uMGUNGUNDLOVU
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DISTRICT MUNICIPALITY
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ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE UMGUNGUNDLOVU DISTRICT MUNICIPALITY

Volume III: Environmental Guidelines for Development Planning

JULY 2017

Institute of Natural Resources

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Volume III
Environmental Guidelines for Development Planning

Prepared For

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EXECUTIVE SUMMARY

INTRODUCTION

The Umgungundlovu District Municipality (uMDM) has embarked on a development strategy that is cognisant of the districts environmental opportunities and constraints. In this endeavour, the initial stages of investigation included a Status Quo Assessment and Strategic Environmental Assessment and Management Plan between 2011 and 2013. Subsequently, the uMDM commissioned an Environmental Management Framework to consolidate previous work, and refine specialist assessments within given development pressures in the uMDM. The EMF is aimed at gazetting and thereby formalising legally the consideration of the EMF findings in all spatial planning and development applications.

PURPOSE OF AN EMF

The EMF Regulations of 2010 promulgated under the National Environmental Management Act (Act No 107 of 1998) defines an EMF as "*the study of the biophysical and sociocultural systems of a geographically defined area to reveal where specific land uses may best be practiced and to offer performance standards for maintaining appropriate use of such land".*

PURPOSE OF AN ENVIRONMENTAL MANAGEMENT FRAMEWORK

The EMF regulations, 2010 (Section 2) list the purpose of the regulation as: *Compilation of information and maps specifying the attributes of the environment in a particular geographical area:*

a) For such information to inform environmental management, and

b) For such maps and information to be used as environmental management frameworks in the consideration of applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply.

Section 2 (3) further explains that EMFs are aimed at:

a) Promoting sustainability.

b) Securing environmental protection.

c) Promoting cooperative environmental governance.

OVERVIEW OF THE EMF

The EMF study is comprised of several volumes that fulfil the requirements of the EMF Regulations, 2010 and the purpose of the EMF. This document is Volume III which gives development planning guidance.

ENVIRONMENTAL SENSITIVITY AND CONSTRAINT PATTERNS

Volume II documents the seven environmental sensitivity zones mapped for the District, which includes:

- Flood Risk
- Wetlands
- Agricultural Resources
- Water Quality
- Water Production Areas
- Biodiversity
- Infrastructure Availability

Analysis of the individual sensitivity layers confirmed the following which are relevant in terms of presenting development constraints.

i. The ***District is endowed with valuable agricultural resources***. As emphasized in the SEA, these resources are not necessarily adequately valued nationally and the ongoing transformation of high potential agriculture land to other land-uses represents one the most

significant sustainability issues in the Province. Consequently high value agricultural land represents a significant constraint to other land uses which will result in their permanent loss for agricultural production and grazing. These represent a high constraint to any other use with consequent requirements in the EIA process and various agricultural legislation (see Volume II), to confirm the agricultural value of the land in question.

ii. Large areas identified as of '***Very High' sensitivity for agricultural purposes are also deemed to be 'highly' sensitive from a biodiversity perspective***.

iii. The untransformed areas noted in i and ii above are also critical from a water resources delivery point of view. Given that the District incorporates the key economic hubs of the greater Pietermaritzburg-Durban area, and the stressed nature of water resources documented in the status quo and SEA, the transformation of these catchments will place further stress on social well-being and economic productivity in the catchment.

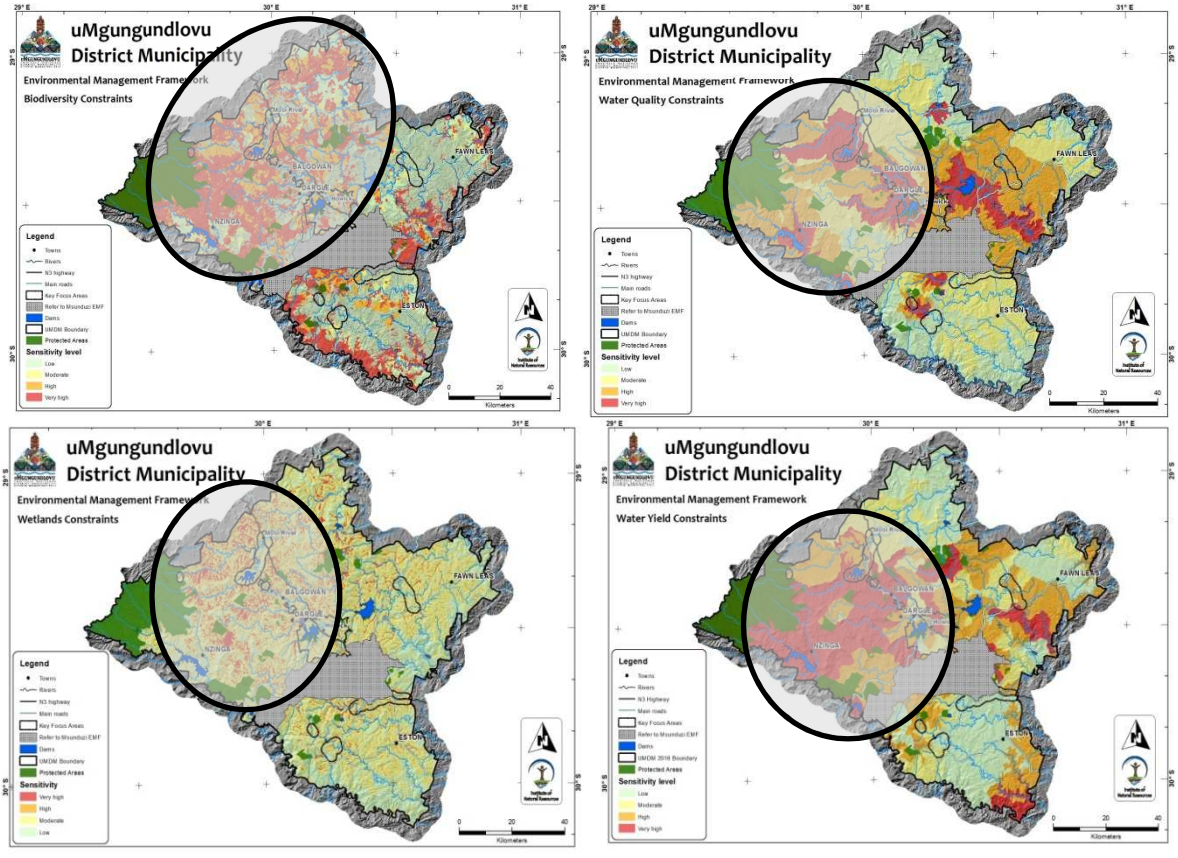
iv. ***There is a clear link between the high urbanised and industrialised sections of the catchment and the water quality sensitivity zones***, which is exacerbated with Pietermaritzburg and its waste water treatment plant being located on major river systems. The agricultural production in the midlands is putting pressure on the quality of water in the major impoundments – namely Spring Grove, Midmar and Albert Falls Dams.

v. The ***high density of wetlands in priority water quality catchments is another key factor to consider given the role that wetlands play*** in ameliorating poor water quality, attenuation of floods and regulating streamflow. The ***poor condition of wetlands*** discussed in the SQ and SEA, ***emphasize the need for attention in protecting and reinstating wetland function***.

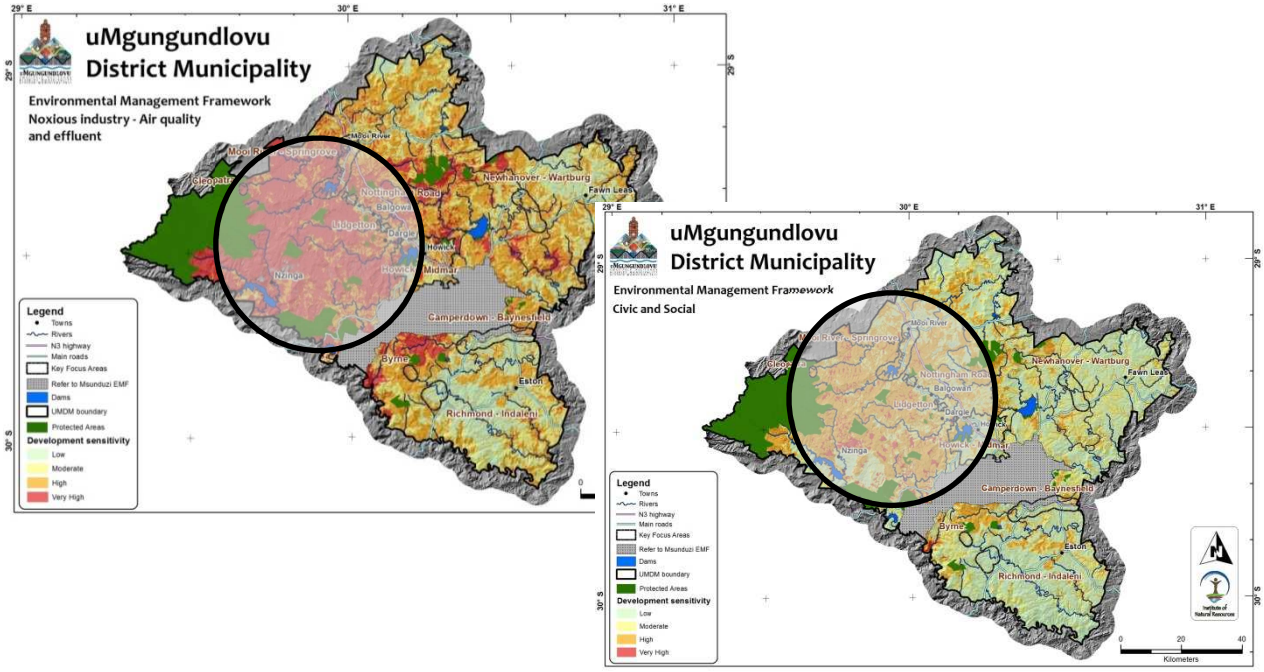
vi. The areas of ***high infrastructure constraint occur in areas key to biodiversity, water production and agricultural*** i.e. areas sensitive to transformation through the development of infrastructure.

