Mountain Biking series, the MM is not a key tourism hub. Its capital status has however resulted in it being a political and administrative hub for the province. **Table 13** lists various key statistics about the MM.

[1] The contents of this section have been extracted from:

- Msunduzi Local Municipality. (No Date). Integrated Development Plan (IDP) Review for 2015/16. Msunduzi Local Municipality IDP Office. Pietermaritzburg.
- Urban-Econ. (2013). KZN Technology Hub Feasibility Assessment – Msunduzi Value Proposition. Prepared for the Department of Economic Development and Tourism and KZN Provincial Treasury. Durban.

Table 13 Municipal summary of key statistics

	2011 (Census) [1]	2016[2]	State
Total Population	618 536	679 039	Increase
Number of Households	163 993	180 469	Increase
Average Household Size	3.6	3.8	Increase
Population Growth Rate	1.12% p.a	2.00% p.a	Increase
Male: Female	45.45 : 54.55		
Female Headed Households	45.2%	45.9%	Increase
Unemployment	33%		
Flush Toilets Connected To Sewerage	51.6%	49.3%	Decrease
Weekly Refuse Removal	53.2%	47.4%	Decrease
Piped Water Inside Dwelling	47.9%	41.7%	Decrease
Electricity For Lighting	91.9%	96.1%	Increase

The MM is subject to several advantageous components, such as:

- Its strategic location along the N3 corridor and in close proximity to the Durban Port and the King Shaka International Airport (KSIA)
- Its good transport networks (road, air and rail)
- Is an administrative and service centre for the inland region
- Is home to leading tertiary institutions such as the UKZN and the Durban University of Technology (DUT)
- Is well equipped with services (commercial, community and infrastructure)
- Has an established business base with an integrated Chamber of Business (CoB)
- Its manufacturing basis which includes textiles, agriculture (timber, beef, dairy, agri-processing), aluminium, construction material, clothing and leather goods, motor components, and steel.
- It being a tourist destination which drives the increase of hotels and restaurants
- Its assortment of development projects and planned growth

Population and Demographics

As indicated in the recent census (2011), the average annual population growth rate in the MM of 1.21%, having risen from 552 837 people in 2001 to 618 536 people in 2011. Based on the 2016 municipal records, the population has further grown to 679 039. There has been an increase in the number of households (130 292 to 163 993 to 180 469 in 2001, 2011 and 2016 respectively), however the household size has decreased from 4.0 (2001) to 3.6 (2011) and 3.8 (2016) persons per households. As indicated in the table above, there are more females than males in the MM, which is a trend that has strengthened since 2001.

The majority of the MMs population (68.4% in 2011 and 64.7% in 2016) is within the economically active age bracket (15 to 64 years), while approximately a quarter of the population (26.6% in 2011 and 31.5% in 2016) is under the age of 15, and the remaining are over the age of 64. Although the

[1]Msunduzi Local Municipality. (No Date). Integrated Development Plan (IDP) Review for 2015/16. Msunduzi Local Municipality IDP Office. Pietermaritzburg.

[2] http://www.municipalities.co.za/locals/view/88/Msunduzi-Local-Municipality#demographic

dependency ration of people within in 15 to 64 age cohort has decreased, it still remains high at 46.2% (2011) and 54.7% (2016).

One of the main concerns in the MM is the prevalence of HIV/Aids. It has been recorded that the uMgungundlovu District Municipality, in which the MM falls, had the highest prevalence of the highest prevalence of HIV/Aids in the province and country in 2010[1]. The HIV/Aids prevalence rate in the MM was 42.3% (2010).

In terms of education in the MM, there has been positive change between 2011 and 2011, with a decrease in the percentage of adults of the age of 20 with no schooling (record of 5.5% in 2011 and 4.3% in 2016). In line with this trend, there has also been an increase in the percentage of adults with a matric qualification, having risen from 24.5% in 2001 to 33.7% in 2011, and a further increase to 40.5% in 2016. In addition, those who have obtained higher qualifications have also increased from 9.2% to 13.1% and 14.5% in 2001, 2011 and 2016 respectively. Despite these positive trends, the number of children of school-going age that are attending school has decreased from 66 789 in 2001 to 62 737 in 2011. isiZulu is the most predominately spoken language in the MM, followed by English. Other prominent languages include Afrikaans, isiXhosa and Sesotho.

Economy

In 2014, the MMs GDP showed signs of positive growth following the 2010 period of negative growth (3.85% for 2010). The census indicates that there has been a decline in the unemployment level, the percentage of unemployed economically active adults having decreased from 48.2% in 2001 to 33% in 2011. This trend is mirrored by the youth (15-34 years) unemployment rate, which has decreased from 58.2% to 43.1% in 2001 and 2011 respectively. The key economic sectors that drive the MM and contribute to the GDP include Community Services, Finance, Transport, Trade and Manufacturing.

In terms of the Gross Value Added (GVA), which is a measure of the value of goods and services produced in an area, the Municipality's GVA comprises of tertiary (69%), manufacturing (25%) and agricultural (6%) activities. The tertiary sector is driven by retail trade and business services, and a large portion of the manufacturing component is reliant on the commercial agricultural capacity of the surrounding municipalities. The main economic sectors contributing to the GVA are general government (19%), business services (14%), wholesale and retail trade (10%), and Transport and communication (9%). The Information Communication and Technology (ICT) is also a key sector with a growing at a rate of 7.5%, and is positively impacted by the 3.8% growth rate of the electrical machinery and apparatus sector. Alongside recent major developments (such as the Victoria Country Club Golf Estate, Liberty Midlands Mall, the Golden Horse Casino and Hotel, and 'Motor City'), property development is also on the rise in the MM, with developments ranging from residential estates to light industrial, hotel and conferring facilitates, commercial enterprises, and logistics and warehousing.

As previously indicated, the MM is fortunate in that it has a number of economic advantages, namely: locational (its central location and its situation along the N3 corridor – a primary logical

[1] According to the annual Department of Health anti-natal survey undertaken at state hospitals

corridor linking two key economic hubs, Durban and Gauteng); natural/geographic (highly fertile land); human capital (array of good schools and tertiary education facilities); and institutional (capital city of the province).

Employment and Labour

Employment figures for the MM demonstrates that majority of employment is of a formal nature, accounting for approximately 167 000, while informal employment accounts for approximately 32 500 based on the 2015 figures. Formal employment rates grew by 1.5% between 2005 and 2015, however this rate is too slow to absorb the growing labour force, which is evident in the fact that unemployment rate is 2015 was 30%.

The majority of formal employment is generated by the community services sector, followed by the trade, finance and manufacturing sectors. The informal employment is dominated by the trade sector, with other main contributors being community services, construction and transport sectors.

Total remuneration derived from the formal sector in MM in 2015 was approximately R23.5 billion. The majority of this is generated through the community services sector (almost 40%), with other main contributors being the manufacturing, finance and trade sectors. This demonstrates that the manufacturing sector plans a relatively important role in generating relatively high paid jobs, although it on contributes to approximately 13.5% of the formal sector employment.

Expenditure

Household expenditure per sector is an important reflection of economic activity in the area. Accommodation, food, transport and taxes are the highest expenditure sectors.

Infrastructure

Trends in the access to basic services varies as access to piped water and electricity having increased between 2001 and 2011, while the percentage of households with flush toilets and refuse removal has decreased. Such decreases could be attributed to the population growth of the municipality. In terms of housing backlog, the Department of Human Settlement estimated there is a need for approximately 6 800 houses.

6.6.2 Local Socio-Economic Environment

The overview of the local socio-economic environment is categorized into three areas: the Airport, the suburbs surrounding the airport (inclusive of the Airport Precinct), and the 'extended flight path zone' (the suburbs in the Pietermaritzburg area that are potentially impact by the commercial/scheduled flight path). The context of these three areas is provided in the sub-sections to follow.

Pietermaritzburg Airport[1]

[1] Source: Delta Built Environment Consultants, 2014

Pietermaritzburg Airport (previously known as Oribi Airport) is owned by the MM and serves the city of Pietermaritzburg and surrounds as well as the outer west suburbs of Durban. It is is located at 29°38'44.47" S and 30°23'45.06" E off Oribi Road in the Suburb of Oribi. Construction of the Airport was completed in March 1931 when the municipality also received a license to operate from the Civil Air Board[1]. A flying school was opened in 1938, and the Aerodrome was then leased to the Defence Authorities for the duration of the war and for a year afterwards. The City Engineer took over the Aerodrome in 1945 from the Defence Authorities. Over time, concern about the state of the runway led to extensive investment by the Defence Department and the city council, culminating in an official ceremony marking the opening of the Oribi Aerodrome in July 1967. While the Airport provides a service to General Aviation (GA) and there has been significant demand for increase in the GA facilities so this revenue stream will increase, the sustainability of the airport and its contribution to the regional economy depends on the scheduled passenger services and associated "belly" freight (Coetzee and Oldham, 2007). The Municipality has continued to run the airport but not without subsidizing the provision of this service, which was estimated to be approximately R 5.5 million in 2007.

Since the initial construction of the airport, the surrounding land has naturally developed. The airfield site, contained within the airfield boundary fence, covers an area of approximately 89ha, however, there is significant area of undeveloped municipal owned land available which falls directly alongside the airfield, totaling to an area of approximately 157.45ha.

Existing infrastructure at the airport includes the airside, landside infrastructure, the terminal building, and other facilities and utilities. The capacity and condition of the existing facilities, infrastructure, utilities and roads at the airport were some of the key influential factors for the expansion of the airport. The various infrastructure types contain the following components:

- **Airside infrastructure:** runway, taxiway, apron areas, navigation aids, visual aids and signage
- **General Aviation:** facilities for non-scheduled aircraft and associated activities
- **Landside Infrastructure:** access roads and parking areas
- **Terminal Building:** public amenities including check-in counters, arrival and departure lounges, a VIP lounge, a cargo office, an airport management office, an ATM, a coffee shop and ablution facilities
- **Other facilities and utilities:** control tower, fire and rescue facility, fuel, car hire facility; hangars and general utilities (electricity, water, sewerage, communication).

Airport Surrounds

The Pietermaritzburg Airport and its surrounding areas (inclusive of the Airport Precinct which is defined below) falls with the *Central Business District (CBD), Ashburton and Eastern Areas* Area Based Management (ABM) region of the MM. CBD functions as the primary market area for the MM and a place of power concentration (economic, political and financial), investment, and rates revenue generation. The region also provides social interaction and integration opportunities, is a tourism destination and acts as a gateway to the surrounding tourist destinations. The Capital City status has contributed to the economic and development growth and stability of the region.

[1] The history presented in this section is a summary drawn from the historical overview of the airport presented in the 2007 Economic Impact study by Coetzee and Oldham.

The CBD, Ashburton and Eastern Areas ABM is the main employer with the Municipality's working population, with a large portion being employed in governments departments, while other in the industrial sector, particular in areas such as Willowton, Pelham, Mkhondeni and Northdale. The ABM is also home to the major education institutions in the Municipality, namely the University of KwaZulu-Natal (UKZN) and Durban University of Technology, which are in the Scottsville area, and the UNISA and FET College/s which are in the central (CBD) areas. Although the ABM's land use is dominated by thornveld and grasslands, the region is predominantly used for residential purposes. The area is also home to important transport corridors as it accommodates a large proportion of the N3, which also connects provincial corridors, and hosts the city's airport and railway station.

The area surrounding the airport is characterised by different types of land-use, namely low and middle income residential areas, industrial areas, and open space/reserve and agricultural areas. There are several schools in the surrounding area, such as crèches and day cares and a primary school (Bisley Park Primary) as well as several churches and two sporting clubs.

In terms of commercial entities within the residential areas (therefore excluding the car hire services etc. that operate within the airport boundary, and the industrial sector), there are several shops and service providers. From a tourism perspective, there are various small scale businesses such as lodges and BnBs, and transport/tour agencies. There are also several informal, small scale business entities within the residential areas.

Airport Precinct

The Airport Precinct includes the airport and portions of the surrounding residential neighbourhoods (Scottsville Extension, Oribi Village, Bisley and Oribi Heights) and industrial areas (Shortts Retreat and Mkondeni). The Precinct is 495ha in size and is located 2km from the main national transport route (N3) and 5km south-west of the Pietermaritzburg (CBD) (TMRP, 2016).

The Airport Precinct Plan (APP) of 2016[1] was commissioned by the Municipality in line with the Aerotropolis of Airport City concept, which seeks to optimize their role of the airport through links to the immediate/local context and the broader regional economy.

Land Use

Land-use within the Precinct is characterised below (TMRP, 2016).

- *Residential*: Accounts for approximately 23% of the Precinct and is cluster into four distinct areas:
    - *Oribi Village*: A former military barracks and low income housing area is now predominately an urban residential area managed by the Provincial Human Settlement Department.
    - *Oribi/Bisley/Westgate*: Mainly sub-urban single detached residential land-use types, with three duplex/cluster complexes.
    - *Scottsville Extension*: Mainly sub-urban single detached residential units, with seven cluster/duplex complexes.

[1] Airport Precinct and Management Plan for the Pietermaritzburg Airport and Surrounds, 2016

    - *Westgate*: The main land-use type is a residential complex, Acacia Park, which is a social housing cluster managed by the Msunduzi Housing Association.
- *Economic*: Accounts for approximately 21% of the Precinct and comprises of three distinct economic clusters.
    - *Mkondeni*: A mixed use industrial areas, dominated by agri-industry, general industrial and wholesale, and auto and repairs businesses, with evidence of informal trading operations.
    - *Oribi Village*: Various small businesses making use of existing building stock and some formal operations.
    - *Shortts Retreat*: An industrial area characterised by auto repair and transport, and logistics businesses.
- *Social facilities*: Accounts for approximately 8% of the Precinct and includes a mobile clinic, clubs, a community hall (not in use), a fire station, institutional facilities, a municipal market, places of workshop (Christian denomination), public spaces and schools.
- *Vacant/public open space***:** Accounts for 35% of the Precinct and has either been set aside for future use as part of the Town Planning Scheme or classified as public open space or road verges

Infrastructure

There are various infrastructure types within and adjacent to the Precinct, which are described below.

- *Road network:* The Precinct area is in close proximity to the national road network (N3), as well as connected to with main roads that link the area to the city and national routes. Traffic activity is most intense during the typically commuter peaks periods.
- *Rail network:* The Precinct vicinity contain three rail lines
- *Public transport network:* The main form of public transport is taxis (combi taxis)
- *Non-motorised transport facilities*: In general, to condition of formal non-mortised transport facilities (for pedestrians, cyclist and horses) are poor and minimal.
- *Parking*: Parking facilities are generally adequate, with sufficient parking in residential and industrial areas cater for demand.
- *Access*: Access to the airport is by means or Oribi Road, which is classified as Class 4 urban collector street. The access is somewhat remote from the main national and provincial road network, limiting the airport access ease.
- *Bulk water supply:* The Precinct and adjacent areas are supplied water from the Bisley Reservoir by means of Bisley Break pressure Tank (BPT), and the Balancing Reservoir supplies the Bisley Reservoir, which supplies the Oribi Reservoir. There is one operational fire hydrant in the area; however its use is hindered by its inadequate pressure.
- *Bulk sanitation*: The Precinct falls into three sewer catchments, namely the Scottsville Mall, Foxhill South 1 and Blackburrow catchments. All sewage drains to the Darvill Waste Water Treatment Works.
- *Stormwater drainage:* The current drainage system is governed by the Msunduzi Stormwater Management Plan, which provides stipulations for runoff management.

Property Ownership and Values

The largest land owner in the Precinct is the MM, owing approximately 39% of the land, the most of which is within the airport boundary. Of the remaining area, 31% is privately owned (either residential, commercial, mixed use or industrial), 11% belongs to the National Government (mainly Oribi Village), and 8% is unknown. In terms of property values, the total municipal value of properties in the Precinct is R 1 462 billion, over which 77% is held by the private sector.