The cumulative value the midlands region of the district for biodiversity, water production, wetlands, water quality and agriculture is emphasized by considering these layers in combination below. This highlights the risk to the people and economy of the District from:

- Transforming the natural systems, notably grassland and wetlands in the region.
- Failing to address water quality issues.



The influence of the cumulative sensitivity of this region in terms of development constraints is highlighted in the case of the examples shown below – 'Noxious industry' and 'Civic and Social' which both involve the transformation of the natural systems in this region which underpin the sensitivity of the environmental components described above. As a consequence these land uses have 'high' to 'very high' levels of constraint in the midlands region.



DEVELOPMENT CONSTRAINT MAPS AND GUIDELINES

Development constraints have been mapped for 32 different land use activity types, drawn from the Land-Use Management Systems Guidelines based on their impact on sensitivity zones developed in Volume II. These maps indicate where it is preferable from a sustainability point of view to locate each of the development typologies within the District. Specific guidance has also been provided for each development typology. More specific guidance regarding the relevant regulatory processes and associated specialist investigations required to support an application is provided in Volume II.

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GLOSSARY

AgroBiodiversity Zone: A type of designation for an area in terms of both its agricultural and biodiversity value.

AgroEcological Zones: A land resource mapping unit where climate, landform and soils and/or land cover, were sufficiently similar that a specific range of potential and constraints for land use could be estimated.

Agricultural Potential: Any assessment of potential agricultural use that includes arable use (the growing of the widest possible range of annual crops), horticulture (perennial crops in general, and fruit trees in particular), pastoral use (grassland and fodder crops) and silviculture (commercial growing of trees)

Bioresource Unit: Land with soils, vegetation, climate and terrain form which are sufficiently similar to provide for similar recommendations in terms of agricultural land management.

Critical Biodiversity Area: An area required to meet biodiversity targets as identified in a systematic biodiversity plan.

Desired Future State: Is a sustainability objective that sets out a vision, goals, indicators and targets for each key strategic issue.

Ecological Infrastructure: Ecological features that deliver valuable services to people.

Ecological Support Area: An area that is not critical for meeting biodiversity targets but plays an important role in supporting the ecological health of Critical Biodiversity Areas and/or delivering ecosystem services.

Ecosystem Goods And Services: All the benefits for human livelihoods arising from the ecological functions of ecosystems.

Environmental Management Framework: is a legislated tool developed in terms of the National Environmental Management Act, 107 of 1998 (NEMA) which supports sustainable development and provides legal standing to the information and tools generated.

Environmental Management Zone: Areas that have a 'low' agricultural potential that also support important biodiversity patterns and processes.

Key Focus Area: The predefined areas of high development pressure within the uMgungundlovu District Municipality.

Land Use Management Scheme: A tool used by municipalities to guide development according to the vision, strategies and policies of the Integrated Development Plan (IDP) and Spatial Development Framework (SDF).

Protected Areas: all areas as referred under Section 9 of the National Environmental Management: Protected Areas Act (Act 57 of 2003), which are protected by law for the purpose of conserving biodiversity. These include nature reserves and protected environments, with their management assigned to a competent authority of the region.

Service Infrastructure: Is infrastructure that delivers utility services such as electricity, reticulated water, waterborne sewage, waste disposal, and transport infrastructure.

Surface Water Resource: Surface water is water on the surface of the planet such as in a river, lake, wetland, or ocean. It can be contrasted with groundwater and atmospheric water. Sources of water that is potentially useful for human consumption and use

ACRONYM LIST

ABZ	AgroBiodiversity Zone
AEZ	AgroEcological Zones
ACRU	Agricultural Catchments Research Unit
AFDN	Albert Falls Development Node
AIA	Agricultural Impact Assessment
BA	Basic Assessment
BRU	Bioresource Unit
BSP	Biodiversity Sector Plan
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CBD	Central Business District
CE	Critically Endangered species
COGTA	Department of Cooperative Governance and Traditional Affairs
DAQMP	District Air Quality Management Plan
DD	Data Deficient species
DEA	Department of Environmental Affairs
DFS	Desired Future State
DM	District Municipality
DMR	Department of Mineral Resources
DRDLR	Department of Rural Development and Land Reform
DST	Decision Support Tool
DTI	Department of Trade and Industry
DTM	Digital Elevation Model
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Assessments
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIES	Ecological Importance and Ecological Sensitivity
EIMS	Environmental Information Management System
EKZNW	Ezemvelo KZN Wildlife
EMF	Environmental Management Framework
EMP	Environmental Management Programme
EMPr	Environmental Management Plan report
EMZ	Environmental Management Zones
EN	Endangered species
ESA	Ecological Support Area
ESZ	Environmental Sensitivity Zones
FRIS	Flood Risk Information System
GEV	General Extreme Value
GIS	Geographic Information System
ICMP	Integrated Catchment Management Plans.
IDP	Integrated Development Plan
INR	Institute of Natural Resources
IUCN	International Union for Conservation of Nature
KFA	Key Focus Area
KZN DARD	KwaZulu-Natal Department of Agriculture and Rural Development
KZN SALGA	KwaZulu-Natal Department of Local Government and Traditional Affairs
KZN EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
LM	Local Municipality
LUMS	Land Use Management Scheme
MAP	Mean Annual Precipitation
NALR	National Agricultural Land Register
NEES	National Energy Efficiency Strategy
NEMA	National Environmental Management Act

NFA	National Forests Act
NLC	National Land Cover
NSSD	National Strategy for Sustainable Development
NT	Near Threatened species
NWA	National Water Act
PA	Protected Area
PAA	Protected Area Act
PAMP	Protected Area Management Plan
PDALF	Preservation and Development of Agricultural Land Framework
PES	Present Ecological State
PGDP	Provincial Growth and Development Plan
PPP	Public Participation Process
PSC	Project Steering Committee
RQO	Resource Quality Objective
RRAMS	Rural Roads Assets Management System
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SEMP	Strategic Environmental Management Plan
SIPs	Strategic Infrastructure Projects
SO	Sustainability Objective
SoER	State of the Environment Report
SUDS	Sustainable Urban Drainage Systems
SWR	Surface Water Resources
TOR	Terms of Reference
UDDT	Urine Diversion Dehydration Toilets
UDPWHS	Ukhlahamba Drakensberg Park World Heritage Site
uMDM	uMgungundlovu District Municipality
UW	Umgeni Water
VIP	Ventilated Improved Pit Toilet
VU	Vulnerable species
WMST	Wetland Management Series Tools
WSA	Water Services Authority
WSDP	Water Services Development Planning
WULA	Water Use Licence Application
WWTW	Wastewater Treatment Work
WWW	Waste Water Works

1. INTRODUCTION

1.1 Background and Motivation for the EMF

The uMgungundlovu District Municipality (uMDM) has set as its long term vision the following: "*The uMDM will evolve into a dynamic metropolitan area, spreading its vibrant economic benefits to its citizens and places and will, through concerted integrated development and service delivery, realise improvement in the overall quality of life" (UDM, 2016)*[1]

The UDM has further adopted the seven strategic goals of the Provincial Growth and Development Plan (PGDP) to guide the District's response to key challenges to fulfilling this vision. These include "*Goal 5: Environmental Sustainability*". The vision and goals are further supported by five pillars that include the 3rd Pillar "*Balanced and sustainable development, green economy and a garden city model that is in harmony with nature*".