The airport precinct currently contributes 3% in property rates to the MM, which amount to approximately R21 million per annum. Of this, the industrial properties in Mkondeni and Shortts Retreat contribute 37%, the residential areas (Scottsville Extension and Westgate/Bisley/Oribi) contribute 35%, and the airport contributes less than 1%.

Heritage Resources

The MM is rich in historical, archaeological, cultural and architectural history, totalling 646 recorded heritage sites and 32 heritage zones (Msunduzi EMF, 2010), some of which are within the airport boundary and the Precinct.

The Pietermaritzburg Aero Club is a well-known facility located adjacent to the existing airport terminal building, and is classified as medium to high heritage significance. The club house is over 60 years and has been continually used for its purpose, holding much social, historic and cultural value. Currently, the heritage resource has not been graded but protected as a grade IIB heritage resource, and therefore required permission from Amafa Kwazulu-Natal (The Provincial Heritage Resources Authority) before alternation or demolition (van Schalkwyk, 2016).

Extended Flight Path

Several suburbs within the MM are potential impacted due to their location along the commercial/scheduled aircraft flight path. These suburbs along the ‘extended flight path’ are potentially impacted due to the topography of the area, resulting in their elevation being higher than other parts of Pietermaritzburg, and therefore being exposed to aircraft noise.

These areas, classified as the ‘extended flight path zone’ for the purposes of this assessment, are located in the more upmarket suburbs of Pietermaritzburg, extending to the southern part of Hilton (De Klerk, 2016). These suburbs include Worlds View, Wembley, Athlone and Clarendon which are the established and more affluent “leafy suburbs” of Pietermaritzburg (De Klerk, 2016).

4. IMPACTS IDENTIFIED

4.1. Significant Impacts Identified for the Project

The potential impacts of the proposed developed are linked to the sensitivity of the receiving environment, and the footprint and outputs of the proposed development. Such impacts may occur during the construction and/or operation phases. These impacts were identified through engagement with I&APs and specialist assessments.

The list below provides an overview of the anticipated impacts followed by an in-depth assessment of the impacts and their significance, and well as mitigation, enhancement and management measures.

- **Aircraft induced noise**

Aircraft induced noise has been identified as one of the environmental aspects of an airport. A specialist study undertaken by IMA Trader 20 cc (IMA) and documented in the Environmental Noise Impact: Baseline Assessment and Impact Prediction Report (Shrives and Simpson, 2016) identified the impacted areas along the commercial/scheduled flight path recoding elevated LAeq (above guideline values). Spatially, the suburbs of Hilton and Worlds View are quietest, Bisley is the noisiest and Clarendon and Wembley are moderately affected by noise compared with the other suburbs. The north end of the runway are the most impacted. This is typically when the aircraft is at its lowest height above the ground and initiating maximum forward thrust (take-off) or reverse thrust (approach and landing). The type of aircraft in use also contributed the level of noise recorded. During the survey, it was noted that the 'peak aircraft' noise only persists for an average of 20 - 30 seconds (out of 15-min measurement runs) but varies slightly at each location dependent upon extraneous factors such as wind direction, cloud cover and blanket noise from other sources.

- **Impact on archaeological and heritage resources**

The Oribi village precinct and The Pietermaritzburg Aero Club are the known heritage resources of significant value. The Aero Club is a well-known facility located adjacent to the existing airport terminal building, and is classified as medium to high heritage significance. The club house is over 60 years and has been continually used for its purpose, holding much social, historic and cultural value. Currently, the heritage resource has not been graded but protected as a grade IIB heritage resource, and therefore required permission from Amafa Kwazulu-Natal (The Provincial Heritage Resources Authority) before alternation or demolition. A specialist study conducted by Heritage Impact Assessment Report conducted by van Schalkwyk (2016) concluded that neither the Pietermaritzburg Aeroclub Clubhouse nor the Oribi Village precinct will be affected by the proposed developments.

- **Impact on property values**

Mills Fitchet Africa Pty Ltd undertook a property valuation assessment to determine the current and potential impact of the increase of aircraft induced noise impacts on property values along the commercial/schedule flight path (De Klerk, 2016). The study concluded that, in the airports surrounds zone, the receiving environment is sensitive to aircraft noise and will most likely respond negatively to increased noise and frequency, with a resultant decrease in property values in those parts directly under the flight paths that are most affected. However, given the nominal increase in the number of flights and expected noise levels, the overall impact is likely to be low.

- **Impact on the functioning of natural systems**

The proposed development will result in the direct loss of wetland and grassland habitat and a small portion of degraded bushveld, even if the final buffer zone is implemented and effectively managed. Impacts from the adjacent developments may result through diffuse surface inputs or point source discharges. These impacts will need to be taken into consideration, as these types of impacts may result in a further loss of functionality or area of ecosystems. The table below summarises the projected type of vegetation and extent of loss. Impacts include (refer to the impact tables):

- Loss of wetland/stream habitat (habitat and buffer) – construction phase.
- Loss of Grassland habitat – construction.
- Loss of Red Listed Species.
- Pollution of Wetlands and Blackborough Spruit – during construction from construction activities and substances (cement, steel, rubble, etc.) and sediment, from disturbed areas.
- Increased infestation by Alien invasive plant species in wetland and grassland - construction/operational phase.
- Pollution and erosion of wetland and stream habitat– (operational phase) from uncontrolled storm water.

Table 14 Estimated area of loss and likely cause for loss

Vegetation Type	Area (Ha)	Estimated Area Loss (%)	Cause for Area Loss
Wetland 1	3,01	4	Proposed road, Commercial mixed use, GA Phase 1
Wetland 2	2,33	26	Techno hub, small stretch of proposed road, car park, passenger terminal
Wetland 3	5,70	1	Small patches of road, GA Phase 1, Industrial area
Grassland Inside fence line	69,53	50	Techno hub, Taxiway apron, passenger terminal, GA Phase 1, Car park, proposed roads
Grassland Outside fence line	45,38	11	Techno hub, Industrial area, Commercial mixed/use, GA Phase 1, proposed roads
Secondary Grassland	3,07	100	Techno hub
Maintained Areas	21,36	16	Commercial Mixed Use, Taxiway apron
Sports field	0,68	100	Commercial Mixed Use
Degraded grassland	10,47	87	Proposed Industrial and proposed road
Degraded Bushveld	6,48	3	Proposed Road
Wooded Grassland	4,68	46	Proposed Industrial and proposed road

- **Impact on the local and regional economy**

A specialist assessing the potential impact that the proposed development will have on local and regional economy undertaken by Oldham (2016) indicated significant positive impacts. Impacts include:

- the direct and indirect effects on employment and income that is likely to be generated as a result of the implementation of the proposed development during the construction phase.
- Investment in and stimulation of the economy as a potential result of the proposed development.

- **Impact on the sustainability of the airport**

Currently the operating budget for Pietermaritzburg Airport is subsidised by the Msunduzi Municipality. Operating expenditure exceeds revenue by about R2 million be annum. The economic impact assessment undertaken by Oldham (2016) indicated that a true picture of the Airport financial situation could not be obtained until income and expenditure are "ring fenced" and accounted for using sound business principles. However, projected future trends in income and expenditure, predicts that the upward trend in aeronautical revenue will eliminate an operational deficit, and the need for a subsidy, within 5 years. This prediction is based on continuous growth in commercial aviation passenger numbers, as estimated for Phase 1 of the Airport Master Plan.

- **Impact on traffic operations, access, and safety**

The potential increase in road traffic will exacerbate the existing traffic congestion in the precinct area. In addition, there is currently one access to the Airport and adjacent land via Pharazyn Way – off Oribi Road. This requires that users need to travel through residential and industrial areas to access the Airport. Poor access is therefore currently a negative issue. The upgrades on the road network will have a positive impact by reducing the traffic congestion, enhancing accessibility to the airport and also the installation of the pedestrian bridge will improve public safety.

- **Potential pollution and degradation of natural systems.**

Generation of pollution (solid, natural, effluent, noise and air) is a typical implication any new development, and has the potential to negatively impact the local social environment during the construction and operational phases. Guidelines must therefore be used to manage, monitor and mitigate pollution.

- **Spread and infestation of Invasive Alien Plans and Species.**

The un-mowed, unburnt areas in the airport are being invaded by alien invasive woody plant species. Lantana camara, Solanum mauritianum (Bugweed), Litsea sebifera, Melia azedarach (Syringa), Gleditsea triacanthos (Honey locust) and Tecoma stans (Yellow bells) are species that require an active alien invasive control programme in this area. The encroachment of the wetland and grassland during the construction phase will exacerbate the infestation of IAPS.

- **Waste generated**

Construction activities generate various waste streams (general and hazardous) on site which may result in;

- Pollution of habitat from general and hazardous waste.
- Secondary contamination from improper waste management e.g possible contamination of groundwater or surface water from leachate.
- Contamination of waste streams.
- Increasing waste to landfill.
- Reduced aesthetic value of the construction site and airport.

4.2. Low Significance Impacts

In addition to the list of 'key' issues above, there are a range of additional impacts identified which are either:

i. Of low significance and easily dealt with through standard management measures. An example is dust which is generated during construction.
ii. Significant but are either addressed or optimized through management requirements/actions. An example is the benefit to local labour from job opportunities during construction and operational phase. This is a significant benefit. It does however not required detailed assessment. Rather, the optimization of the positive impact is achieved through inclusion of tender requirements imposed on the contractor to employ a certain percentage of labour from the local labour pool.
iii. A third category of issues are those that were identified in the scoping process and upon investigation were shown to be of negligible impact. A level of explanation is however warranted and is provided below. An example of such an issue is the impact of vibration caused by aircraft and large construction machinery on the integrity of buildings from aircraft.

All relevant management and mitigation measures related to these issues have been taken through to these EMPR.

Air quality

With any construction activities, air quality impacts are typically experienced in the form of nuisance effects as a result of dust generation. Such impacts must be managed and monitored during the construction phase of the proposed development to limit impacting the local receiving environment. It is also important that disturbed/exposed areas are rehabilitated after use to prevent future dust generation. It is unlikely that the facilities of the proposed development will result in negative air quality implications during the operational phase as the nature of the facilities do not differ from the current context.

Economic and Safety impacts of Bird strikes

Bird strikes result in an economic impact in terms of the cost implications as a result of flight delays and aircraft repairs. There is also the safety risk related to accidents. Airport Management and Airlink (the only current commercial airline operating at the Pietermaritzburg Airport), bird strikes do currently have a negative economic impact (the bird strike rates at Pietermaritzburg are some of the worst of any Airport in South Africa). There are informal bird management measures in place; however the formalization by means of the management plan would aid the mitigation of negative impacts. There is also the potential to adopt more effective management options to further mitigate future impacts.

Health and safety

As with any development, safety and health risks are likely to be imposed on the local community as a result of temporary or permanent influx of persons (contractors, labour, etc.). Efforts should be made by local authorities and developers to prevent such impacts from occurring.

Infrastructure and services

The proposed development is anticipated to occur in phases, over an approximate 10-15 year period. As a result, there is unlikely to be an intense influx of people and activities occurring in the local area. Importantly, the Airport Precinct Plan includes an *Infrastructure Framework* which details that current infrastructure and services (water, sanitation, storm water, energy and ICT) and provides guidance on upgrades based on future demands. The Infrastructure Framework indicates that – *"Upgrading of existing bulk infrastructure supplying services to the Precinct and/or the reticulation within each of the sub precincts should keep pace with the demands of existing and new development in order for the precinct to be a competitive investment location and in order to protect existing economic development and provide an appropriate infrastructure platform for the "work live play" vison. In addition consideration should be given in all instances of new infrastructure and upgrading of existing infrastructure to the construction of green infrastructure"* (TMRP, 2016, Pp 26).

Local employment of labour and contractors

During the construction and operational phases of the proposed development, it is important that, where feasible, employment, skills development and business opportunities are offered to the local community. It is a municipal guideline that with all developments in the Municipality, 70% of contractors and labour during the construction phase must be sourced from the developments' local area. This acts as a means of positively impacting the local receiving socio-economic environment.

Open spaces

Open/public spaces are important social assets and should therefore be considered in planning going forward, particularly considering the loss of open space that will occur as a result of the proposed development. Their value lies in use for recreational and spiritual purposes. Like any development well-managed open space protects the natural green infrastructure, preserving important environmental and ecological functions. The Msunduzi Municipality Environmental Management Framework (EMF) identifies conservation priorities throughout the municipality, and wetland areas are regarded as sensitive areas which have to be preserved protected and free from intensive development.

Conservation zones relating to sensitive areas and habitats have been identified for protection. In addition, buffer zones between residential and airport related land uses have been provided. The ecological specialist reports has delineated specific buffers for each of the three wetlands and proposed core grassland habitat associated with these wetlands as being conserved and managed. The reserve is an important riparian corridor along, and around the water bodies. It serves as a physical link to and between significant sources of biodiversity (from the Bisley nature reserve south of the airport extending all the way up to Msunduzi River past the Hayfields reserve) to prevent local species extinctions in the MM Area.

To provide further guidance on public spaces and corridors in the airport precinct, the Airport Precinct Plan (TMRP, 2016) detailed a *Public Space and Landscape Framework*. The Precinct Plan indicates that *"A discernible public space network and high quality landscaping throughout the precinct is critical to the creation of a brand identity for the area, as well as, for the comfort and convenience of its residents, users and visitors. Public space is the "glue" that integrates various sub precincts, neighbourhoods and blocks and its quality and useability as an attribute for the competitiveness of the area as a "live, work, play" precinct cannot be underestimated."* (TMRP, 2016, Pp 20). The Precinct Plan consequently includes as one of the projects for the Blacbourh Spruit

"Sub-precinct" the rehabilitation of this area and provision of access and trails for local people to walk and enjoy the area.

Pollution

Generation of pollution (solid, natural, effluent, noise and air) is a typical implication any new development, and has the potential to negatively impact the local social environment during the construction and operational phases. Guidelines must therefore be used to manage, monitor and mitigate pollution.

Traffic noise

Currently, the areas surrounding the airport are exposed to traffic noise either due to general traffic along main the urban roads (i.e. Oribi and Washington Roads) and/or heavier vehicle traffic in the industrial areas (i.e. Gladys Manzi and C B Downes Roads). The proposed development includes improvement and expansion to the local road network, with the intention of improving traffic flows and therefore resulting in less congestion. The traffic impact assessment undertaken (McGuigan, 2016) suggests that additional traffic volumes as a result of the proposed development are likely to occur on main roads and intersections in the precinct area, which already experience high volumes particularly during peak hours. Therefore, the traffic induced noise impact is likely to remain isolated to main routes, with little to no impact on quieter residential areas, as is the current situation. It should also be noted that traffic noise was not raised as a significant concern by I&APs during the public consultation process, but focus was rather on congestion, access and safety, which were assessed in the traffic impact assessment (refer to sub-sectio: Impact on traffic operations, access and safety).

Vibration

During the construction phase, it is anticipated that little high vibration activities (such as pilling or blasting) will be required for the construction of the proposed development elements. The movement of heavy construction vehicles will be isolated to main roads, and will not generate additional noticeable vibration on the receiving environment. In addition, the construction of facilities will occur in phases, meaning that activities will be isolated and limited in their intensity.

Ground-Bourne vibration impacts during the operational phase are also deemed insignificant. Movement of aircraft and support equipment occurs along smooth surfaces and does not generate vibrations that will affect sensitive receptors, as is currently the case.

A potential concern is typically regarding vibrations caused as a result of aircraft take-off and landing, which is generated through low-frequency noise energy. Some local I&APs highlighted this as a potential concern due to the expectation that aircraft induced vibration could affect the structural integrity of buildings. However, numerous studies have been conducted in similar cases to investigate the validity of such concerns and perceptions (Desia, 2016). These studies have revealed that aircraft sounds levels, even those in close proximity to an airport, are of insignificant magnitude to result structural damage to buildings. Even in cases where audible and visual (i.e. vibration of windows) evidence is noted, the magnitude of the vibration generate by aircraft is insufficient to cause damage. Such studies were even conducted based on older aircraft, which have much higher noise and low-frequency energy level output than modern aircraft. Furthermore, noise induced vibration may only begin to occur on light building structures when the noise level reaches approximately 85dB(A). Based on the findings of the baseline noise impact assessment, even the

areas that are subject to greatest exposure to take-off and landing aircraft noise do not experience noise levels of that magnitude (Shrives and Simpson, 2016).

Visual impact

Due to the type, style and/or the location of the elements of the proposed development, visual impacts are deemed of little concern. This was reiterated by the fact that during the public consultation process, visual impacts on the areas surrounding the proposed development were of little concern to I&APs. Based on the sub-precinct guidelines provided in the Airport Precinct Plan (TMRP, 2016), non-of the proposed facilities will be designed above 3 stories (the mixed used/commercial sites cannot exceed 3 stories, all other facilities are 2 or less stories). As indicated in this report rezoning will be required via the SPLUMA process which involves consultation. It may be required through this process that a visual assessment is necessary.

5. IMPLEMENTATION

5.1. Accountability and Responsibility

The successful implementation of this EMPr is a collective effort and responsibility of the key role players in this project with different functions but a common goal. Below is a diagrammatic representation of the Organisational structure showing the relationships among the role players. Descriptions of the key individuals with environmental responsibilities are described in the following paragraphs. The role players include;

- Regulatory Authorities
- Developer: New Airport Management Entity
- Resident Engineer
- Principal Contractor
- Sub-contractors
- Operators/Tenants
- Internal Environmental Control Officer
- Independent Environmental Control Officer and
- Specialist Support

Figure 24 below summaries the organizational structure and also demonstrates the communication and reporting channels within the structure. Timing of reporting from internal ECO to external ECO, and External ECO to EDTEA needs to be defined in the detailed EMPRs that will be developed for each element of the project.

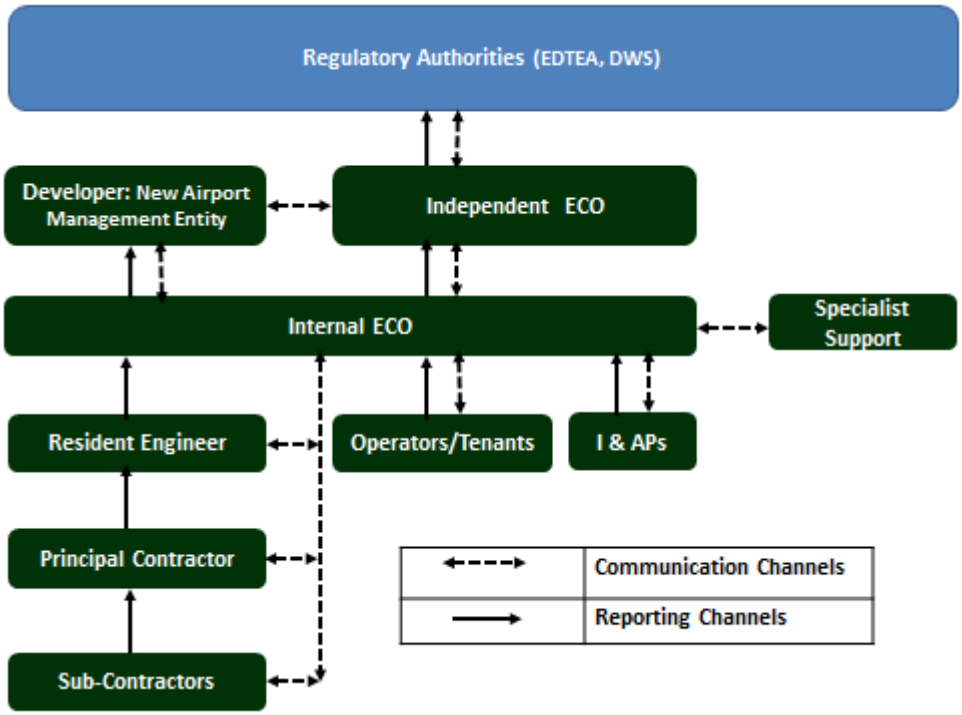


Figure 24: Organisational Structure

Table 15 Summary of the key role players' responsibilities

Regulatory Authority • Monitor the compliance to the Environmental Authorisation, Licenses, and Permits issued. • Makes a decision on non-compliance based on the severity of the non-compliance. • Reviews the reports on incident/accident investigations. • Monitors the changes in corrective action.
Developer: New Airport Management Entity • Be familiar with the recommendations and mitigation measures of this EMPr, and enforce these measures; • Ensure that all relevant environmental management measures in the EMPr have been incorporated into the project design. • Include the EMPr in all tender documents to ensure that sufficient resources are allocated to environmental management by the Contractor. • Identify the environmental competence of all contractors (and sub-contractors) working on the project. • Review method statements for environmental aspects and advise of any suggested improvements prior to work starting. • Appoint an independent Environmental Control Officer (ECO) to oversee construction activities.
Resident Engineer • Design of the proposed upgrades and associated infrastructure. • Take cognisance of all relevant measures in the EMP and ensure integration thereof in the detailed design. • Make reference the applicable environmental management measures in tender documents. • Report any environmental emergencies/concerns to the ECO immediately • Ensure that non-compliance is remedied timeously and to the satisfaction of the relevant authorities.
Principal Contractor • Develop and improve Method Statements other specialist procedures. • Ensure all sub-contractors are sensitised regarding their environmental obligations. • Monitor compliance of the sub-contractors to the EMPr. • Liaison with the ECO and Resident Engineer.
Sub-contractors and Service Providers/Tenants/Aircraft Operators • Compliance with the environmental management specifications. • Submitting Methods Statement for approval by the ECO and Principal contractor prior to commencement of work. • Maintain all records of site meetings and non-compliance to this EMPr. • Identify environmental competence requirements for all staff working prior to commencement of work. • Maintain waste register and ensure correct waste management procedures. • Report any activity that has resulted, or has the potential to result, in an environmental incident immediately to the ECO.
Internal ECO • Must have adequate knowledge of the principles of Integrated Environmental Management as well as sound environmental legislative knowledge to understand and implement this management plan. • Implementation of the EMPr. • Regular liaison with the contractors and the project manager, • Investigating and resolving complaints and environmental incidents. • Ensure correct procedures are followed in the event of an environmental incident. • Provide advice and assistance to site personnel on environmental matters. • Recommend corrective action for any environmental non-compliance incidents on the site. • Conduct environmental audit of subcontractors and suppliers. • Reports to the Independent ECO only. • Liason with Specialist Support teams in case of emergency.

Independent ECO

- Monitoring of the implementation of the EMPr.
- Regular liaison with the Internal ECO.
- Regular reporting of major environmental incidents to the regulatory authorities within 24hours.
- Provide advice and assistance to the Internal ECO.
- Reviews the Internal ECO` monthly reports, on incident/accident investigations on the implementation of the EMPr.
- Monitors the corrective action recommended by the Internal ECO
- Conduct environmental audit of subcontractors and suppliers.

Specialist Support

- Attend to any major spills or environmental incidents that may occur on site.
- Keep records of all incidents attended to on file.
- Report to the regulating authority of any major incidents.

5.2. Compliance

Applicable environmental standards, policies and license requirements within the environmental legal framework were identified and considered in the development of the management practices thus this EMPr a legally binding. The Principal Contractor (including sub-contractors and suppliers) must comply with the relevant provisions of the EMPr, applicable environmental legislation, by-laws and associated regulations promulgated in terms of these laws. The EMPR is a collective responsibility and all staff and other role-players (contractors, neighbouring community) need to be trained/made aware of the requirements and both specific and general responsibilities that need to be complied with. Evidence of compliance with the above, evidence of payment of all taxes, permits, license fees and levies should be well documented and filed for an audit trail. In the event of non-compliance[1], a non-compliance report shall be completed stating the corrective action and the due date for the corrective action.

5.3. Monitoring

Monitoring compliance is an integral part for integrated environmental management as it establishes how the project is performing against objectives set in this EMPr. The success of the EMPR is only as good as the review and adaption of the plan, where required and assists in:

- Identifying any negative impacts from the construction and operational activities.
- Assessing the adequacy and effectiveness of the mitigation measures in place.
- Demonstrating compliance with the regulatory obligations and objectives set in this EMPr.
- Identifying corrective action for continuous improvement.

The internal ECO in consultation with the Independent ECO shall develop a monitoring plan. The plan will identify and clearly define the information that will be collected to show compliance with the objectives of the EMPR and in for each of the specific plans (waste management, fire, and alien invasive species management plans) that form part of and support the EMPR. The plan needs to indicate responsibility for the collection monitoring of indicators and collection of the relevant information to support regular review and revision. Both the Internal and Independent ECO are responsible for monitoring compliance to this EMPr. Regular meetings will be held between the Independent ECO and the developer to:

[1] Specific non-compliance may result in penalties or ceasing of work as stipulated in each legal requirement.

- Assess the general state of the environment on site and discuss any environmental concerns and advise on corrective action.
- Establish the suitability of the contractor's methods and machinery in an effort to minimise environmental impact.
- Discuss possible non-conformance to EMPr guidelines or environmental legislation.
- Provide feedback into the environmental management system for continuous improvement.

The frequency of monitoring and reporting will be determined by the Internal and Independent ECO in consultation with the Developer. However, external compliance audits by the authorities will be undertaken less frequently –approximately 3 years). An annual internal review of the EMPR is a necessity to identify any needs for revision/update.

5.4. Record Keeping

All relevant records related to the implementation of this management plan must be filed safely by the Project Manager and copies kept by the Internal ECO. Records should also be easily accessible. Records include:

- Monitoring results (e.g. inspection reports, internal audit reports, incident investigations, emergency drills etc.)
- Non-conformance reports
- Written corrective action instructions
- Notification of emergencies and incidents
- Environmental Authorisation
- Permits and Licenses
- Records of complaints

5.5. Environmental Training and Awareness

It is important to ensure that all personnel on-site have a certain level of environmental training for them to understand their environmental obligations in their area of work. The Developer together with the Internal ECO should promote environmental awareness of all personnel on site.

Objectives	**Indicators**
• Promote environmental awareness amongst all personnel on site. • Provide generic training on the implementation of environmental management specifications.	• Incorporation of Environmental awareness in induction material • Monthly number of trained/inducted personnel

Environmental Management Practices	**Pre-planning and Design** • Include the EMPr in all tender documents to ensure that sufficient resources are allocated to environmental management by the Contractor. • The EA and this EMPr forms part of the formal site induction for all contractors, sub-contractors and casual labourers, preferably in their native language. • All contractor teams involved in construction/operations work are to be required to undergo some form of environmental induction on their obligations towards environmental controls and methodologies in terms of this EMPr, prior to commencing of the works.	**Responsible Parties** • Developer • Principal contractor • Internal ECO
	Construction and Operation • All contractors, sub-contractors and casual labourers must acknowledge their understanding of the EMPr and environmental responsibilities by signing an induction attendance record. • Site talks. • Use notice boards to post awareness issues.	**Responsible Parties** • Internal ECO • Principal contractor • Sub-contractor
	Rehabilitation and monitoring *Corrective action*: • Induction • Site talks *Monitoring and Reporting*: • Maintain all induction records i.e induction material and acknowledgement of all inducted. • Induction report will be signed by the all inducted (contractors as well as the employee undergoing Induction). • Training and induction records should be properly filed for auditing purposes and copies given to the ECO for filing.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

6. MANAGEMENT PLAN

6.1. Ecological Impacts

6.1.1. Wetland Management

<table>
<tr><td colspan="3">Impacts
• Loss of wetland/stream habitat (and buffer) - from transformation to hardened surfaces/infrastructure.
• Loss of bio-diversity and ecological value of airport land.
• Loss of faunal and floral species (numbers and diversity) associated with loss of habitat.
• Pollution of wetland health and river system (Blackborough spruit).
• Increased infestation by Alien invasive plant species in the wetland.</td></tr>
<tr><td colspan="2">Objectives
• Protection of the ecological assets of Blackborough Catchment & associated wetlands.
• Sustainable protection, restoration, management and promotion of ecosystems.
• To rehabilitate and protect the natural habitat and ecosystem functioning of the degraded wetlands and river system.
• Maintenance of integrity and functioning of riparian zones and wetlands</td><td>Indicators
• Incorporated into the final design
• Changes in wetland habitat and water quality</td></tr>
<tr><td>Environmental Management Practices</td><td>Pre-planning and Design
• Amendment of the final design of infrastructure to limit the loss of wetland and grassland habitat
• Select the most appropriate design for infrastructure e.g. bridges/culverts to limit impact on systems.
• The implementation of the recommended final buffer zones.
• Develop catchment management interventions prior to any further development within the catchment.
• Develop and implement a wetland and grassland rehabilitation and management plan.
• Standard pollution control measures and sediment control measures/systems
• Develop and implement an invasive plant management plan.
• Develop a stormwater management plan to prevent silt and polluted water ingress into the wetlands.
• Develop a Wetland Rehabilitation Plan for the remaining wetland systems,</td><td>Responsible Parties
• Resident Engineer
• Principal contractor</td></tr>
</table>

	which will need to include rehabilitation activities such as clearing aliens, replanting of veg, clearing rubble, erosion control, etc.	
	Construction and Operation • Rescue and relocate indigenous species, medicinal plants, floral and protected species[1] to a suitable habitat off site. • Cleary demarcate and adhere to development footprint and areas required for construction activities. • Standard pollution control measures and sediment control measures/systems. E.g. use of sediment curtains, limit activities within wetlands, reduce footprint of activities, etc. • Buffer zone management.	**Responsible Parties** • Internal ECO, Botanist and Ecologist • Principal contractor and sub-contractors
	Rehabilitation and monitoring *Corrective action*: • Implement a wetland rehabilitation and management plan, activities include clearing aliens, replanting of veg, clearing rubble, erosion control, etc. *Monitoring and Reporting*: • Buffer zone management. • Add environmental issues in monthly meeting agendas.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

6.1.2. Stormwater Management

Impacts • Flooding of the existing passenger terminal and fire station due to the slopes of the adjacent taxiway and aprons. • Possible surface water contamination from sediments, oil, fuel, heavy metals from parked, moving vehicles and or during aircraft servicing. • Contamination from the incorrect storage and/or disposal of waste materials generated during construction. • Increase area of hard surface (e.g. more paved and sealed surfaces due to more roads, parking, aprons, taxiways and buildings)	
Objectives • Provide safe paths or storage for runoff from major storms.	**Indicators** • Number of pollution incidents per month • Incorporated into the final design

[1] Necessary approval for the removal/ cutting/ pruning of protected tree species should be obtained from Department of Forestry, as per National Forests Act (Act No. 84 of 1998) under Government Notice GN 1012 of 2004 and GN 767 of 2005.

• Prevent pollution of the Stormwater from contaminated surface run-off. • To protect and restore the remnant aquatic and riparian habitats.		• Water quality monitoring results • Number of flooding incidents per annum
Environmental Management Practices	**Pre-planning and Design** • Develop and implement a storm water management plan • New stormwater infrastructure construction must be developed strictly according to specifications of approved guidelines[1] to ensure efficiency. • Final design should integrate the new stormwater system into the airport's existing stormwater systems. • Ensure that the stormwater system design and a cut-off drain allows for adequate stormwater retention on site. • Develop Emergency Response/Spill procedures. • Develop an Erosion and Sediment Control plan. • Train tenants on the aspect of stormwater protection.	**Responsible Parties** • Resident Engineer • Developer
	Construction and Operation • Minimise paved and sealed surfaces to reduce stormwater runoff. • Appropriate temporary methods to manage run-off. • Provide for sub-surface drainage and stormwater removal systems at edges of impermeable surfaces where impermeable geological layers are shallow. • All wastewater and contaminated runoff from the storage and working areas must be channelled into existing wastewater management system. • Have in place Oil/Water interceptors.	**Responsible Parties** • Engineer • Principal contractor
	Rehabilitation and monitoring *Corrective action*: • Immediate notification of the relevant personnel through the Incident reporting procedure. • All erosion damage shall be repaired as soon as possible. • Application of Emergency Response/Spill procedures in the event of Stormwater contamination. • Investigation of all environmental incidents. *Monitoring and Reporting*:	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

[1] The South African Guidelines for Sustainable Drainage Systems, WRC Report No. TT 558/13 May 2013

	• Record of all contamination incidents. • Weekly inspections of Stormwater drains/ponds interceptors to check the state of the ponds and pick up any pollution incidents. • Quarterly water quality monitoring. • Quarterly tenant audits • All corrective and preventive actions shall be recorded and included in the review sessions as appropriate.	