The uMDM commissioned the development of a Strategic Environmental Assessment and Management Plan (SEA & SEMP)[2] to serve as a tool for giving effect to these environmental sustainability goals. The SEA & SEMP was completed in 2013. The uMDM together with the KwaZulu-Natal Department of Economic Development and Tourism (EDTEA) subsequently identified the need to build on the outcomes of the SEA & SEMP in translating the outcomes into an Environmental Management Framework (EMF). An EMF is a legislated tool developed in terms of the National Environmental Management Act, 107 of 1998 (NEMA) which supports sustainability and provides legal standing to the information and tools generated, something that is not achieved through the SEA & SEMP.

PURPOSE OF AN ENVIRONMENTAL MANAGEMENT FRAMEWORK

The EMF regulations, 2010 (Section 2) list the purpose of the regulation as: *Compilation of information and maps specifying the attributes of the environment in a particular geographical area:*

c) For such information to inform environmental management, and

d) For such maps and information to be used as environmental management frameworks in the consideration of applications for environmental authorisations in or affecting the geographical areas to which those frameworks apply.

Section 2 (3) further explains that EMFs are aimed at:

d) Promoting sustainability.

e) Securing environmental protection.

f) Promoting cooperative environmental governance.

The uMDM commissioned the Institute of Natural Resources NPC (INR), to build on the SEA & SEMP in developing the EMF. The focus of this additional work is detailed in the overarching EMF report. This

[1]Integrated Development Plan for uMgungundlovu District Municipality. The Comprehensive 2017/12018 – 2021/22 Five Year IDP – 4th Generation. Accessed on 9 May 2017 from http://www.uMDM.gov.za/Official_Site/index.php/idp/draft-comprehensive-idp-2017-2018-to-2021-2022

[2]Umgungundlovu District Municipality. December 2012. Strategic Environmental Assessment Report: for the Umgungundlovu District Municipality Strategic Environmental Assessment and Management Plan. Isikungusethu Environmental Services (Pty) Ltd and Zunckel Ecological and Environmental Services, Pietermaritzburg.

'Environmental Guideline for Development Planning' serves as one of the EMF tools, the purpose of which is explained further in sections 2 and 3.

1.2 Project Area

The uMgungundlovu District Municipality (UMDM) is one of 10 District Municipalities in KwaZulu-Natal. It is located in the Midlands on a major transport route or movement corridor (N3) which serves as link between KwaZulu-Natal and Gauteng (Figure 1). It is bordered by the Ethekwini Metropolitan Municipality, Illembe and Ugu Districts to the East, Umzinyathi to the north, Uthukela to the west and Sisonke to the south.

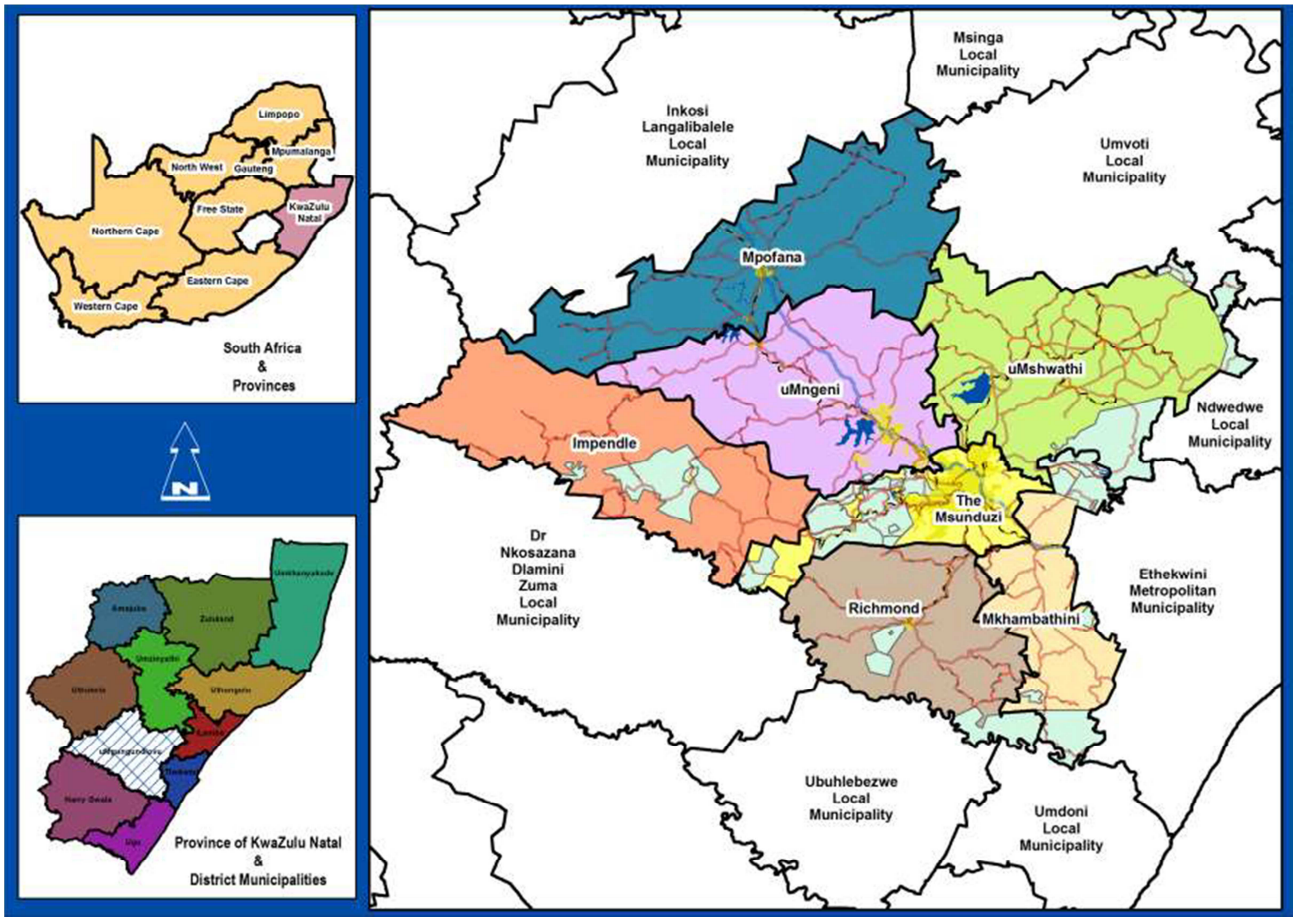


Figure 1 Locality of the uMgungundlovu District wihtin the Province and the Local Municipalities wihtin the District

Several refinements have been made to the focus of the EMF area within the District based on consideration of existing EMFs and development pressure as explained below.

Consideration of Existing EMFs

The District comprises of seven local municipalities (LMs), with a rural-urban mix including uMngeni, uMshwathi, uMzinyathi, Mpofana, Impendle, Richmond and Mkhambathini. Of the LMs, uMsunduzi has a gazetted EMF which is the process of being updated. The decision was taken to defer decision making to the uMsunduzi EMF based on the fact that the:

- Resolution of the information generated at the LM scale is higher than at the District scale,
- The EMF is Gazetted, and

- The EMF includes a specific information management and reporting system.

The implications of this is that for all spatial queries in the District EMF Decision Support System made within uMsunduzi, the response will provide a link to the local EMF, and responsible contacts.

A high resolution EMF has also been developed for the Albert Falls Development Node (AFDN) within uMshwathi Local Municipality (Figure 2). The decision was taken to include this area within the uMDM based on the following points:

- The EMF has not been gazetted.
- The approach to developing the sensitivity assessments and EMF outputs is the same as that for the UMDM EMF, and was developed by the INR.

So in developing the District EMF, the AFDN has been included, integrating the higher resolution information for this EMF in the process.