6.1.3. Erosion and Sediment Control

Impacts • Siltation - run off of soil from cleared areas and soil stockpiles. The movement of heavy construction vehicles is also likely to contribute to this impact. • Soil erosion		
Objectives • To limit and mitigate erosion and sedimentation through effective planning prior to initiation of construction and maintenance activities.		**Indicators** • Inclusion into the final design • Soil structure
Environmental Management Practices	**Pre-planning and Design** • Develop an Erosion and sediment control plan - which identifies appropriate areas and methods for the management of soil and containment of runoff. • The Contractor shall provide all erosion control measures necessary during execution of the work and for rehabilitation of disturbed areas after completion of the work. • Cleary demarcate and adhere to development footprint and areas required for construction activities. • Carefully consider what machinery will be appropriate to the task while minimising the extent of environmental damage.	**Responsible Parties** • Resident Engineer • Principal contractor and sub-contractors
	Construction and Operation • Limit construction-, maintenance- and inspection activities to dry periods in order to curb occurrence/ augmentation of erosion in areas of existing erosion. • Cleary demarcate and adhere to development footprint and areas required for construction activities.	**Responsible Parties** • Internal ECO • Principal contractor and sub-contractors

	• Excavation should preferably take place in the drier months of the year in order to limit the influence of stormwater on the mobilization of sediments. • During construction the Contractor shall protect all areas susceptible to erosion by installing all necessary temporary and permanent drainage works as soon as possible. • Topsoil must be separated from overburden and spoiled separately. • The spoil site must not be within the within the 1:100 year flood line, wetland or associated buffer. • The spoil site must be cleared of all inert waste, rubble, foundations and litter. • Any erosion channels developing during the construction period or during the operational and maintenance period shall be backfilled and consolidated immediately and the area restored to the proper condition.	
	Rehabilitation and monitoring *Corrective action*: • Contractors shall submit a rehabilitation plan for each site for approval. • All erosion damage shall be repaired as soon as possible. Displaced topsoil will be replaced from stockpiles or approved borrow pits. • Topsoil placement shall follow as soon as construction in an area has closed. • No activity shall be permitted onto the topsoil after it has been placed. • Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum depth, the Contractor shall obtain suitable substitute material from other accepted sources. • All areas onto which topsoil is to be spread shall be graded to the approximate original landform and shall be ripped prior to placement. • Exposed surfaces to be re-vegetated (indigenous grasses) and stabilized as soon as possible to avoid soil erosion risks. • Revegetation of disturbed and work areas shall be done with an indigenous grass mix; similar to what is found in the vicinity of the site *Monitoring and Reporting*: • Monitor success of re-vegetation. Success is considered achieved when there is 80% or more vegetation cover.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

	• All corrective and preventive actions shall be recorded and included in the review sessions as appropriate.	

6.1.4. Invasive Alien Plant Species Management

Impacts • Increased infestation by Alien invasive plant species in wetland and grassland - construction/operational phase. • Invaders threaten many species with extinction and disrupt ecosystem functioning.		
Objectives • To control & prevent the spread of IAPs. • Prevent the introduction of new species which have a high risk of invading.		**Indicators** • Annual change in change in area, species and levels of infestations. • Changes in extent and intensity of infestation.
Environmental Management Practices	**Pre-planning and Design** • Identification and classification of IAPS on site in terms of the National Environmental Management Biodiversity Act (NEMBA) IAPS Regulations. • All declared aliens must be identified and managed in accordance with the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) • Develop an IASMP including methods to be employed for various species, timing for undertaking the clearing of the pieces identified and securing resources (References - [1] and[2]) • Allocate resources to control the extent and intensity of IAPS. • Training of staff to implement the IASM plan.	**Responsible Parties** • Internal ECO and Ecologist • Developer
	Construction and Operation • Rapid response to deal with invasive species at the early stages of invasion. • Effective management at a range of scales in space and time as per the IASMP. • Systematic management plans at the scale of landscapes. • Minimize any secondary invasions that might occur as a result of the clearing of the primary target species. • Rescue and relocate indigenous species, floral and protected species to	**Responsible Parties** • Internal ECO and Ecologist • Contractors

[1] The NEMBA: Alien invasive species regulations should be considered in developing the AISMP. As well as the provisions of the National Environmental Management: Biodiversity Act (NEM:BA), 2004

[2] Government Notice R1048 of the Conservation of Agricultural Resources Act (No 43 of 1983)

	suitable habitat off site. • Control the extent and intensity of IAPS. • The Green landscaping guidelines and the National Forestry Standard should inform removal of all exotic species.	
	Rehabilitation and monitoring *Corrective action*: • Notify the ECO and Principal contractor on the presence of IAPS on site. • Early detection and Rapid response to deal with invasive species at the early stages of invasion. • Clear all IAPS identified on site. *Monitoring and Reporting*: • Monitor and evaluate the efficiency, effectiveness and appropriateness of the IAPM plan. • Annual monitoring to document change in area, species and levels of infestations. • Maintain records on the extent and intensity of infestations and effectiveness of control measures.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

6.1.5. Resource Conservation

Impacts • Shortages of finite resources[1] that have a negative impact on airport operations. • Increased electricity capacity will be required for apron lighting and for the proposed GA area. • Increased demand yet low pressure of water supply due to the relative elevations of the airport and reservoir.		
Objectives • Sustainable use of finite resources. • Reduce the energy and water consumption in the airport facilities, and enhance the design of the proposed projects to maintain or achieve more.		**Indicators** • Water consumption in litres per month • Energy consumption in kilowatts per month • Monthly consumption of fuel in litres • Incorporation of recommendations into the final design.
Environmental Management	**Pre-planning and Design** • Incorporate environmental principles into the design process, where possible	**Responsible Parties** • Developer

[1] Finite resources include water, fuels, energy and materials

Practices	use renewable energy. • Augmentation of power supply. • Undertake an engineering assessment to determine the suitability of the elevation configurations in the long-term. • Upgrade the reticulation to the terminal building to meet the additional requirements and address the current issues relating to the existing infrastructure. • Identification and buffering of sensitive areas and habitats i.e sensitive riparian systems and open land for conservation.	• Resident Engineer
	Construction and Operation • Upgrade the reticulation to the terminal building to meet the additional requirements and address the current issues relating to the existing infrastructure. • Develop a Resource Conservation Plan[1] (RCP). • Include the RCP as part of the induction material. • Promote rainwater harvesting and water conservation measures. • Use re-cycled water in construction activities and washing of equipment and construction vehicles. • Promote energy conservation measures. • Retain green spaces for the benefit and recreation of the employees and building occupants.	**Responsible Parties** • Internal ECO • Principal contractor and sub-contractors • Engineers
	Rehabilitation and monitoring *Corrective action*: • Immediate repair all water leakages. *Monitoring and Reporting*: • Regular inspections to check for water leakages. • Weekly readings of water and electricity meters. • Quarterly audits • All corrective and preventive actions shall be recorded and included in the review sessions as appropriate.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

[1] The National Environmental Management Act (NEMA) 108 of 1998 prioritises and promotes the conservation of land, water and other natural features and resources in South Africa.

6.1.6. Waste Management

<table>
<tr><td colspan="3">Impacts
• Pollution of habitat from general and hazardous waste.
• Secondary contamination from improper waste management e.g possible contamination of groundwater or surface water from leachate.
• Contamination of waste streams.
• Increasing waste to landfill.
• Reduced aesthetic value of the construction site and airport.</td></tr>
<tr><td colspan="2">Objectives
• To promote waste prevention, reduction, recycling and reuse and recovery of waste developed onsite[1].
• Ensure general waste disposal activities conform with legislation[2] and best practice.</td><td>Indicators
• Amount of waste produced per month
• Amount and value of waste of recycled per month
• Amount of waste disposed per month
• Number of waste receptacles available on site</td></tr>
<tr><td rowspan="2">Environmental Management Practices</td><td>Pre-planning and Design
• Develop a Waste Management Plan (WMP)based on the waste hierarchy approach, outlining the minimum regulatory requirements for managing non-hazardous and hazardous wastes generated on site.
• Development of a WMP covering each phase of the waste cycle i.e. collection, storage and disposal and responsibilities for implementing the plan. The plan needs to identify appropriate options for each aspect of the waste management.
• Develop a waste recycling programme addressing e.g electrical equipment, waste paper, concrete removed during upgrades and topsoil stripped for new developments etc.
• The quality and labelling of bins/waste skips should be as per the legal recommendation[3]
• Capacity building.</td><td>Responsible Parties
• Project Manager
• Principal Contractor
• Internal ECO</td></tr>
<tr><td>Construction and Operation
• Strategically position waste receptacles onsite to limit littering.
• Provide different/color coded waste bins, for different waste streams to</td><td>Responsible Parties
• Internal ECO
• Principal contractor</td></tr>
</table>

[1] The reduction, recycle or reuse all waste before it is disposed of in terms of section 17 of the National Waste Act (59 of 2008).

[2] National Environmental Management: Waste Management (59 of 2008).

	ensure correct waste separation at source. • Refuse from the construction site must be collected on a regular basis according to the waste generation quantities and locations, and deposited at an appropriate landfill site. • All wastewater and contaminated runoff from the storage and working areas must be channelled into existing wastewater management system. • Burning of waste material will not be permitted. • Obtain written authorization prior to transportation, storage, treatment and/or disposal of any chemical or hazardous material.	• Sub-contractors
	Rehabilitation and monitoring *Corrective action*: • Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. • Immediate notification of the ECO of any overflowing waste receptacles. *Monitoring and Reporting*: • Maintain a waste inventory • Scheduled weekly refuse collection or when necessary • Maintain records of all waste generated, recycled and disposed	**Responsible Parties** • Independent ECO • Internal ECO • Contractors

6.1.7. Handling and Storage of Hazardous substances

Impacts • Contamination of soil and water through spills, accidental leaking of equipment, rupture of containers or incorrect disposal of waste containers. • Potential spills from fuel pipe rupture and poor pipeline connections or overfill leading to contaminated stormwater, soil and/or groundwater. • Associated costs to clean-up contamination.	
Objectives • Proper storage and efficient handling of hazardous substance/materials. • Prevent pollution and environmental incidents.	**Indicators** • Monthly number of chemical hazards/spills. • Volumes/cost of chemicals and fertilizer use. • Monthly hazardous waste generated and disposed • Final designs

Environmental Management Practices	**Pre-planning and Design** • Final design of storage facilities as per relevant norms and standards. • The location and design of fuel and chemical storage facilities needs to reduce risk of pollution of contamination by being located on flat areas sufficiently away from water courses. • The design of fuel storage facilities must include bunding and that complies with relevant standards[1] and legislation[2]. • Train all hazardous substances handlers on best practice and safe use.	**Responsible Parties** • Resident Engineer • Principal contractor
	Construction and Operation • Ensure restricted access to storage facilities of hazardous substances. • Material safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances used on site. • Clear signage must be placed at all storage areas containing hazardous substances / materials. • No refuelling of vehicles or storage of large volumes of fuel infield. Smaller volumes of fuel can be stored in appropriate containers at designated sites outside sensitive areas). • Fuel bowser to be stationed in lined bund. • Disposal of hazardous and chemical waste, including used containers, is in accordance with legislation and best practice • Hazardous substance containers, contaminated substrates and materials used in the clean-up of spillages must be stored in a designated, impermeable container (e.g. a skip) • Refuse from the construction site, hazardous substance containers, contaminated soil, clean-up materials, etc. must be transferred to an appropriate disposal site on a regular basis. • Obtain written authorization prior to transportation, storage, treatment and/or disposal of any chemical or hazardous material	**Responsible Parties** • Internal ECO • Principal contractor and sub-contractors
	Rehabilitation and monitoring *Corrective action*: • In case of leakages the Emergency response team in coordination with ECO	**Responsible Parties** • Independent ECO • Internal ECO

[1] SABS standards – 10131; 10089.
[2] Hazardous Substances Act. no. 15 of 1973.

	shall respond to the situation and as per the Emergency Preparedness and Response procedure. *Monitoring and Reporting*: • A register of all hazardous chemicals, solvents and paints used on site shall be maintained. • Maintain waste records, waste manifest and waste declaration of all hazardous waste[1] generated on site and disposed of. • All corrective and preventive actions shall be recorded and included in the review sessions as appropriate.	• Contractors

6.1.8. Pollution Control

Impacts • Stormwater and soil contamination. • Associated economic impact cost to clean up		**Indicators** • Number of recorded pollution incidents • Final design of service area/workshop
Objectives • Avoid, minimise and remedy pollution and degradation of the environment		
Environmental Management Practices	**Pre-planning and Design** • Develop an Emergency Prepared and Response Plan • The Contractor must design, test/exercise appropriate emergency preparedness programmes (plans, schedules, procedures and methods) for addressing environmental accidents, incidents and events such as spills of fuel, oil or lubricants; fires etc. • The location and design of fuel and chemical storage facilities needs to reduce risk of pollution of contamination by being located on flat areas sufficiently away from water courses. • Service are/workshop should be bunded with concrete floor slab to prevent infiltration of hydrocarbon products. • Train all on site on the reporting procedure in the event of an emergency. • Provide adequate Spill kits as per the potential magnitude of the spillage.	**Responsible Parties** • Internal ECO • Resident engineer

[1] Hazardous waste is waste which is unsuitable for direct disposal into the Environment or sewer system or by traditional landfill, and any waste deemed by the Municipality to pose risk on the Environment or Public Health due to the production operation, the existence of Hazardous components or chemical or Physical properties.