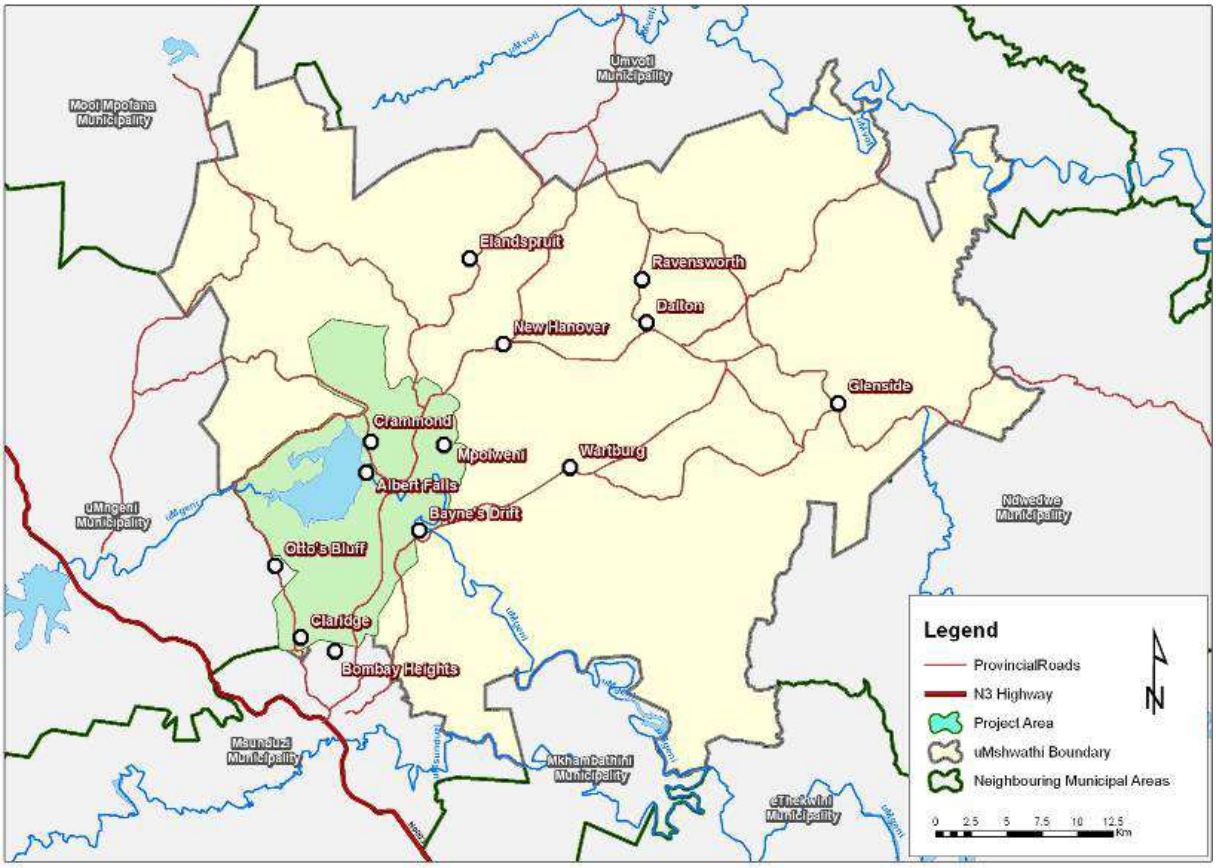


Figure 2 Location of the Albert Falls Development Node wihtin the uMshwathi Local Municipality

Consideration of Development Pressure

The uMDM has identified areas under significant development pressure. Several of these are located along the N3 corridor and other routes such as the R103 along which the Midlands Meander Tourism Route are clustered. The others KFAs are associated with small outlying towns. These Key Focus Areas (KFAs) are indicated with red boundaries and text in Figure 3 and include:

- Midmar;
- Howick and Hilton area;

- The small outlying towns of Mooi River/Nottingham Road; Richmond/Byrne; and, New Hanover/Wartburg,
- A small area in the upper Kamberg Valley titled 'Cleopatra".

The implications of the KFAs in the final EMF products, is that while they received increased attention in developing the EMF, in the form of more detailed mapping and ground-truthing they will not be highlighted in the final EMF products.

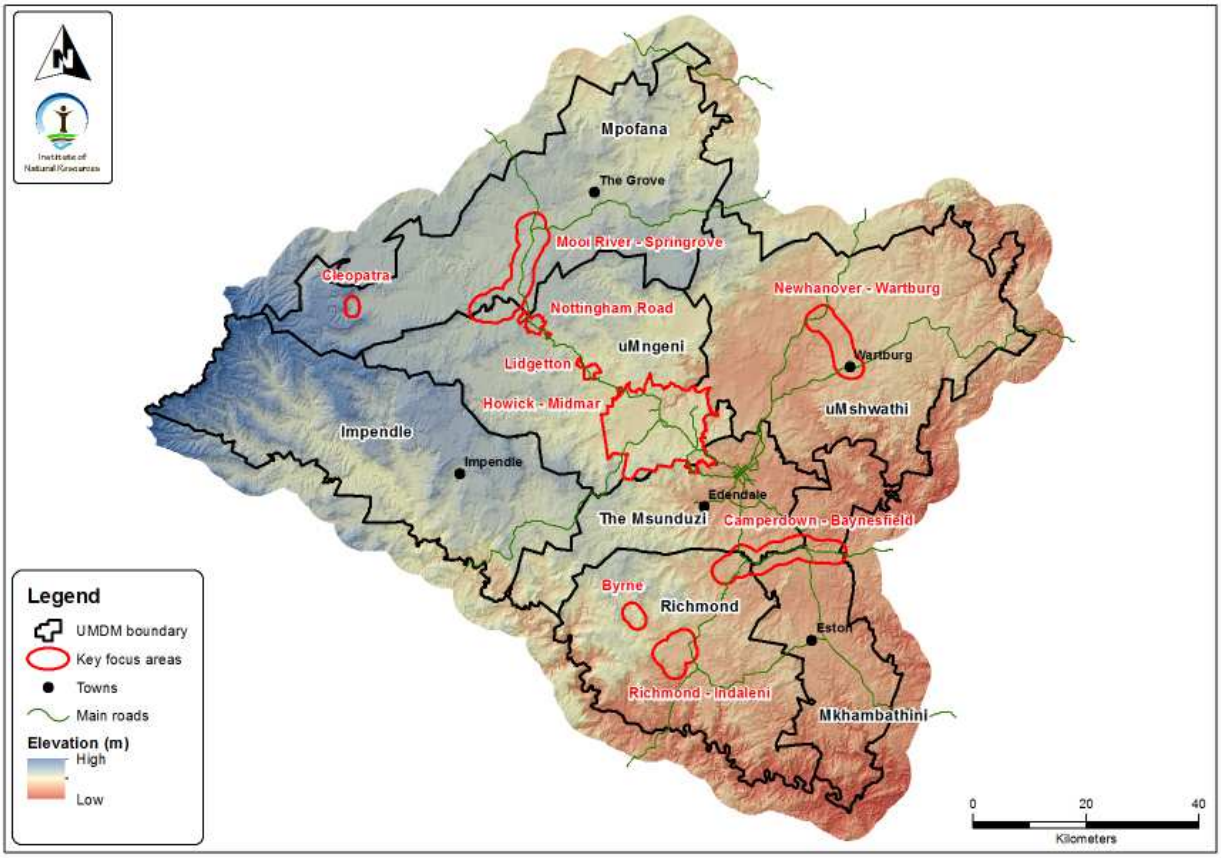


Figure 3 Spatial extent of the Umgungundlovu District and Key Focus Areas identified for specific attention in the EMF

In summary, the Project area is the **entire extent of the uMgungundlovu District** Municipality Boundary, **excluding the uMsunduzi** local Municipality, with **higher confidence** data informing the outputs in the **KFAs**.

2. STRUCTURE OF THE EMF

The aim of the Environmental Management Framework (EMF) is to support the achievement of the Sustainability Vision developed as part of the Sustainability Framework that represents the Desired Future State. This vision is articulated in Figure 3 below along with the various EMF tools developed to support the achievement of the vision. ***This document is Volume III*** of the suite of EMF outputs. The development constraints and management measures provided in this guideline draw extensively on the environmental sensitivity zones and guidance developed in Volume II. The two guidelines should therefore be read in conjunction.

Figure 4 Structure and components of the EMF

3. OVERVIEW OF THE GUIDELINE

3.1 Purpose of the Guideline

The purpose of this guideline is to ***inform development planning*** by indicating where the environmental constraints on different types of land use are highest in terms of both:

a. Number of constraints – how many environmental features defined in Volume II which include among others; wetlands, air quality, flood zones, occur on a land parcel proposed for development.

b. Level of constraint – whether the proposed land use (and/or the ancillary activities and outputs such as effluent) will impact the environmental feature. The higher the level of sensitivity, the higher the higher the level of development constraint because it will likely demand:

- A range of authorisation and licensing processes which,
- Have time and cost implications, and
- Increases the risk of a development proposal not being authorised.

3.2 Who Should Use the Guideline?

The guideline aims to assist both the municipality and developers in the following ways:

- *Developers* - The guideline allows for a level of risk assessment by developers because the higher the number and level of environmental constraints indicated at a selected site, the higher the development costs and the lower the chances and/or, longer it will take to secure the various licences and authorisations required to proceed with the development. To optimise its value in assessing risk, the guideline should be applied at the earliest stages of development planning i.e. when selecting an appropriate site.

- *Municipality* – the municipality plays a variety of roles in relation to development planning and applications, with the guideline providing a useful tool in each.
    - *Development planning* – The municipality should consider the environmental constraints established in the guideline to inform the spatial planning tools, namely the Integrated Development Plan, Spatial Development Framework (SDF) and specifically the Land use Management Scheme (LUMS) as the guideline is designed in accordance with the LUMS guideline. By entrenching the environmental constraints in these spatial tools the Municipality will proactively promote sustainable development by guiding development to environmentally appropriate locations. A further benefit of the tool is that it can be used to market the area to prospective developers who are seeking to invest. The Municipality can show that they have undertaken an initial, broad level of environmental due diligence. The guideline is also a very relevant input to the development of a strategic environmental assessment for the entire Municipality, which is a requirement by COGTA of local municipalities.
    - *Development applications* – The tool provides guidance to the municipality when commenting on projects proposed by private or public developers in the development area. The recommendations provided each land-use type in the guideline for mitigating the impacts of different land use on sensitive environmental features can be included as conditions of planning authorisation.

The approach used in developing the guideline is provided below as context for understanding the detail that follows.

3.3 Approach

3.3.1 Defining Land Use Types

The aim is to provide guidance for the full range of land use types that already exist, or are likely to be developed within the District. The starting point for defining land uses were the categories and definitions provided in the "*KwaZulu-Natal land use management system guidelines for the preparation of schemes for municipalities – update 2011".* The eight main categories of land use established in the guideline are summarised in the adjacent list. The titles and colour scheme for these main land use categories are the same as that used in the provincial LUMS guidelines. This will make it simpler to align the outputs of this development guideline with the municipal LUMS when they are developed. The main categories then include subcategories. For example, the Agriculture includes amongst others the subcategories: forestry, crop production and animal production. The full list of over 50 sub-categories provided in the LUMS guidelines was refined to 32 for the EMF by grouping land-uses that have similar development sensitivity. The process through which development sensitivity was established is described in 3.3.2 below.

AGRICULTURE
CIVIC AND SOCIAL
MIXED USE
RESIDENTIAL
TOURISM
INFRASTRUCTURE AND SERVICES
CONSERVATION AND OPEN SPACE
INDUSTRY

3.3.2 Defining and Mapping Development Sensitivity per Land Use Type

Volume II of the EMF defined a sensitivity layer for each of the seven environmental features which have sub categories or components of sensitivity. As an example, a wetland body is allocated a 'Very High' sensitivity ranking, while the wetland buffer is assigned a 'High' level of sensitivity. The sensitivity layers were then assessed against the 32 land use types. The impact of each development typology was scored against each of the components' sensitive categories using a scoring system of 1 – 4 with 4 being the highest sensitivity/impact and thus posing the highest constraint to a development of that kind and 1 being the lowest sensitivity / lowest constraint to a development of that kind. An example of this process is shown in the adjacent table for 'Intense Mixed Use". Each of the components' sensitivity layers contains such an attribute table of scores reflecting the impact potential of each of the 32 land use types on the features identified by for the environmental feature. These sensitivity categories were mapped so they have a spatial footprint.

4 Very high
3 High
2 Moderate
1 Low

Environmental Features	Components	Mixed use 9. Intense Mixed Use
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1

The sensitivity layers were then 'Unioned'. Unioning is an ArcGIS geoprocessing function whereby overlapping layers are integrated into one layer, retaining all boundaries and attributes. In Figure 3 below, the input circle represents a feature in one layer and the input rectangles two features in another input layer. Once unioned, the output no longer has a circle and two rectangles, but 5 different feature shapes made up using all the boundaries of the input features.

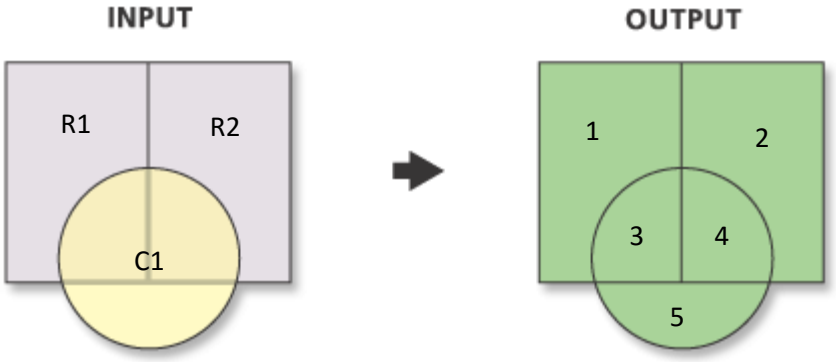


Figure 5 Illustration of a Union geoprocessing operation

All seven component's sensitivity layers were Unioned to generate an integrated sensitivity layer containing the spatial distribution data for each sensitivity feature and their sensitivity score for each of the land use types. This created a layer of several polygons with the input features of the input layers being fragmented by the features of the other layers. Importantly, all of the attributes of the input features are retained for each of the output polygons. This layer enables the user to identify the various levels of sensitivity (from any of the 7 components' sensitivity layers) to any of the 32 land use types at any location in the District Municipality. When looked at from another perspective, this provides information regarding where particular development types are best located across the District and which areas are to be avoided.

The key challenge is how best to represent this information in a usable fashion. It is possible to map any combination of component sensitivity and land use type, but this is not practical for summary and planning purposes (i.e. a potential for 32 x 7 = 224 maps). Obviously, very high sensitivity areas from any component are important and must influence decision making. Areas that are categorised as 'Very high sensitivity' from the perspective of a number of components are obviously very important. Summary maps have therefore been developed for each of the 32 land use types using a method designed to show aggregated sensitivity that land use type at any particular point, but also to weight the number of 'Very high sensitivity' components found at that point. The following equation has been used to **aggregate** the sensitivity data for each development typology/land use type:

(AS + BS + FS + WPS + WQS + WTS) x (1 + (C_VHS / 7))

Where: *AS = Agricultural Sensitivity Score*
BS = Biodiversity Sensitivity Score
FS = Flood Area Sensitivity Score
WPS = Water Production Sensitivity Score
WQS = Water Quality Sensitivity Score
WTS = Wetland Sensitivity Score
C_VHS = Count of Components Ranked as "Very high sensitivity"

The output of this calculation is an **additive score** of sensitivity for each polygon in the sensitivity layer, but weighted by the number of "Very high sensitivity" features located at that site. The overall scores have been grouped to provide 4 categories of constraint – ranging from Very High to Low.

3.3.3 Considerations when Applying the Guideline

The following is provided for each land use types in the guideline:

i. ***Definition*** - of the land use with examples.
ii. ***Map -*** indicating the most appropriate areas for the land use i.e. where constraints are lowest.
iii. ***Development Constraints and Guidelines*** – a description of how the land use impacts the different environmental sensitivity features described, with guidelines provided for addressing these impacts either in the planning and/or authorisation of the land use in question.

The following needs to be considered when using the guideline:

- The ***constraints map shows the highest aggregated level of constraint at every point in the study area***. So there may be areas where the constraint level is shown as low, but where a particular land-use still impacts an environmental feature with a very high sensitivity value. This understanding is accessible from querying the Decision Support Tool which allows the user to query an area to establish all the constraints that occur on a particular land parcel.
- For some of the main land use categories, ***the impact of the land use on the different environmental features is similar*** so that there is only one constraints map for all the sub categories e.g. residential. But there are categories such as agriculture, where the impact is quite different across the subcategories and specific maps have been compiled for each.
- There is ***a two way relationship between land uses and environmental sensitivity***. The first is where the land use will negatively impact the environmental feature. For example, the loss of natural habitat when converted to urban infrastructure. The other situation is where the environmental feature or condition places a constraint on the development. For example, flood risk areas increase the costs of risk to developing in such areas.
- It is also important to understand that ***a high level constraint does not mean that the landuses in question cannot be developed at this location*** i.e. it is not a fatal flaw. Rather, it means that:
    - It should rather be developed at an alternative location if the municipality is to move towards a sustainable development.
    - The higher the number of constraints and the higher the level of the constraint, the higher the likely costs and time frame for securing the required licences and authorisation. The mitigation measures required to reduce the impact on sensitive features is also likely to increase the costs of development within environmental sensitivity zones. For example, if there is a wetland, high potential agriculture and high value biodiversity several authorisations and associated studies will be required.
- The ***uMDM district boundary*** has been changed since the inception of the EMF. The area of significant change includes the south west area of the Impendle Local Municipality. Important to note is that this area currently presents a data gap in current spatial planning for the district i.e. SDF and IDP. However, the assessment approach agreed with the technical committee comprising of KZN EDTEA and the uMDM is the following regarding the new district area in Impendle:
    - Identify clearly any data gaps and include these areas as updateable information within the final spatial products
    - Include the assessment of these areas with available information and where information provided is more conservative than the rest of the district and KFAs, these must be clearly stated in the accompanying specialist reports.

4. GENERAL DEVELOPMENT CONSTRAINT PATTERNS

The following general patterns have emerged in terms of constraints imposed by environmental sensitivity zones on different land uses.

4.1 Overview of Individual Constraint Patterns

The following series of Figures provide graphic summary of the sensitivity zones of the various environmental features, which translate into development constraints. The analysis reveals the following key points:

vii. The ***District is endowed with valuable agricultural resources*** as indicated in Figure 6. As emphasized in the SEA, these resources are not necessarily adequately valued in S.A. and the ongoing transformation of high potential agriculture land to other land-uses represents one the most significant sustainability issues in the Province. Consequently high value agricultural land represents a significant constraint to other land uses which will result in their permanent loss for agricultural production and grazing. These represent a high constraint to any other use with consequent requirements in the EIA process and various agricultural legislation (see Volume II), to confirm the agricultural value of the land in question.