	Construction and Operation • Strategically position adequate Spill Kits to contain potential spillages. • Concrete mixing must only take place within designated areas. • No vehicles transporting concrete to the site may be washed on site. • The servicing and repair of vehicles should be restricted to a specified area/workshop. • The effluent from the workshop should be drained separately from the Stormwater. • The polluter will implement remedial action as per the *Polluter Pays Principle*[1]	**Responsible Parties** • Internal ECO • Principal contractor
	Rehabilitation and monitoring *Corrective action*: • In case of significant leakages/spillages the Emergency response Team in coordination with internal ECO shall respond to the situation as per the Emergency Preparedness and Response procedure. • The internal ECO must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. • All spillage of oil onto concrete surfaces shall be controlled by the use of an accepted absorbent material. • Soil contaminated by oil, fuel or chemicals shall be removed and disposed of at a registered Hazardous Waste Disposal Site or rehabilitated *in-situ.* *Monitoring and Reporting*: • Conduct regular Emergency Preparedness drills. • All corrective and preventive actions shall be recorded and included in the review sessions as appropriate. • All accidents and incidents shall be investigated, recorded and reported as soon as possible, and as Incident/Accident and Investigation procedure.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors • Special Support (Pollution Control)

[1] Section 28 of the NEMA embodies the polluter pays principle

6.1.9. Emergency Preparedness and Response

<table>
<tr><td colspan="3">Impacts
• Environmental pollution, fire, contamination of water bodies, cost implications in repairs of damages</td></tr>
<tr><td colspan="2">Objectives
• Effectively respond to emergencies to contain and limit damage to the environment/property.</td><td>Indicators
• Monthly hazardous waste generated and disposed
• Monthly number of chemical hazards/spills.
• Volumes/cost of chemicals and fertilizer use.</td></tr>
<tr><td>Environmental Management Practices</td><td>Pre-planning and Design
• Develop an Emergency Preparedness and Response Plan to provide for emergency procedures during construction and operations
• Define command and control system for response and rapid dissemination of critical information to affected parties.
• The Contractor must design, test/exercise appropriate emergency preparedness programmes (plans, schedules, procedures and methods) for addressing environmental accidents, incidents and events such as spills of fuel, oil or lubricants; fires etc.
• Develop clean up and disposal procedures.
• Purchase adequate Emergency response equipment (e.g Spill kits, fire extinguishers, antidotes[1]).
• Develop a fire management plan (FMP)in accordance with the relevant legislation[2]
• The location and design of fuel and chemical storage facilities needs to reduce risk of pollution and contamination by being located on flat areas sufficiently away from water courses.
• Coordination with adjacent operators and other aid teams e.g Fire brigades, Ambulances, Spill response teams etc.
• Capacity building.</td><td>Responsible Parties
• Developer
• Internal ECO
• Resident Engineer</td></tr>
</table>

[1] The amount of "**adequate"** Emergency response resources should be measured in terms of a situational analysis: e.g if **ALL** the chemicals on site spilled, the response resources should be enough to contain the spillage. Spill kits, fire extinguishers, antidotes

[2] National veld and forest fires Act, no. 101 of 1998

	Construction and Operation • Fire prevention facilities must be present at all storage facilities. • Evaluate response preparedness including support facilities for fire fighting, spill containment and operational procedures for handling of equipment and chemicals. • Ensure restricted access to storage facilities of hazardous substances. • Material safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances used on site.	**Responsible Parties** • Internal ECO • Principal contractor and sub-contractors
	Rehabilitation and monitoring *Corrective action*: • In case of fire, significant leakages/spillages or any environmental incident, the Emergency response team in coordination with ECO shall respond to the situation as per the Emergency Preparedness and Response procedure. *Monitoring and Reporting*: • Routine maintenance and servicing of all equipment. • Conduct regular Emergency Preparedness drills. • All corrective and preventive actions shall be recorded and included in the review sessions as appropriate. • All accidents and incidents shall be investigated, recorded and reported as soon as possible, and as Incident/Accident and Investigation procedure.	**Responsible Parties** • Independent ECO • Internal ECO • Contractors • Special Support (Pollution Control)

6.2. Social Impacts

6.2.1. Noise Management

Impacts • Engine runs and noise from maintenance of aircraft. • Traffic induced noise nuisance to sensitive receptors around the airport • Reduction in property values within the airport precinct affected with noise originating from increased air traffic.		
Objectives • Reduce the air traffic noise induced nuisance to sensitive noise receptors. • Reduce noise to sensitive receptors during the construction phase		**Indicators** • Recorded formal noise complaints
Environmental	**Pre-planning and Design**	**Responsible Parties**

Management Practices	• Develop a Noise Management Plan[1] • Construction routes must be clearly defined. • Develop subdivision regulations: Subdivision regulations/guidelines to guide developments in noise impacted areas, to minimize impact on new developments but not affect existing ones. • Consider using lower noise output aircraft during times of high impact (e.g. morning flights that affect Bisley Park Primary School could make use of lower noise output aircraft than other times). • Working hours should ideally occur per section 25 of the Noise Control Regulations of the Environment Conservation Act, 1989 (Act No. 73 of 1989) only. • Communicate the construction schedule to residents (through ward councillors) and schools located in closest proximity to the site.	• Internal ECO • Engineers
	Construction and Operation • Construction and heavy machine operators must be particularly sensitive to staying within access routes and prevention of unnecessary noise. • Aircraft - Use of more Noise Efficient and larger Planes to reduce the overall air traffic and the associated noise levels. • Land-use Planning and Zoning - rezoning of the Airport properties and Airport Precinct. • Consider a post-expansion comparative survey at significant impact sites may be considered more useful[2]. • Aircraft being introduced should be equivalent to or quieter than the AVRO RJ 85 in all possible flight modes and should be limited to before and after school hours (8.00am to 3.00pm). • Sound Proofing or double-glazing of windows and sound insulation in the ceiling of sensitive receptors immediately adjacent the airport on the north end of the runway - namely Bisley Park Primary School. • Introduce Noise barriers[1] for noise sensitive receptors that are in close	**Responsible Parties** • Contractors • Commercial Aircraft operators

[1] The province of KZN does not have noise regulations in place, therefore the management practices were guided by the "Balanced Approach to Noise Management" as per the ICAO recommendations, refer to annexure 1 for the full suite of the the viable mitigation options tailor made for Pietermaritzburg Airport.

[2] The basis for this recommendation is that aircraft type and flight plans are not affected significantly by the initial phase of the Airport Expansion Master Plan, whilst flight events are not currently of a harmful magnitude or duration, being very brief compared with other noise sources observed.

	proximity to airport ground operations (including immediate take-off and landing). • Various aviation operational procedures can also facilitate noise output some extent (e.g. approach angles), although passenger safety is always the primary concern (ATNS, 2016).	
	Rehabilitation and monitoring *Corrective action*: • Sound proofing of noise sensitive receptors. • Investigations to formal noise complaints. *Monitoring and Reporting*: • Maintain a Noise complaints log book. • Regular assessments to ensure that noise output is not increasing. • Regular serving is conducted on all aircraft, however formal noise output monitoring is not always conducted.	**Responsible Parties** • Independent ECO • Internal ECO • I&APs

6.2.2. Air Quality Management

Impacts • Nuisance dust and air pollutant emissions from vehicle to surrounding receptors affecting visibility. • Pollution from emissions associated with construction machinery and vehicles and aviation activities. • Increases of pollutant levels and greenhouse gases.		
Objectives • To limit the nuisance compromising air quality in the area		**Indicators** • Nuisance complaints from public and/or existing tenants.
Environmental Management Practices	**Pre-planning and Design** • Dust suppression - appropriate methods. • Develop a Service and Maintenance Schedule	**Responsible Parties** • Contractors
	Construction and Operation • Application of appropriate dust suppression measures for activities that are to produce a significant amount of dust or other air pollutants (e.g.	**Responsible Parties** • Internal ECO • Contractors

[1] Noise barriers can man-made or in the form of vegetation, earthen berms, etc. However, such barriers may not mitigation in-flight noise and are more appropriate and effective for ground noise.

	excavation activities, use of heavy vehicles during construction, etc.). • Environmentally benign binding agents shall be used to limit dust generation by construction vehicles. • Speed limits must be enforced in all areas, including public roads and private property to limit the levels of dust pollution. • Dust must be suppressed on access roads and construction sites during dry periods by biodegradable soil stabilisation agent.	
	Rehabilitation and monitoring *Corrective action*: • Implement dust suppression measures immediately as and when dust complaints are received *Monitoring and Reporting*: • Record all nuisance complaints from public and/or existing tenants. • Monthly inspection of vehicle Service and Maintenance log books.	**Responsible Parties** • Independent ECO

6.2.3. Heritage Resources Management

Impacts • At the development of this EMPr, there are no known impacts as the Pietermaritzburg Aeroclub Clubhouse and the Oribi Village precinct will not be affected by the proposed developments. • The discovery of heritage resources during construction and operations.		
Objectives • Identification and recovery of heritage resources on site. • Protection of sites of cultural, ecological, recreational, historical, aesthetic and spiritual significance.		**Indicators** • Incorporation of areas of significance in final design. • Applicable permits
Environmental Management Practices	**Pre-planning and Design** • Formal protection of the Pietermaritzburg Aeroclub Clubhouse, which is a Grade IIB heritage resource. • Any incursion on the material fabric of the Oribi Village Precinct will require engagement with Amafa aKwaZulu-Natali. • Operations are planned to protect sites of cultural, ecological, recreational, historical, aesthetic and spiritual significance. • Protect areas and infrastructure with archaeological and cultural value will be	**Responsible Parties** • Developer

	managed as per legal requirements[1].	
	Construction and Operation • Sites of significance are rehabilitated as soon as damage occurs and interventions are monitored and adapted to ensure effectiveness. • Should any archaeological of palaeontological artefacts (pottery, stone implements, fossil material) be uncovered in the process of establishing the project, work should cease and the relevant authority should be contacted to advise on the process going forward. • Developer to cease all work immediately and adhere to the protocol for the identification, protection and recovery of heritage resources during construction and operation. • In the event that authorisation is required to destroy heritage resources the Amafa's Pietermaritzburg office should be contacted for further guidance.	**Responsible Parties** • Developer • External ECO
	Rehabilitation and monitoring *Corrective action*: • All construction within a radius of at least 20m of the indicator should cease. This distance should be increased at the discretion of supervisory staff if heavy machinery or explosives could cause further disturbance to the suspected heritage resource. • This area must be marked using clearly visible means, such as barrier tape, and all personnel should be informed that it is a no-go area. • A guard should be appointed to enforce this no-go area if there is any possibility that it could be violated, whether intentionally or inadvertently, by construction staff or members of the public. • No measures should be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone or stone. • If a heritage practitioner has been appointed to monitor the project, s/he should be contacted and a site inspection arranged as soon as possible. • If no heritage practitioner has been appointed to monitor the project, the head of archaeology at Amafa's Pietermaritzburg office should be contacted; telephone 033 3946 543). • The South African Police Services should be notified by an Amafa staff	**Responsible Parties** • Developer • Internal ECO • External ECO • Specialist support

[1] National Heritage Resources Act (No 25 of 1999)

	member or an independent heritage practitioner if human remains are identified. No SAPS official may disturb or exhume such remains, whether of recent origin or not. • All parties concerned should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains, and refrain from making public statements until a mutually agreed time. • Any extension of the project beyond its current footprint involving vegetation and/or earth clearance should be subject to prior assessment by a qualified heritage practitioner, taking into account all information gathered during this initial heritage impact assessment.	

6.2.4. Traffic Management[1]

Impacts • Increasing bottlenecks on residential roads associated with more traffic in the area • Increased traffic will overburden the existing road network and infrastructure (road, intersections, signage, calming/management) • The impact of more traffic in the Precinct, especially in areas around the schools • Increased congestion on existing intersections with inadequate configurations i.e (Washington/Oribi/Ritchie Road intersection, Washington/Market/Market Extension intersection and Washington/CB Downes/ Gladys Manzi intersection) • Lack of adequate pedestrian and safety infrastructure in Oribi village. • In the event that the proposed improvements are not undertaken, the current congestion would remain.		
Objectives • To minimise the traffic congestion on the major access routes. • To improve the existing road network		**Indicators** • Changes in the traffic flow
Environmental Management Practices	**Pre-planning and Design** • Strategic positioning of entry and exit points to ensure as little impact/ effect as possible on the traffic flow. • Proposed improvements to roads (Section of Washington Road between Gladys-Manzi and Market Road – and upgrades to the various intersections). • Expansion to the local road network (as proposed as part of the development) will improve existing traffic flow problems.	**Responsible Parties** • Engineers (SANRAL) • Principal contractor • Developer

[1] The management practices presented herein were drawn from proposed road upgrades presented in the Traffic impact assessment for the airport precinct undertaken by Royal HaskoningDHV (McGuigan, 2016)

	Construction and Operation • Proposed improvements to roads (Section of Washington Road between Gladys-Manzi and Market Road – and upgrades to the various intersections). • Implementation of Public Transport and Non-motorised transport options. • Inclusion of safety measures/systems. • Warning signs/Sign posts must be placed on and around the site as per the occupational health and safety requirements.	**Responsible Parties** • Engineers (SANRAL) • Principal contractor • Developer
	Rehabilitation and monitoring *Corrective action*: • Roads to maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop. • Warning signs must be placed on and around the site as per the occupational health and safety requirements. *Monitoring and Reporting*: • Closely monitor the progress of both the Techno Hub development as well as the Airport Expansion, and their cumulative impact on the intersections of Gladys Manzi with Oldfield Road and Oribi Roads. • Monitor the existing intersection of Oribi Road and Pharazyn Way[1].	**Responsible Parties** • Contractors • Internal ECO • External ECO

6.2.5. Visual Impact

Impacts • Alteration of the overall landscape from encroachment of the natural systems (grassland, wetlands etc.) • Reduced aesthetic value of the airport. • Loss of open space that will occur as a result of the proposed development		
Objectives • Establish a discernible, legible and imageable identity and character for the precinct through provision and maintenance of high quality and well landscaped public spaces and well-designed buildings.		**Indicators** • Final designs of the proposed infrastructure • Number of complaints from I&AP`s
Management Practices	**Pre-planning and Design** • The design of the proposed infrastructure should be at a maximum of 3	**Responsible Parties** • Developer • Resident engineer

[1] McGuigan (2016), predict the satisfactory operation of these road in the short to medium term but will require signalisation and associated reconfiguration when warranted by traffic volumes.

	stories • If rezoning is done for the airport, a visual impact assessment may be required. • Incorporate the natural systems into the final design as per the Green Landscaping guidelines[1].	
	Construction and Operation • Non-of the proposed facilities will be designed above 3 stories (the mixed used/commercial sites cannot exceed 3 stories, all other facilities are 2 or less stories). • Apply the "Built form Guidelines" in the Airport Precinct Plan, 2016. • Ensure that the "public face" of buildings have a human scale and add interest and activity to streets and public spaces at the ground level.	**Responsible Parties** • Developer
	Rehabilitation and monitoring *Corrective action*: • Provision and maintenance of high quality and well landscaped public spaces and well-designed buildings. *Monitoring and Reporting*: • Check the final building designs of the proposed infrastructure.	**Responsible Parties** • Developer • Internal ECO • Independent ECO

6.2.6. Pressure on infrastructure and services

Impacts • Pressure on the existing infrastructure and services (water, sanitation, storm water, energy and information and communications technology (ICT)) as a result of an intense influx of people and activities occurring in the local area. • Safety and health risks are likely to be imposed on the local community.		
Objectives • To keep pace with the demands of existing and new developments. • To promote the precinct to be a competitive investment location. • To protect existing economic development and provide an appropriate infrastructure platform for the "work live play" vison.		**Indicators** • Infrastructure upgrades • Number of complaints from I&AP`s
Management	**Pre-planning and Design**	**Responsible Parties**

[1] The Green landscaping guidelines of 2009 was developed to effectively design and maintain public landscapes to minimise harm to the natural environment and maximise their ecological function.

Practices	• Infrastructure upgrades based on projected future demands in the Airport Precinct Plan of 2016[1]. • Introduce more sustainable water supply, reticulation and management systems in Oribi village. • The capacity of the Darvill Waste Water Treatment Works (WWTW) is at present being upgraded. • Develop a Storm Water Management Master Plan based on sustainable practices which identifies and articulates the requirements for the macro and micro systems. • The upgrading of and addition of new ICT infrastructure must be considered as part of the planning of the redevelopment of the precinct.	• Developer • Resident engineer
	Construction and Operation • Infrastructure upgrades based on projected future demands in the Airport Precinct Plan of 2016 .	**Responsible Parties** • Developer
	Rehabilitation and monitoring *Corrective action*: • Infrastructure upgrades *Monitoring and Reporting*: • Check the final building designs of the proposed infrastructure.	**Responsible Parties** • Developer • Internal ECO • Independent ECO

6.2.7. Open spaces

Impacts • Loss of open space as a result of the proposed development • Reduced character definition of the precinct.	
Objectives • Protects the natural green infrastructure, preserving important environmental and ecological functions. • Maintain and enhance the character of the airport.	**Indicators** • Final designs of the proposed infrastructure • Improvement on the signage, street furniture and paving in the area

[1] The Airport Precinct Plan includes an Infrastructure Framework which details that current infrastructure and services (water, sanitation, storm water, energy and ICT) and provides guidance on upgrades based on future demands.