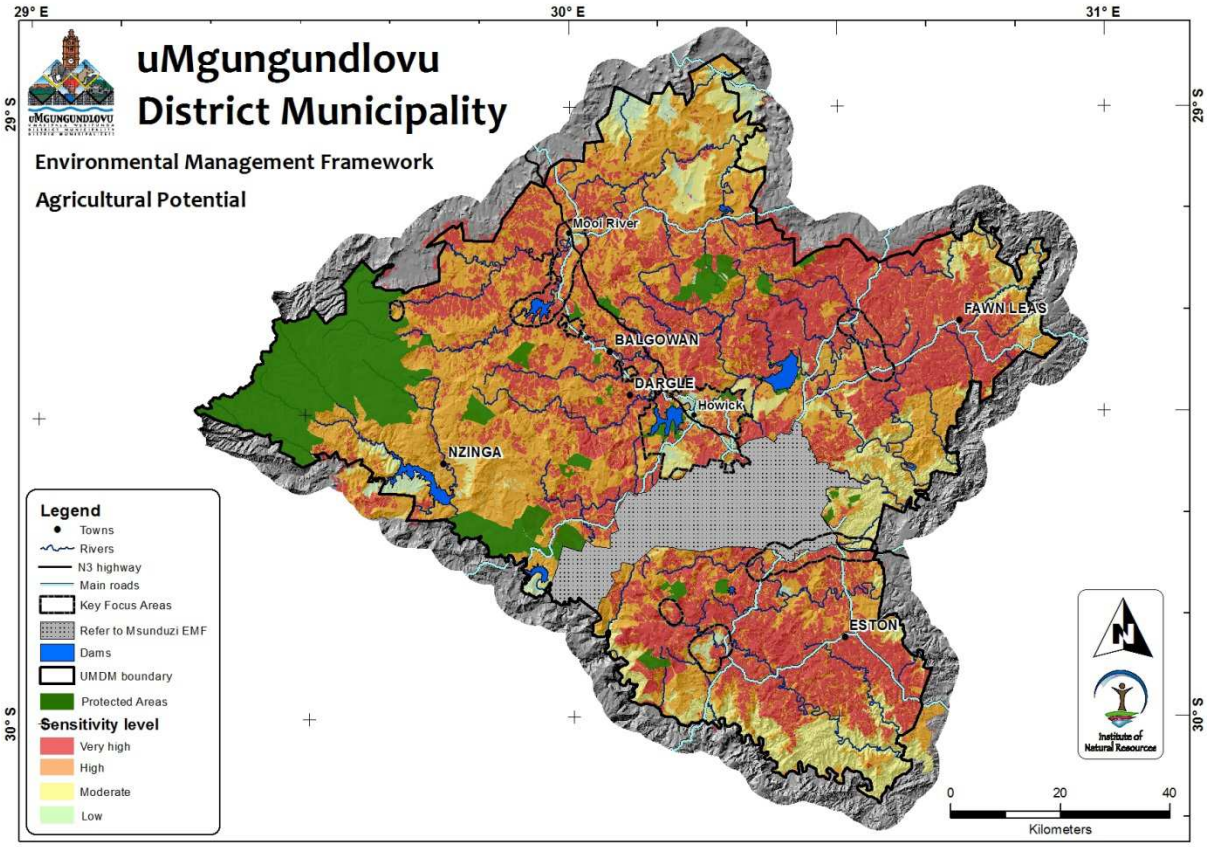


Figure 6 Agricultural Senstivity Zones Map

viii. Large areas identified as of '***Very High' sensitivity for agricultural purposes are also deemed to be 'highly' sensitive from a biodiversity perspective*** - evident when one compares Figure 6 and 7.

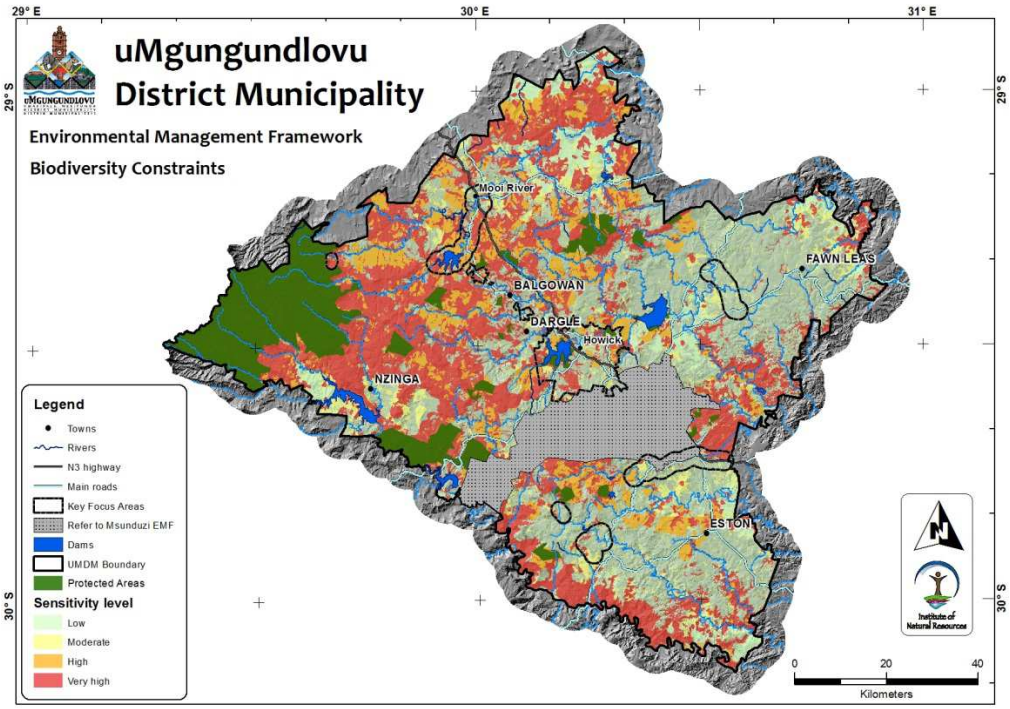


Figure 7 Biodiversity Sensitivity Zone Map

ix. The untransformed areas noted in i and ii above are also critical from a water resources delivery point of view (Figure 10). Given that the District incorporates the key economic hubs of the greater Pietermaritzburg-Durban area, and the stressed nature of water resources documented in the status quo and SEA, the transformation of these catchments will place further stress on social well-being and economic productivity in the catchment.

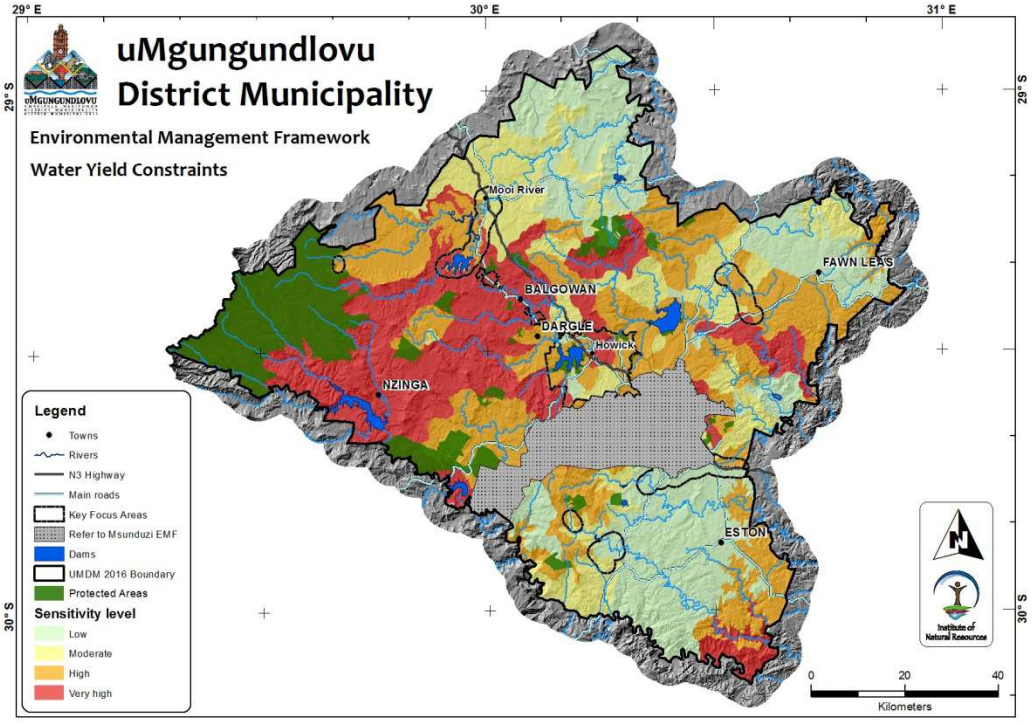


Figure 8 Water Yield Sensitivity Zone Map

x. ***There is a clear link between the high urbanised and industrialised sections of the catchment and the water quality sensitivity zones***, which is exacerbated with Pietermaritzburg and its waste water treatment plant being located on major river systems. The agricultural production in the midlands is putting pressure on the quality of water in the major impoundments – namely Spring Grove, Midmar and Albert Falls Dams.

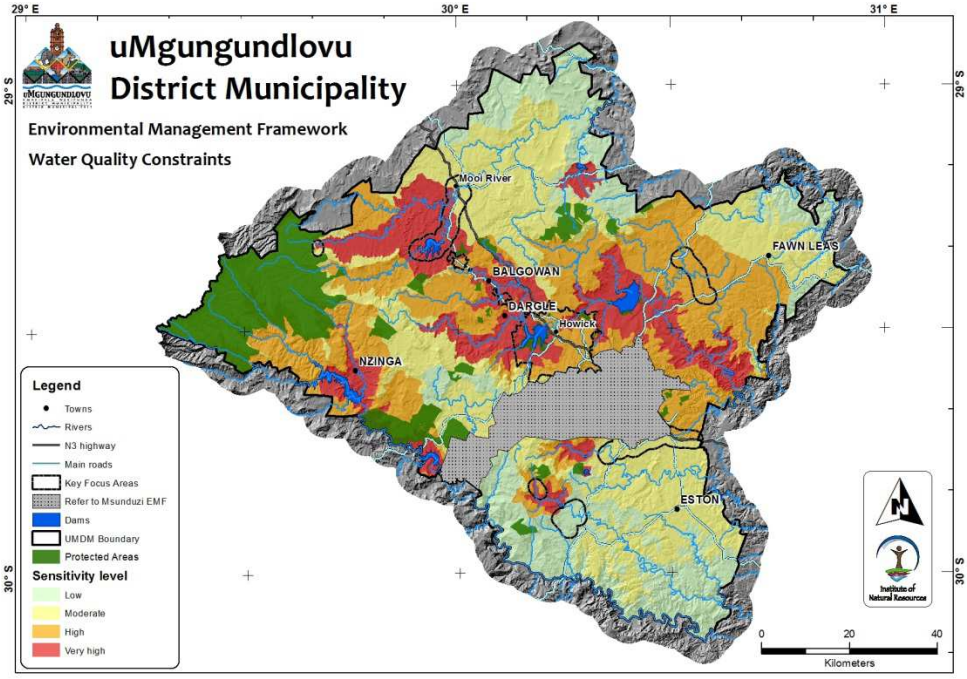


Figure 9 Water Quality Sensitivity Zone Map

xi. The ***high density of wetlands (Figure 10) in these priority water quality catchments is another key factor to consider given the role that wetlands play*** in ameliorating poor water quality, attenuation floods and regulating streamflow. The ***poor condition of wetlands*** discussed in the SQ and SEA, ***emphasize the need for attention in protecting and reinstating wetland function***.

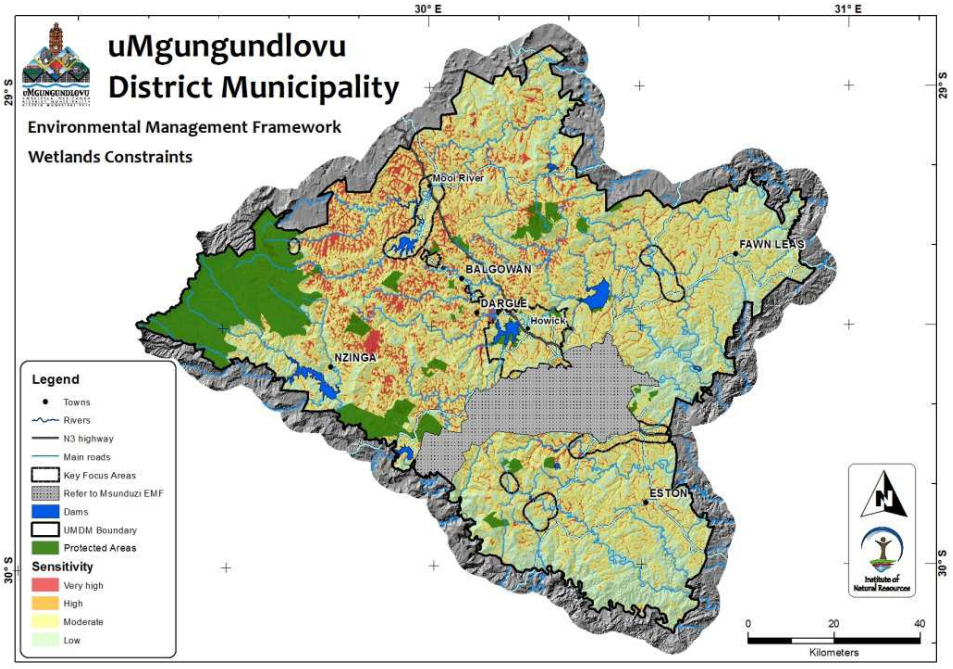


Figure 10 Wetland Sensitivity Zone Map

xii. The areas of ***high infrastructure constraint*** (**Figure 11**) ***occur in areas key to biodiversity, water production and agricultural*** i.e. areas sensitive to transformation through the development of infrastructure.

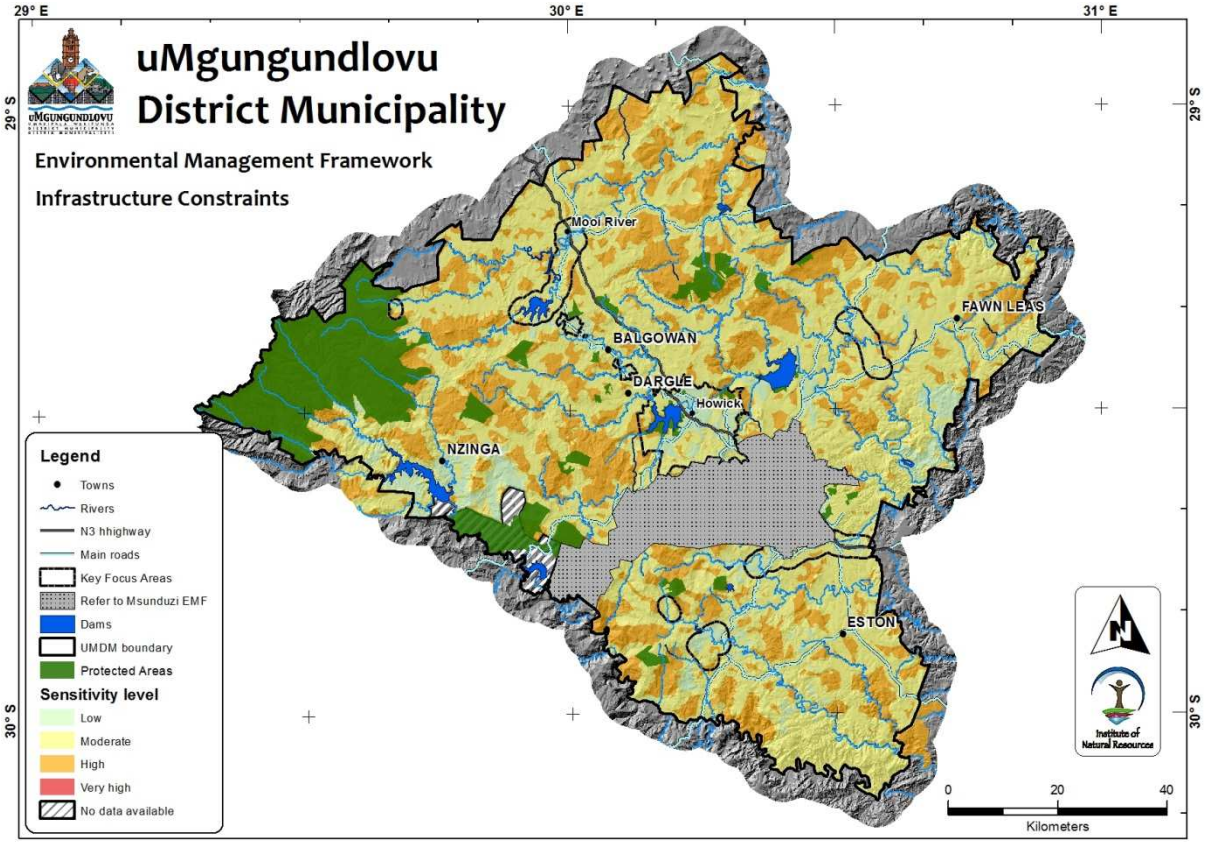
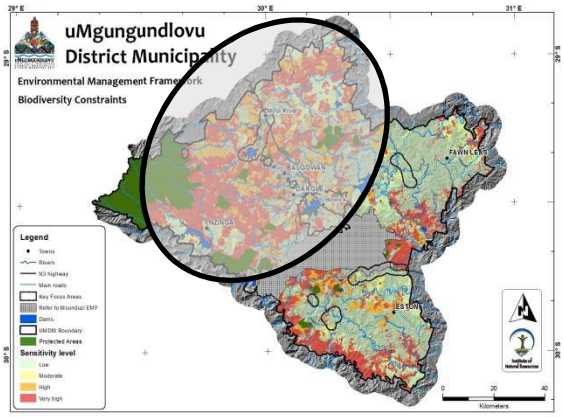