• To conserve ecological assets and integrate all public spaces into PMOSS. • Conservation of the sensitive areas and habitats have been identified for protection in the EMF[1] • Improve the access to, and increase the useability of, public space within precinct.		
Management Practices	**Pre-planning and Design** • Clear demarcation of buffer zones between residential and airport related land uses. • Strategic reservation of sensitive natural systems[2]. • Incorporate the natural systems into the final design as per the Green Landscaping guidelines.	**Responsible Parties** • Developer • Resident engineer
	Construction and Operation • Development to keep away from the open space buffer of 30m that has been assigned, primarily to protect the sensitive riparian systems and open land. • Apply the guidelines detailed in the Public Space and Landscape Framework in Airport Precinct Plan, 2016. • Encourage the form of buildings, particularly along their interface with the public domain, to complement each other in forming positive public space.	**Responsible Parties** • Developer
	Rehabilitation and monitoring *Corrective action*: • Provision and maintenance of high quality and well landscaped public spaces and well-designed buildings. • Upgrade and increase the signage, street furniture and paving in the area *Monitoring and Reporting*: • Regular inspections to check if the stipulated buffer zones are maintained.	**Responsible Parties** • Developer • Internal ECO • Independent ECO

6.2.8. Local employment of labour and contractors

Impacts • Social conflict from the influx of construction workers.	
Objectives • To achieve equity in the workplace by promoting equal opportunity. • Enhance Opportunities for skills development.	**Indicators** • number of locals employed, • number of females,

[1] Msunduzi Municipality Environmental Management Framework (EMF), 2010.

[2] A significant portion of the land parcel with the wetlands has been set aside as strategic reservation in order to ensure the protection of a healthy system

• Resolution of labour related conflict situations.		• number of youth employed, • number of disabled people employed
Management Practices	**Pre-planning and Design** • Have in place an employment policy and ensure it is communicated to local stakeholders, especially to the community. • Tender documents should include statements to include the use of local communities or local community organisation where possible in supplying services and labour to the construction activities. • Develop communication protocols (verbal and written); - Contact names and numbers - An escalation path for complaint resolution; • Ensure that employment procedures / policy are communicated to local stakeholders, especially community representative organisations and ward councillors. • Provide initiatives for employees to enhance or develop new skills associated with their jobs. • Have in place formal conflict resolution processes to resolve any conflicts with employees or contractors. • An employer must display at the workplace where it can be read by employees a statement in the prescribed form of the employee's rights under this Basic Conditions of Employment Act in languages which are spoken in the workplace. • The Developer must ensure that this EMPr forms part of any contractual agreements with a Contractor(s) and sub-contractors for the execution of the proposed project. The Contractor must make adequate provision in their budgets for the implementation of the EMPr.	**Responsible Parties** • Developer • Resident engineer
	Construction and Operation • Employment opportunities should first be offered to the local community if the skills are available within the community. • Employ (male and female, skilled and unskilled) workers from the local community. • Particular attention must be paid to employment opportunities for women,	**Responsible Parties** • Developer • Contractor

	youth and disabled persons. • Inform the workers that employment is only temporary and will be terminated once the contract period has expired or on completion of the construction activities. • Contractor should endeavour to use and local suppliers, and records of attempts to do so should be kept. • Wherever possible and practical, the Contractor should endeavour to source building materials from environmentally responsible and permitted sources, and records of attempts to do so should be kept. • Ensure that unskilled locals shadow experienced laborers.	
	Rehabilitation and monitoring *Corrective action*: • Conflict resolution as per the plan developed. *Monitoring and Reporting*: • Evidence of compliance with labour legislation. • Compliance with health and safety legal requirements and best practice. • A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings.	**Responsible Parties** • Developer • Internal ECO • Independent ECO

6.2.9. Health and Safety

Impacts • Frequent accidents/incidents • Major environmental incidents • Damage to property and • Fatalities	
Objectives • To provide a safe working environment for the employees, contractors, operators, tenants and visitors on site. • To prevent major environmental/property damage.	**Indicators** • Records of; - unsafe situations, - near misses, - HFRI's, - first aid box - injuries, - medical cases, - disabling injuries

		- number of reported accidents/incidents • Lost Time Injury Frequency Rate
Management Practices	**Pre-planning and Design** • Developer to provide a safe working environment for all workers on site as per legislation[1]. • Appoint a Safety, Health and Environment Officer as per the Occupational Health and Safety Act. • The Developer and Contractors must adhere to the prescriptions of the relevant health and safety legislation and standards. The Contractor must familiarise himself and his employees with the contents of the applicable legislation. • The Contractor must design, test/exercise appropriate emergency preparedness programmes (plans, schedules, procedures and methods) for addressing environmental accidents, incidents and events such as spills of fuel, oil or lubricants; fires etc.	**Responsible Parties** • Developer
	Construction and Operation • The wearing of Personal Protective Equipment (PPE) on site is mandatory for all personnel and construction team members. • Construction workers should be clearly identifiable by wearing protective clothing displaying the logo of the construction company. Construction workers could also be issued with identification tags. • Visible PPE signs must be strategically erected on site at the areas where it is required and the integrity of the signs must be maintained. • First Aid kits should be readily available and easily accessible on site at all times. • All visitors to the construction site must sign a register at the security checkpoint and undergo a site induction by the SHE Officer.	**Responsible Parties** • Developer • SHE Officer
	Rehabilitation and monitoring *Corrective action*: • In the event of an accident/incident a thorough investigation should be conducted to identify the cause and recommend corrective action to avoid recurrence.	**Responsible Parties** • SHE Officer • Internal ECO • Independent ECO • Contractors

[1] Occupational Health and Safety Act, 181 of 1993

	• Issue a Non-Compliance Report (NCR). • Agreed timeframe by which the actions documented in the NCR must be carried out. *Monitoring and Reporting*: • Keep an incident register of all incidents, investigate and apply corrective action where required. • Understand the causes of and accident and the sort of changes are needed to address them. • Routine inspections of premises, plant and equipment by staff and internal ECO. The results must be tabled for action and discussed at the Health and Safety Committee meetings or the site meetings. • Planned function check regimes for high risk work areas. • A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings. • Inspect reports, log books, audit reports, induction reports, accident/incident investigation report all should be filed.	

6.3. Economic Impacts[1]

6.3.1. Local and Regional Economy

Impacts • Relatively large amounts of capital expenditure involved for external works, basic services, roads, open areas and other infrastructure. • Uncertainty on the availability of funds for new roads or infrastructure for mixed business and industrial zones. • Improved Gross domestic product (GDP) from increased sales of firms in the local economy. • Stimulation of economic growth[2]. • Long term sustainable growth in Regional gross domestic product (GDP) and valuable jobs. • Increased income from remuneration. • Increased revenue to Msunduzi Municipality during construction. • Increased business returns for local firms -Local firms that supply the contractor increase their activity and make purchases of inputs and services from other local

[1] The management practices presented herein were drawn from proposed mitigation measures presented in the Economic Impact Study of the Pietermaritzburg Airport conducted by George Oldham in 2016

[2] These benefits will be spread over 10 years but not continuously.

<table>
<tr><td colspan="3">firms.
• Commercial and industrial investment opportunities.</td></tr>
<tr><td colspan="2">Objectives
• To improve the local GDP
• To boost the local business economy
• To provide jobs and skills training for the local economy.</td><td>Indicators
• Changes in the GDP
• Number of temporary and permanent jobs created
• Number of jobs created in both the construction and operational phases.
• Number of formally and informally trained local.</td></tr>
<tr><td rowspan="3">Management Practices</td><td>Pre-planning and Design
• Attract new inward investment from research and educational institutions, as well as national and international companies.
• Identify alternative sources of finance.
• Include the following requirements in the tender documents:
• - employment of local people must be prioritised as far as possible and explicitly outlined in the tender application; and
• Local construction employees are to receive job-specific training, as required e.g. formal, on-the-job mentoring / training.</td><td>Responsible Parties
• Developer</td></tr>
<tr><td>Construction and Operation
• Local construction employees are to receive job-specific training, as required e.g. formal, on-the-job mentoring / training.</td><td>Responsible Parties
• Developer</td></tr>
<tr><td>Rehabilitation and monitoring
Corrective action:
• Maintain ongoing communication with appropriate business forums to optimise opportunities for local businesses to participate in and benefit from the Project.

Monitoring and Reporting:
• Maintain records on the changes in the local economy</td><td>Responsible Parties
• Developer</td></tr>
</table>

6.3.2. Sustainability of the Airport

Impacts
• Airport operating budget deficit. • If the Precinct does not develop as planned and growth does not materialise in these areas the subsidy could become a permanent drain on municipal resources. • Capital expenditure (CAPEX) to expand and upgrade airport infrastructure

<table>
<tr><td colspan="3">• Lack of future funding[1] for the Techno hub and airport expansion.</td></tr>
<tr><td colspan="2">Objectives
• To efficiently operate the airport without a municipal subsidy.</td><td>Indicators
• Changes in the Airport budget
• Clearance of the Budget deficit</td></tr>
<tr><td rowspan="2">Management Practices</td><td>Pre-planning and Design
• Approval of a proposal to establish a separate Management Entity to take ownership and control of the Airport operations including the Techno Hub.
• Establish responsibility and provide funding for a campaign to market and create awareness of investment opportunities in the Airport Precinct and Techno Hub.
• Approve an incentive package for potential investors in the Techno Hub and Airport Precinct.
• Promote Private Public Partnerships to attract investment funding.
• Develop policies and decisions that support long term financial sustainability.
• Finalise a land disposal policy with regard to leasing or selling land within the Airport Precinct.
• Remove some of the uncertainty surrounding the capital funding of the Project by including it in the Integrated Development Plan (IDP) and Capital Budget as well as actively seeking alternative sources of funding.
• Planning should, as soon as possible, move on from high level planning to the identification of specific projects suitable for the designated new development zones.
• Finalise planning for an extended General Aviation zone creating opportunities for private investors requiring additional hangar space.
• Promote aeronautical and aviation related activity at the Airport in order to raise revenue and reduce, or eventually eliminate, the Municipal financial subsidy of the airport.</td><td>Responsible Parties
• Developer</td></tr>
<tr><td>Construction and Operation
• Incorporation of new Business zones and the Techno Hub.</td><td>Responsible Parties
• Developer</td></tr>
</table>

[1] Oldham (2007), in the Economic Impact Assessment for the Pietermaritzburg Airport observed the Minimal interest from institutional and private sector in investing in the techno hub and precinct area.

	• Install basic infrastructure and services on the site to attract investors. • Establish Concession Contracts - The municipality will benefit from a fixed annual royalty and a share of total revenue. • Reduced Phase 1A introduced for 2017. • Expansion of aviation activities (hangar revenue) has the potential to eliminate an operational deficit of the airport.	
	Rehabilitation and monitoring *Corrective action*: • Maintain ongoing communication with appropriate business forums to optimise opportunities for local businesses to participate in and benefit from the Project. *Monitoring and Reporting*: • Maintain records on the changes in the local economy	**Responsible Parties** • Developer

6.3.3. Bird strike Management

Impacts • Construction activities may cause an increase in abundance of target bird species that are attracted to feeding or roosting opportunities on the reclamation area, silt curtains and stockpiles, and any litter around construction sites. • Damage to aircraft and have the potential to cause an accident. • Cost implications as a result of flight delays and aircraft repairs.		
Objectives • Reduce target bird attraction to construction site. • Ensure bird strike does not increase as a consequence of the construction and operational activities. • Prevent unnecessary harm to bird species.		**Indicators** • Changes in the number of bird species on site • Reported collisions between a bird and an aircraft.
Environmental Management Practices	**Pre-planning and Design** • Develop and update a Bird Management Plan that considers; - Control measures to minimise the attraction of birds - Use of deterrents to prevent the accumulation of birds; - Minimise activities that attract birds in certain areas; - education about bird hazards; and	**Responsible Parties** • Developer • Internal ECO

	- Monitoring the effectiveness the program implemented.	
	Construction and Operation • Implement strict waste handling particularly kitchen waste to limit the pulling factors for birds at the airport. • Ensure waste receptacles are bird or vermin proof. • Collect and dispose of litter daily to reduce attraction of bird species. • Use deterrents such as flagging material and appropriate lighting to keep birds away.	**Responsible Parties** • Internal ECO
	Rehabilitation and monitoring *Corrective action*: • Discourage birds from feeding or roosting by using flagging material, appropriate lighting or other deterrent methods. *Monitoring and Reporting*: • Use a surveillance program that will monitor any accumulation of birds is detected. • Routine patrol after hours of site during construction to determine if birds are attracted to the site to roost. • Collating data on the strikes at the airport. • Effective analysis of birdstrike data if any for management review and updating of the Birds Management Plan.	**Responsible Parties** • Internal ECO • Contractors

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8. APPENDICES:

8.1. APPENDIX A: EAP CURRICULUM VITAE

David Cox

Personal Data

Nationality:	South African
ID Number:	7206085158083
Date of Birth:	8 June 1972
Place of Birth:	Port Shepstone, South Africa
Place of Residence:	Nottingham Road, KwaZulu-Natal, South Africa
Marital Status:	Married (3 children)

Education and Professional Training

Institution	Qualifications	Year
University of Natal, Pietermaritzburg S.A.	Masters in Environment & Development *(Thesis Title: The Mooi-Mgeni Transfer Scheme: Developing a model for off-site mitigation of wetlands)*	1999
University of Natal, Pietermaritzburg S.A.	B Soc Sci (Geography, Law Majors)	1995

Other Training

- GRI Certified Sustainability Reporting 2011
- GRI Indicators Reporting 2011

Key Experience and Expertise

Environmental Planning, Assessment and Reporting

A primary focus area of David's experience is environmental planning, assessment and reporting. He has worked with the full range of Environmental assessment and management tools across the development life cycle. At a strategic level David has been involved in State of Environment Reporting (SoER), Strategic Environmental Assessment (SEA) and he has a keen interest in the interface between development and environmental planning. At a project level David has been involved in feasibility, due diligence and risk assessments for specific projects. He has led numerous Environmental Impact Assessments (EIA) and been responsible for the development and implementation of Environmental Management Plans and Programmes (EMPs). David's experience in such work has been as the project leader. He also has a comprehensive understanding of the relevant regulatory processes, key environmental issues and has managed the stakeholder participation process in the projects he has undertaken. He is experienced in managing large multidisciplinary teams and integrator of specialist inputs.

Institutional Development and Governance

David's training included a legal component which he has applied in work with all spheres of government in improving institutional co-ordination, environmental governance and legal compliance. This experience has involved analysis of the existing institutional structures, roles and responsibilities and co-ordination role-players. He recent projects include the development of National EIA guidelines for social infrastructure projects, a guideline model for improved application of the EIA regulations in relation to local economic development activities by Municipalities, a framework for mitigation banking as a mechanism for wetland conservation in South Africa, and recommendations for the institutional component of the National Biodiversity Strategy and Action Plan. David was also involved in a review of the institutional structure and operation of Resource Use Management Programmes within the provincial conservation organisation. David also provided input to the development of the Province's Environmental Implementation Plan in 2008.

Natural Resources Management David's master's thesis focussed on wetland assessment and developing a model for off-site mitigation of wetlands. He has built on his experience and skills in the area of natural resources management across terrestrial and water resources with a specific focus on wetlands. His consulting and research projects have involved wetland assessments, the planning of wetland offsets and the investigation of alternative mechanisms for addressing the impact to wetlands, such as mitigation banking. This experience spans consulting and research projects concerned with the development of policy, and tools focussed on improved NRM, with several projects focussed on Integrated Water Resources Management. His general water resource management experience includes several projects focussing on the improved participation of local government in IWRM, and he has undertaken capacity building work with municipalities on IWRM. David's has also worked on several projects which have focussed on the development of decision support tools and mechanisms to facilitate effective integrated water and wetland resources management (IWRM). Examples include incorporation of economic considerations into the determination of the ecological reserve for rivers and the stakeholder consultation component of a protocol for the determination of resource quality objectives for water resources.
Consultation and Participatory Processes Public participation is a specific requirement of the IEM field. Apart from experience in managing this process in related projects, the majority of David's other work has involved varying degrees of interaction with a wide range of stakeholders including government officials and authorities, rural communities, the private sector and NGOs. Much of this experience is related to work in the Water Sector, notably recent development of the stakeholder consultation component of the national protocol for establishing resource quality objectives for water resources. He has also worked at grass roots levels with affected communities in impact assessments and landowners regarding the implementation of wetland offsets.
Project Management In his role at the INR, David has been responsible for all aspects of project management, from financial management and final reporting, to co-ordinating large interdisciplinary teams, and being responsible for client liaison and final reporting.

Language Skills

** underline mother tongue*

***: 1=very good, excellent; 2=good; 3=fair; 4=basic, 5=no knowledge*

Language	Speak	Write	Read/Understand
English	1	1	1
Afrikaans	3	3	3

Memberships

IAIAsa (International Association for Impact Assessment, SA affiliation - KwaZulu-Natal Branch: Current Chairman)

Work Experience

Organisation	**Institute of Natural Resources**
Position **June 2008 - present** **South Africa, KwaZulu-Natal**	**Principal Scientist** **Programme Leader:** Integrated Environmental Management (IEM) Programme **Responsibilities:** ▪ Generating work through relationship building, writing research proposal, responding to tenders, profiling the organisation and contributing to strategic direction of the organisation. ▪ Guiding the development of the IEM programme. ▪ Research – leader. ▪ Project Management - Client Liaison – technical and financial progress reporting. - Management of sub-consultants – preparing terms of reference, managing quality of final products. - Final reporting – preparation of final reporting for projects. ▪ Mentoring of junior staff.
Position **June 1999 – June 2008**	**Principal Scientist** ▪ Generating work through proposal writing and responding to tenders.

Senior Scientist	▪ Research - leader and analyst. ▪ Project Management - Client Liaison – monthly reporting (progress and financial) - Management of sub-consultants – preparing terms of reference, managing quality of final products - Final reporting – preparation of final reporting for projects.

Project Experience

CLIENT	PROJECTS EXPERIENCE
Environmental Planning, Assessment and Reporting	
Industrial Development Corporation	**Proposed Forestry Expansion in the Eastern Cape** Managed the environmental component of a scoping process for proposed development of 24 projects covering approx. 1500ha. Reviewed existing studies to identify key environmental issues, legal requirements and make recommendations regarding further investigation.
De Beers Consolidated Mines	**Compliance Review of Alluvial Diamond Mining, Operations** Undertook a review of compliance with conditions of environmental authorisation and environmental management programme for diamond mining operations on the Vaal River in the Northern Cape.
The Planning Initiative/ Ethekwini Municipality	**Development of a Functional Area Plan and Draft Scheme for the Tongaat and Inyaninga Areas** Responsible for the Environmental Sector report which provided spatial definition of the open space system (OSS), with associated principles and guidelines for defining the open space in the functional area plan. The report also included guidelines for detailed planning and conditions of approvals that give effect to the aim and objectives of the OSS.
Eskom	**Development of an Environmental Constraints Framework to inform ESKOM Master Planning** Project leader responsible for developing and ECF to inform Eskom master planning for Transmission infrastructure in the North Eastern Region of KwaZulu-Natal. An SEA approach was followed in establishing the environmental opportunities and constraints. The approach considered the major components of the Environment (Social, Cultural, biophysical) in terms of both the impact of the environment on Eskom and the impact of Eskom on the environment.
Virtual Consulting Engineers	**Basic Environmental Assessment for the Extension of the Tongaat Trunk Sewer Line** Project leader for managing the environmental application and assessment of the extension of the Tongaat Trunk sewer Line to link the King Shaka International Airport and DubeTradePort with the regional Tongaat Waste Water Treatment Works.
uMswhathi Municipality	**Environmental Management Framework for Mshwathi Municipality.** Project leader for development of an environmental management framework for a 20 000ha proposed development node and consolidating the outputs of the Strategic Environmental Assessment into a range of products including Environmental Sensitivity zone and guidelines, Development Planning Guidelines and a strategic environmental management plan designed to address key sustainability issues identified in the SEA.
The Planning Initiative	**Environmental component of Rezoning Application for Mount Moreland.** Provided environmental input to planning of rezoning application. This input was based on a baseline ecological assessment. Also provided an assessment of the impact of the proposed rezoning application.
Ezemvelo KZN Wildlife	**Due diligence Assessment for Proposed Re-development of Royal Natal and Spioenkop Nature Reserves.** Responsible for environmental component of a due diligence assessment for the proposed re-development of infrastructure at two nature reserves by the provincial conservation authority.
ACSA	**King Shaka International Airport Fuel Storage Facilities: Ground & Surface Water Risk Assessment** Responsible for co-ordinating and compiling the risk assessment which was a condition of the authorisation for new KSIA.
Dube-Tradeport	**Basic Environmental Assessment for the Proposed Extension of the Tongaat Trunk Sewer Line** Responsible for managing the Basic Environmental Assessment process for the extension of bulk sewer line to link the new King Shaka Airport and Dube TradePort to the Tongaat Waste Water Treatment Works.
De Beers Consolidated Mines	**Environmental Impact Assessment for proposed Alluvial Diamond Mining** Project manager for EIA for proposed mining by De Beers on the Vaal River within Rooipoort Nature Reserve in the Northern Cape Province. Responsible for managing the EIA process, commissioning and co-ordinating specialist input, the public participation process, budget, client liaison and the final reporting.
National Ports Authority	**Environmental Impact Assessment - Berth 306 Port of Richards Bay** Project manager and lead consultant responsible for providing the following Environmental Services for the Construction of Berth 306 in the Port of Richards Bay: - Management of the EIA process. - Development of an Environmental Management Plan (EMP) - Development of an Biomonitoring Programme (BMP) - Monitoring and auditing of the implementation of the EMP and BMP - Identification and management of the licensing process for an offshore borrow site.
TPA Con-	**Basic Environmental Assessment and Environmental Management of new local access roads in KwaZulu-Natal Midlands.**

CLIENT	PROJECTS EXPERIENCE
sulting/ Depart-ment of Transport	Management of the EIA application and scoping process (including public consultation), development of an EMP and monitoring of compliance during construction. Responsibilities also included management of specialist sub-consultants (heritage impact assessment and ecology), budgets, engaging relevant departments, client liaison and final reporting.
KwaZulu-Natal Agricultural Development Trust	**Environmental Impact Assessment – Makhathini Cotton Farming** Management of the Environmental Scoping Investigation for the proposed development of 2500ha irrigated agricultural estate on the Makhathini Flats. Preparation of application, commissioning specialist studies, management of budget and public participation process, and production of environmental scoping report.
Sappi-Saiccor	**Environmental Impact Assessment - Temporary water Storage scheme on the Mkomazi River** Management of scoping investigation into impacts associated with two temporary barrages on the Mkomazi River, aimed to ensure the supply of water to Sappi-Saiccor during drought periods. Responsible for management of specialist investigations and compilation of biophysical component of the environmental scoping report.
Impala Irrigation Board	**Environmental Management of Paris Dam** Member of team managing the environmental component for the development of Paris Dam by Impala Irrigation Board and DWAF. Duties include the preparation of an environmental management plan, developing rehabilitation plans and monitoring their undertaking. Also managed the team of specialist responsible for compiling the environmental operating rules and monitoring programme.
Traffic and Transportation Department, eThekwini Municipality	**KwaMashu-Effingham Link Road: A Comparative economic, social and environmental assessment of alternative alignments through the Kenville area** Managed a team who investigated the environmental, social and economic costs of two alignments through a residential area so as to advise a decision regarding the most suitable alignment. Responsibilities included commissioning specialist input, identifying impacts and issues and establishing costs and mitigation options for each. Collating information into a report, which compared the total environmental and social costs of the two alignments.
Cathedral Peak Hotel	**Environmental Management Plan for Cathedral Peak Hotel** Development of an EMP for the CPH which is a 400 hectare property located within the UkhuhlambaDrakensberg World Heritage site. The EMP was required for the hotel to meet legal requirements pertaining to overall operation.
Imani-Capricorn	**Assessment of environmental impacts of proposed infrastructural and tourism ventures along the Transkalagadi highway in Botswana** Assessment of the environmental impacts associated with proposed infra-structural and tourism ventures along the Transkalagadi highway in Botswana.
Environmental Impact Management Services	**Peaking Power Plant EIA: Ecological Assessment** Provide consolidated ecological assessment (terrestrial and aquatic) for a proposed peaking power plant for two proposed sites near Durban, South Africa. Responsible for managing and integrating specialist studies (Aquatic and terrestrial), compiling consolidated report and managing the budget and client interactions.
Development Bank of South Africa /Imani-TMT Consortium	**The C2C Corridor Development and Transport Study of Trans-Kalahari Highway** Provided an assessment of environmental impacts as part of the feasibility study for the proposed tarring of the Trans-Kalahari Highway.
ENVIRONMENTAL GOVERNANCE	
Nati onal Department of Environmental Affairs	**Development of EIA Guidelines for Social Infrastructure Projects** Key team member responsible for developing a guideline to improve the efficiency and effectiveness of the EIA process as it relates to social infrastructure development. The guideline highlighted the importance of considering environmental issues in the planning phases, the EIA process, and the post environmental authorisation phase which is often overlooked. The guideline also focussed on better alignment of the EIA and other relevant regulatory processes, which is one of the key challenges in achieving compliance with the legal framework.
Uthungulu District Municipality, KwaZulu-Natal	**Development of a Model to Streamline the EIA Process for Local Economic Development Projects in the Uthungulu District Municipality** Project Leader responsible for development of a model that addresses the barriers and limitations of the EIA and other regulatory processes on the implementation of Local Economic Development Projects by municipalities. The Uthungulu District Municipality served as the pilot area.
Department of Agriculture and Environmental Affairs	**Alignment of the application processes for Agricultural Activities under the Agricultural (CARA) and Environmental (EIA Regulations) Legislation** The project aimed to improve the alignment between the legal processes governing the authorisation of agricultural activities. This involved stakeholder consultation and a legal review to determine the legal, institutional, logistical and broader issues resulting in illegal development and tension between role players (government, agric sector and environmental organisations). The outcomes included a model to ensure legal compliance, improved institutional and logistical efficiency and alignment of decision making between relevant authorities.

CLIENT	PROJECTS EXPERIENCE
South African Department of Environmental Affairs and Tourism	**National Biodiversity Strategy and Action Plan – Institutional Component** The NBSAP set out a framework and plan of action for the conservation and sustainable use of the country's biodiversity. Responsible for stocktaking and assessment phase of the institutional component. This included a review of documentation and consultation with key role players in government and other relevant institutions. The information and feedback was analysed to identify key institutional issues and challenges against which recommendations were provided that informed the final outcome - action plan.
DAEA	**KwaZulu-Natal State of the Environment Report** Part of a team responsible for developing indicators for reporting on the status of the terrestrial environment (land and biodiversity) in the province. Responsibilities included collection, analysis and presentation of data for indicators associated with different terrestrial environments, as well as final main and relevant chapters of summary report.
Department of Agriculture and Environmental Affairs	**Initial review of Section 24G Review applications** Co-ordinated a review and analysis of over 800 applications for illegal development activities. Established and analysed a database of applications. Responsible for final report with recommendations to client for dealing with administrative inaccuracies and finalising the applications in terms of legal framework.
NATURAL RESOURCE MANAGEMENT	
European Union	**Afromaison - Africa at meso-scale: adaptive and integrated tools and strategies for natural resources management** Key team member responsible for developing INRM strategies for the South African Case Study area - the Uthukela District. A major focus was on integrating the research outcomes into practical application through appropriate planning instruments in the District, notably the Environmental Management Framework. An important focus of this work was the institutional alignment required to achieve integration.
Trans-Caledon Tunnel Authority	**Mooi Mgeni Transfer Scheme Phase 2: Spring Grove Dam Wetland and Biodiversity Offsets** Responsible for the planning of offsets to account for the loss of wetland, river and terrestrial habitats inundated by Spring Grove Dam. This involved a review of the loss within the basin and setting of offset targets in terms of offset policy.
Isimangaliso Wetland Park Authority	**Development, Empowerment and Conservation in the Isimangaliso Wetland Park and Surrounding Region** Part of a team responsible for a scoping investigation to identify the current state of the catchments and associated issues responsible for decreased freshwater supply to the Estuarine system. Responsible for catchment management specialist investigation and integrated report combining hydrology, geomorphology and literature review.
European Union	**LoGo Water: Towards the effective involvement of Local Government in Integrated Water resources Management within the River Basins of the SADC Region** The project involved collaboration between SADC based and European researchers and involvement of associated local governments within the 4 riparian states of the Limpopo River Basin. The research component was concerned with identifying and documenting the state of LG involvement in the SADC region, the limitations and barriers to improved involvement of LG and the development of a range of outputs (including tools and guidelines) aimed at overcoming the challenges and issues identified. The project also involved various awareness raising events including a regional workshop and international seminar.
DWA	**Development of a Protocol for the Determination of Resources Quality Objectives for Water Resources** Part of a team responsible for developing the protocol for setting RQO's for all water resources in line with the national water act and water resource classification and reserve determination processes. David was responsible for the stakeholder consultation component of the project.
Water Information Network Southern Africa	**Promoting the understanding of Integrated Water Resources Management (IWRM) Among Local Governments in the context of Water for Growth and Development** The aims of the project as per the title was achieved through a process involving a workshop and learning journey. Responsibilities included the development of the workshop structure and content, development of background and supporting materials, facilitating the workshop proceedings, and drafting of a record of proceedings, project report and article summarising the event and key issues relating to the topic of IWRM and municipalities.
Water Research Com-mission	**Assessing the Appropriateness of Wetland Mitigation Banking as a Mechanism for Securing Aquatic Biodiversity in the Grassland biome of South Africa** The project involved a review of the mitigation banking concept as implemented in other countries (notably the USA) and an analysis of the strengths and weaknesses of the concept from the legal, institutional and ecological perspective. An analysis of the appropriateness of the concept to South Africa resulted in a proposed model considered appropriate for the local institutional and legal framework, with recommendations for avoiding the risks and harnessing the benefits associated with the mechanism. The final output was the identification of a pilot catchments and projects to pilot the proposed model and a broad framework for implementing the pilot.
Water Research Commission	**Incorporating Economic Considerations in the Determination of the Environmental Reserve for Rivers** Member of a team concerned with evaluating the use of a resource economics approach in contributing to the determination of the ecological reserve as described in the National Water Act, No 36 of 1998. The team developed a framework for incorporating economic considerations, developed and tested methods for valuing the ecosystem goods and services provided by Crocodile River in Mpumalanga South Africa.
DWAF/ Umgeni Water	**Spring Grove Dam EIA - Specialist Investigation into the Impact on Wetlands and Associated Crane Populations** Responsible for the investigation into the impact of the dam on wetlands and affected crane populations. Also required to

CLIENT	PROJECTS EXPERIENCE
	make recommendations regarding for recommendations implementing off-site mitigation of wetlands within the catchment.
Water Research Commission	**Off site mitigation for Wetlands Inundated by Spring Grove Dam** Specialist investigation: responsible for identifying wetlands and securing agreement from landowners to rehabilitate degraded wetlands. This required mapping and assessing wetlands, landowner consultation, development of rehabilitation, monitoring and maintenance plans.
Department of Water Affairs and Forestry	**Thukela Water Project** Managing the environmental component of the Thukela Water Project for the feasibility level investigation. This role involved integration of specialist studies on the biophysical impacts, including the geomorphology, hydrology and aquatic studies into the main environmental feasibility report.
DAEA	**Assessment of the impact of dumped boiler ash and rubble on a wetland in Willowton, Pietermaritzburg** Quantified the loss of wetland area and the impact on ecological functioning and water quality in the surrounding environment from illegally dumped boiler ash and rubble. Assessed the significance of the impact and provided recommendations regarding potential mitigation and future management.
Department of Environmental Affairs and Tourism	**National Wetland Inventory – Pilot Study** Member of team tasked with investigating the most economical method of mapping the country's wetlands to a set level of detail.
DWAF	**Identification of Candidate Wetlands for Rehabilitation in the Mearns Dam Basin** Identification of wetlands suitable for rehabilitation and to recommend measures for implementing rehabilitation. Also required to make recommendations regarding management measures for protecting those wetlands identified as being in good condition.

Publications

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Philip, R, Anton, B. Cox, D. Smits, S, Sullivan, C. A, Chonguiça, E, Monggae, F. Nyagwambo, L. Pule, R, Berraondo López, M. 2008. *Local Government and Integrated Water Resources Management (IWRM) Part II: Understanding the Context – The Role of Local Government in IWRM*.

David has authored in excess of 50 consultancy reports and associated documents during his 15 years in the field.

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8.2. APPENDIX C: FAUNAL SPECIES THAT MAY BE FOUND IN THE AIRPORT SURROUNDS

SPECIES	SCIENTIFIC NAME	STATUS	HABITAT	POTENTIAL TO OCCUR WITHIN OR ADJACENT TO THE STUDY AREA
Natal leaf folding frog	*Afrixalus spinifrons*	Vulnerable	Midlands, KZN, Inhabits marshes, dams, floodplains and river banks and also occurs in highland wetland areas.	Possibly, due to the wetlands present
Short-tailed Pipit	*Anthus brachyurus*	Vulnerable	Msunduzi Municipality, scattered, lowland grasslands	Possibly, grasslands are present but was not identified in previous bird study.
Black-headed dwarf chameleon (Endemic to KZN)	*Bradypodion melanocephalum*	Unknown	Natal Midlands, undisturbed grasslands, tall herbaceous plants. Leaf litter, or on tree trunk or branches.	Unlikely, habitat mostly unsuitable.
Lawrence's red millipede (Endemic to KZN)	*Centrobolus lawrencei*	Unknown	Narrow-range endemic (PMB & Richmond)	Possibly, is found in PMB but unclear if this includes the Airport
Corn crake	*Crex crex*	Vulnerable	Bisley Nature reserve, rank grassland and open savanna. Occurs around the edge of marshes, but seldom in areas with standing water.	Unlikely, most likely found at the Bisley Nature Reserve, the conditions at Oribi are less suitable.
Javelin flat-backed millipede (Endemic to KZN)	*Gnomeskelus jaculator*	Unknown	Bisley, In rotting logs, under rocks or logs, in leaf litter	Possibly but most likely only found at Bisley
Green giant earthworm (Endemic to KZN)	*Microchaetus papillatus*	Unknown	Narrow-range endemic, indigenous, undisturbed grasslands, small patches between bushes or agriculture fields	Possibly, due to the extent of grasslands in and around the Pietermaritzburg Airport. Rare species.
Thornville earthworm (Endemic to KZN)	*Proandricus thornvillensis*	Unknown	Narrow-range endemic, indigenous grasslands, bushes on the river banks	Possibly, due to the extent of grasslands in and around the Pietermaritzburg Airport. Rare species.
Southern African Python	*Python sebae natalensis*	Vulnerable	Very widespread distribution range,	Unlikely, limited suitable habitat.

SPECIES	SCIENTIFIC NAME	STATUS	HABITAT	POTENTIAL TO OCCUR WITHIN OR ADJACENT TO THE STUDY AREA
			preferring rocky outcrops and moist, rocky, well wooded valleys in arid and moist savannah.	
Broad-tailed Warbler	*Schoenicola brevirostris*	Near-Threatened	Widespread species inhabits marshy grassland, tall rank grassland along drainage lines and moist grassy hillsides.	Possibly, is a widespread species that inhabits grasslands.
Digger soil millipede (Endemic to KZN)	*Ulodesmus fossor*	Unknown	Pietermaritzburg Airport, in rotting logs, under rocks or logs, in leaf litter or in top 30cm soil.	Likely, has been identified at Pietermaritzburg Airport before.
Modest millipede (Endemic to KZN)	*Typhloxenus modestus*	Unknown	Bisley Nature reserve, in leaf litter, may also be found in trees on bark of trunk or branches	Unlikely, limited suitable habitat.
Shaw's earthworm	*Tritogenia shawi*	Unknown	Bisley Nature reserve, narrow range endemic	Possibly
Boneberg's Frog/ Kloof frog	*Natalobatrachus bonebergi*	Endangered	Coastal forests and gallery forests, where it is usually found along streams, and does not survive in open areas. It breeds in streams, hanging its eggs above water on branches, and sometimes on rock faces.	Unlikely, unsuitable habitat - no forest or coastal forest.
Pietermaritzburg Giant Earthworm	*Microchaetus caementerii*	Thought to be extinct	Pristine Grassland	Unknown, not enough information available
Hairy robberfly	*Neolophonotus hirsutus*	Unknown	Unknown	Unknown, not enough information available
Wandering Black Millipede	*Doratogonus peregrinus*	Unknown	Endemic to KZN	Unknown, not enough information available
Lanner Falcon	*Falco biarmicus*	Near-Threatened in SA	Observed foraging over the grasslands	Likely to occur

8.3. APPENDIX D: VEGETATION SPECIES LIST AT PIETERMARITZBURG AIRPORT

PLANT SPECIES	FAMILY	RED LIST	ENDEMISM
Blepharis maderaspatensis (L.) Roth	ACANTHACEAE		
Crabbea sp.	ACANTHACEAE		
Dyschoriste burchellii (Nees) Kuntze	ACANTHACEAE		
Ruellia sp.	ACANTHACEAE		
Thunbergia atriplicifolia E.Mey. ex Nees	ACANTHACEAE		
Agavaceae sp.	AGAVACEAE		Alien
Tulbaghia acutiloba Harv.	ALLIACEAE		
***Boophone disticha* (L.f.) Herb.**	**AMARYLLIDACEAE**	**Declining**	
***Crinum bulbispermum* (Burm.f.) Milne-Redh. & Schweick.**	**AMARYLLIDACEAE**	**Declining**	
Cyrtanthus contractus N.E.Br.	AMARYLLIDACEAE		
Schinus terebinthifolius Raddi	ANACARDIACEAE		Alien
Centella asiatica (L.) Urb.	APIACEAE		
Brachystelma franksiae* N.E.Br. subsp. *franksiae	**APOCYNACEAE**	**Vulnerable**	**KZN Midlands**
Periglossum mackenii Harv.	APOCYNACEAE		
***Woodia verruculosa* Schltr.**	**APOCYNACEAE**	**Vulnerable**	**KZN Midlands**
Xysmalobium undulatum (L.) Aiton f.	APOCYNACEAE		
Stylochaeton natalensis Schott	ARACEAE		
Asparagus africanus Lam.	ASPARAGACEAE		
Aloe maculata All.	ASPHODELACEAE		
Aloe sp . (or hybrid) - not in flower	ASPHODELACEAE		
Bulbine asphodeloides (L.) Spreng.	ASPHODELACEAE		
Trachyandra asperata Kunth	ASPHODELACEAE		
Afroaster hispida (Thunb.) J.C.Manning & Goldblatt	ASTERACEAE		
Berkheya umbellata DC.	ASTERACEAE		SA
Bidens pilosa L.	ASTERACEAE		Alien
Macledium zeyheri (Sond.) S.Ortíz	ASTERACEAE		
Euryops laxus (Harv.) Burtt Davy	ASTERACEAE		
Gazania krebsiana Less.	ASTERACEAE		
Gerbera ambigua (Cass.) Sch.Bip.	ASTERACEAE		
Helichrysum nudifolium (L.) Less.	ASTERACEAE		
Helichrysum pallidum DC.	ASTERACEAE		
Helichrysum ruderale Hilliard & B.L.Burtt	ASTERACEAE		SA (KZN)
Hilliardiella aristata (DC.) H.Rob.	ASTERACEAE		
Senecio coronatus (Thunb.) Harv.	ASTERACEAE		
Senecio cf. *madagascariensis* Poir.	ASTERACEAE		
Senecio glaberrimus DC.	ASTERACEAE		
Tagetes minuta L.	ASTERACEAE		Alien
Jacaranda mimosifolia D.Don	BIGNONIACEAE		Alien
Tecoma stans (L.) Juss. ex Kunth var. *stans*	BIGNONIACEAE		Alien
Sisymbrium sp.	BRASSICACEAE		Alien
Wahlenbergia undulata (L.f.) A.DC.	CAMPANULACEAE		
Cucumis hirsutus Sond.	CUCURBITACEAE		

PLANT SPECIES	FAMILY	RED LIST	ENDEMISM
Abildgaardia ovata (Burm.f.) Kral	CYPERACEAE		
Cyperus rupestris Kunth	CYPERACEAE		
Cyperus pseudovestitus (C.B.Clarke) Kük.A64	CYPERACEAE		
Cyperaceae sp.	CYPERACEAE		
Cyperus pulcher Thunb.	CYPERACEAE		
Cyperus sexangularis Nees	CYPERACEAE		
Cyperus obtusiflorus Vahl	CYPERACEAE		
Cyperus denudatus L.f.	CYPERACEAE		
Eriospermum mackenii (Hook.f.) Baker	ERIOSPERMACEAE		
Acalypha angustata Sond.	EUPHORBIACEAE		
Acalypha punctata Meisn.	EUPHORBIACEAE		
cf. *Jatropha natalensis* Müll.Arg.	EUPHORBIACEAE		SA (KZN)
Manihot sp.	EUPHORBIACEAE		Alien
Acacia sieberiana DC. var. *woodii* (Burtt Davy) Keay & Brenan	FABACEAE		
Argyrolobium humile E.Phillips	FABACEAE		SA
Gleditsia triacanthos L.	FABACEAE		Alien
Indigofera dimidiata Vogel ex Walp.	FABACEAE		
Indigofera hedyantha Eckl. & Zeyh.	FABACEAE		
Rhynchosia totta (Thunb.) DC.	FABACEAE		
Rhynchosia cooperi (Harv. ex Baker f.) Burtt Davy	FABACEAE		
Vigna vexillata (L.) A.Rich.	FABACEAE		
Eriosema cordatum E.Mey.	FABACEAE		
Monsonia cf. *angustifolia* E. Mey. ex A. Rich.	GERANIACEAE		
Pelargonium alchemilloides (L.) L'Hér.	GERANIACEAE		
Pelargonium luridum (Andrews) Sweet	GERANIACEAE		
Albuca cf. setosa Jacq.	HYACINTHACEAE		
Drimia cf. *multisetosa* (Baker) Jessop	HYACINTHACEAE		
Ledebouria ovatifolia (Baker) Jessop	HYACINTHACEAE		SA
Ornithogalum cf. *tenuifolium* F.Delaroche	HYACINTHACEAE		
Schizocarphus nervosus (Burch.) van der Merwe	HYACINTHACEAE		
Hypericum aethiopicum Thunb.	HYPERICACEAE		
Hypoxis acuminata Baker	HYPOXIDACEAE		
Hypoxis argentea Harv. ex Baker	HYPOXIDACEAE		
Hypoxis colchicifolia Baker	HYPOXIDACEAE		SA
***Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall.**	**HYPOXIDACEAE**	**Declining**	
Tritonia gladiolaris (Lam.) Goldblatt & J.C.Manning	IRIDACEAE		
Ocimum obovatum E.Mey. ex Benth.	LAMIACEAE		
Orthosiphon suffrutescens (Thonn.) J.K.Morton	LAMIACEAE		
Litsea sebifera Pers.	LAYRACEAE		Alien
Corchorus asplenifolius Burch.	MALVACEAE		
Grewia hispida Harv.	MALVACEAE		
Hermannia depressa N.E. Br.	MALVACEAE		
Hermannia grandistipula (Buchinger ex Hochst.) K.Schum.	MALVACEAE		

PLANT SPECIES	FAMILY	RED LIST	ENDEMISM
Hermannia parviflora Eckl. & Zeyh.	MALVACEAE		
Hibiscus aethiopicus L.	MALVACEAE		
Sida dregei Burtt Davy	MALVACEAE		
Melia azedarach L.	MELIACEAE		Alien
Oxalis corniculata L.	OXALIDACEAE		Alien
Passiflora subpeltata Ortega	PASSIFLORACEAE		Alien
Mimulus gracilis R.Br.	PHRYMACEAE		
Alloteropsis semialata (R.Br.) Hitchc.	POACEAE		
Arundo donax L.	POACEAE		Alien
Cymbopogon caesius (Hook. & Arn.) Stapf	POACEAE		
Eragrostis capensis (Thunb.) Trin.	POACEAE		
Eragrostis curvula (Schrad.) Nees	POACEAE		
Eragrostis racemosa (Thunb.) Steud.	POACEAE		
Eustachys paspaloides (Vahl) Lanza & Mattei	POACEAE		
Heteropogon contortus (L.) Roem. & Schult.	POACEAE		
Melinis nerviglumis (Franch.) Zizka	POACEAE		
Panicum natalense Hochst.	POACEAE		
Setaria cf. *sphacelata* (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	POACEAE		
Sporobolus pectinatus Hack.	POACEAE		SA
Themeda triandra Forssk.	POACEAE		
Tristachya leucothrix Trin. ex Nees	POACEAE		
Cheilanthes viridis (Forssk.) Sw.	PTERIDACEAE		
Rubus rigidus Sm.	ROSACEAE		
Kohautia amatymbica Eckl. & Zeyh.	RUBIACEAE		
Dovyalis zeyheri (Sond.) Warb.	SALICACEAE		
Thesium costatum A.W.Hill	SANTALACEAE		
Physalis viscosa L.	SOLANACEAE		Alien
Raphionacme hirsuta (E.Mey.) R.A.Dyer	SOLANACEAE		
Solanum mauritianum Scop.	SOLANACEAE		Alien
Solanum campylacanthum Hochst. ex A.Rich. subsp. *panduriforme* (Drège ex Dunal) J.Samuels	SOLANACEAE		
Solanum chenopodioides Lam.	SOLANACEAE		Alien
Gnidia kraussiana Meisn.	THYMELAEACEAE		
Lantana camara L.	VERBENACEAE		Alien
Verbena brasiliensis Vell.	VERBENACEAE		Alien
Verbena rigida Spreng.	VERBENACEAE		Alien

8.4. APPENDIX E: REDLIST PLANT SPECIES PZB AIRPORT

SPECIES	IMAGE	SOURCE
Boophone disticha		http://www.plantzafrica.com/plantab/boophdist.htm
Brachystelma franksiae		http://redlist.sanbi.org/species.php?species=2640-34
Crinium bulbispermum		http://www.plantzafrica.com/plantcd/crinumbulbisp.htm
Hypoxis hemerocallideais		http://www.plantzafrica.com/planthij/hypoxishemero.htm
Woodia verruculosa		http://www.midlandsconservancies.org.za/threatenedplants/woodia%20verruculosa.php

8.5. APPENDIX F: SUMMARY OF THE APPLICABLE LEGISLATION

Act/Regulation	Arear of Application
The Constitution of the Republic of South Africa Act (No. 108 of 1996)	• Duty of care of the environment
National Environmental Management Act (NEMA) (No.107 of 1998, revised 2010)	• Provides principles and guidelines to be considered in environmental planning and development. Such as pollution prevention/control, activities which may have a detrimental effect on the environment.
The National Environmental Management Act, EIA Regulations of 2014	• Provides the an outline of the contents of an EMPR and procedure to be followed in compiling, • Provides separation distance of the proposed infrastructure from the sensitive environmental assets.
National Environmental Management: Air Quality Act (No 39 of 2004)	• Regulate air quality in order to protect the environment by providing reasonable measures for the prevention of pollution.
National Environmental Management: Waste Act (Act 59 of 2008)	• Regulates waste management. • Provides reasonable measures for the prevention of pollution.
Environmental Conservation Act (ECA) Act No. 73 of 1989	• Provides for the effective protection and controlled utilization of the environment.
National Water Act (No. 36 of 1998)	• Water consumption, • Licensing of water use, • Prevention of water pollution.
Hazardous Substances Act (No. 15 of 1973)	• Provides for the control of hazardous substances which may pollute the environment.
Conservation of Agricultural Resources Act (No. 43 of 1983)	• Provides for soil conservation.
Construction Regulations	• Responsibility of the principal contractor.
National Norms and Standards for Storage of Waste Government Notice No. 926, 2013	• Provides a uniform approach to the management of waste storage facilities; • Provides a minimum standard for the design and operation of new and existing waste storage facilities