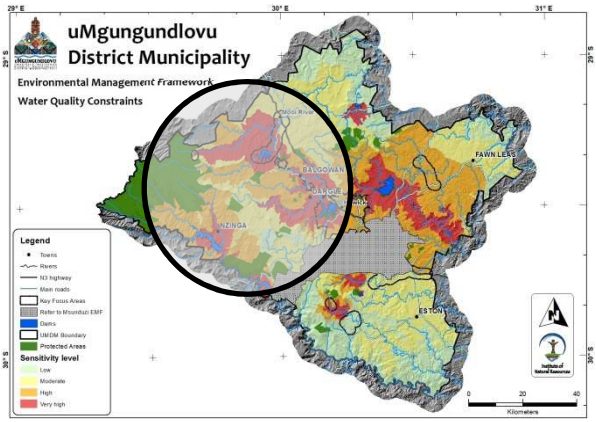
Figure 11 Infrastructure Sensitivity Zone Map

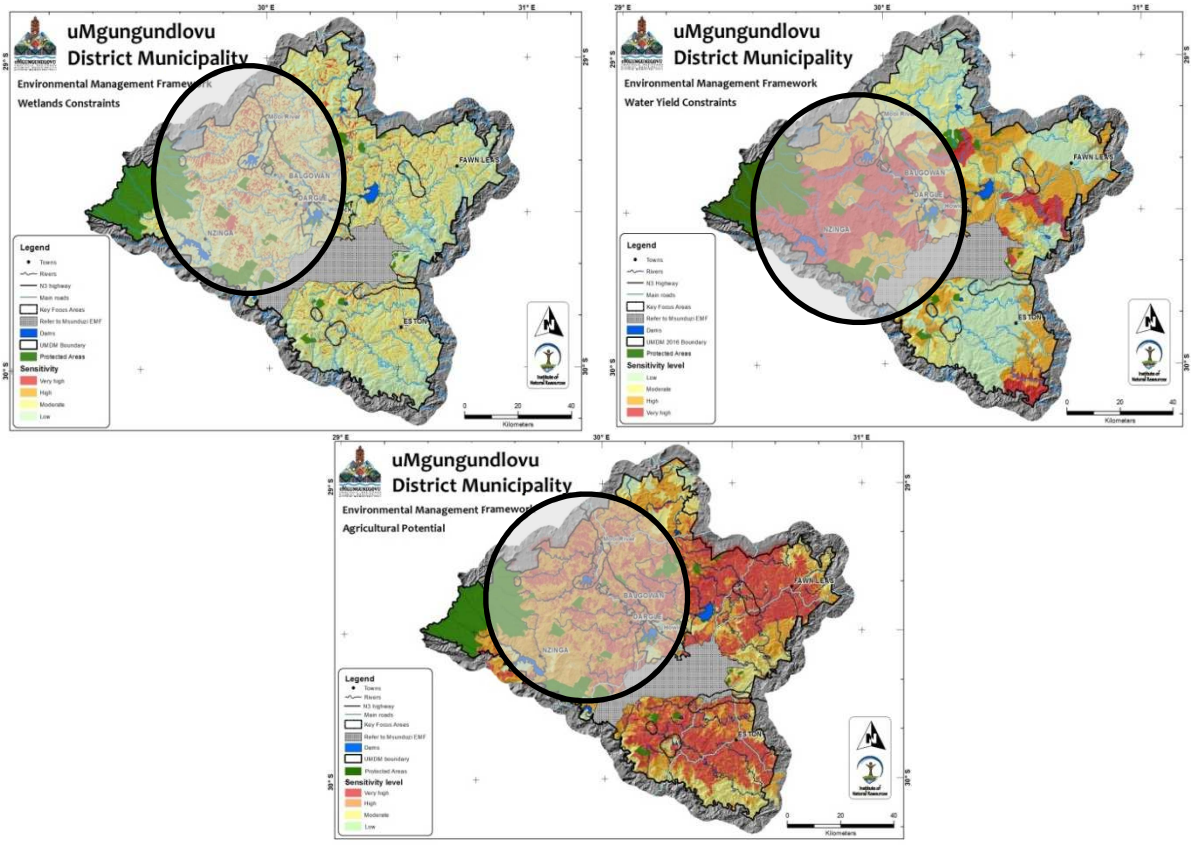
4.2 Cumulative Influence of Constraint Patterns on Development

The cumulative value the midlands region of the district for biodiversity, water production, wetlands, water quality and agriculture is emphasized by considering these layers in combination below. There are other areas of the district in which are highly sensitive for each of these features. For example the well-developed sugar-cane growing areas in the Wartburg and Eston/Richmond areas are an important for agriculture. However, the midlands region is highly sensitive to the majority of the seven environmental components. This highlights the risk to the people and economy of the District from:

- Transforming the natural systems, notably grassland and wetlands in the region.
- Failing to address water quality







The influence of the cumulative sensitivity of this region in terms of development constraints is highlighted in the case of the examples shown below – 'Noxious industry' and 'Civic and Social' which both involve the transformation of the natural systems in this region which underpin the sensitivity of the environmental components described above. As a consequence these land uses have 'high' to 'very high' levels of constraint in the midlands region.

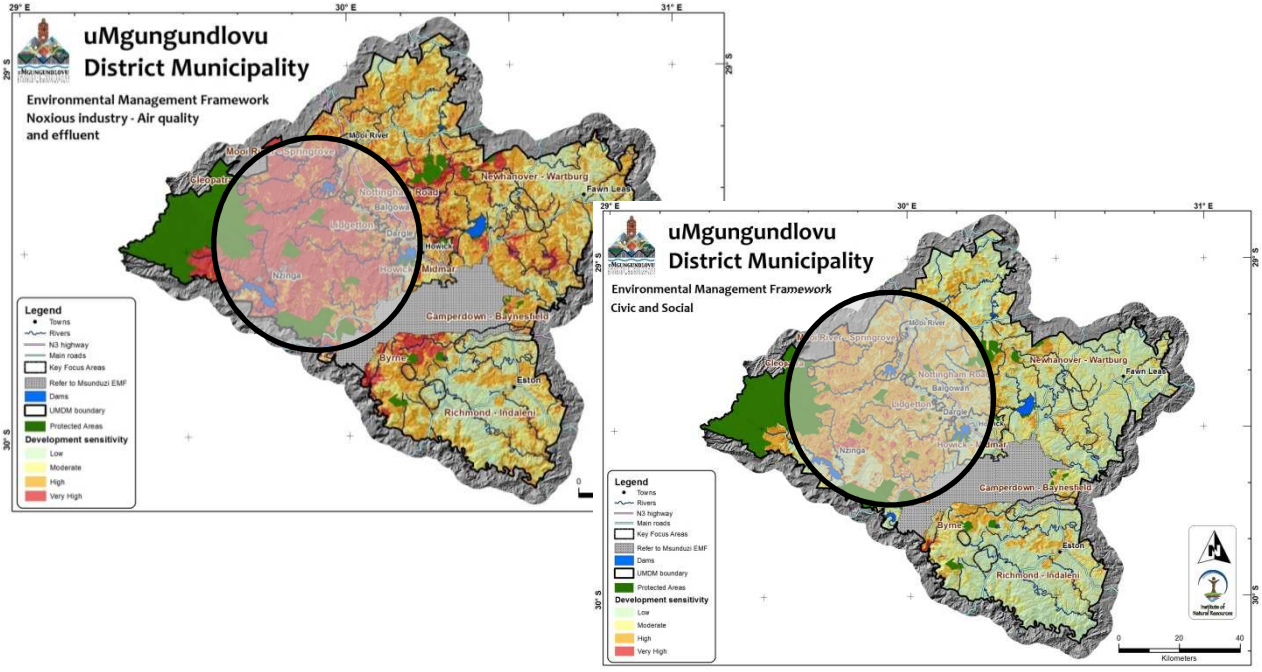


Figure 12 Cumulative influence of envirnmental sensitivity zones on development

5. AGRICULTURE

5.1 Extensive Crop Production

Irrigated or dry land commercial production of crops over extensive areas. **Examples:** Sugar cane, maize, soya, wheat and vegetables.

Development Constraints and Guidelines

The constraint ratings highlight the high constraint imposed by wetlands and terrestrial biodiversity on crop production, arising from the transformation of these systems if converted to cropland.

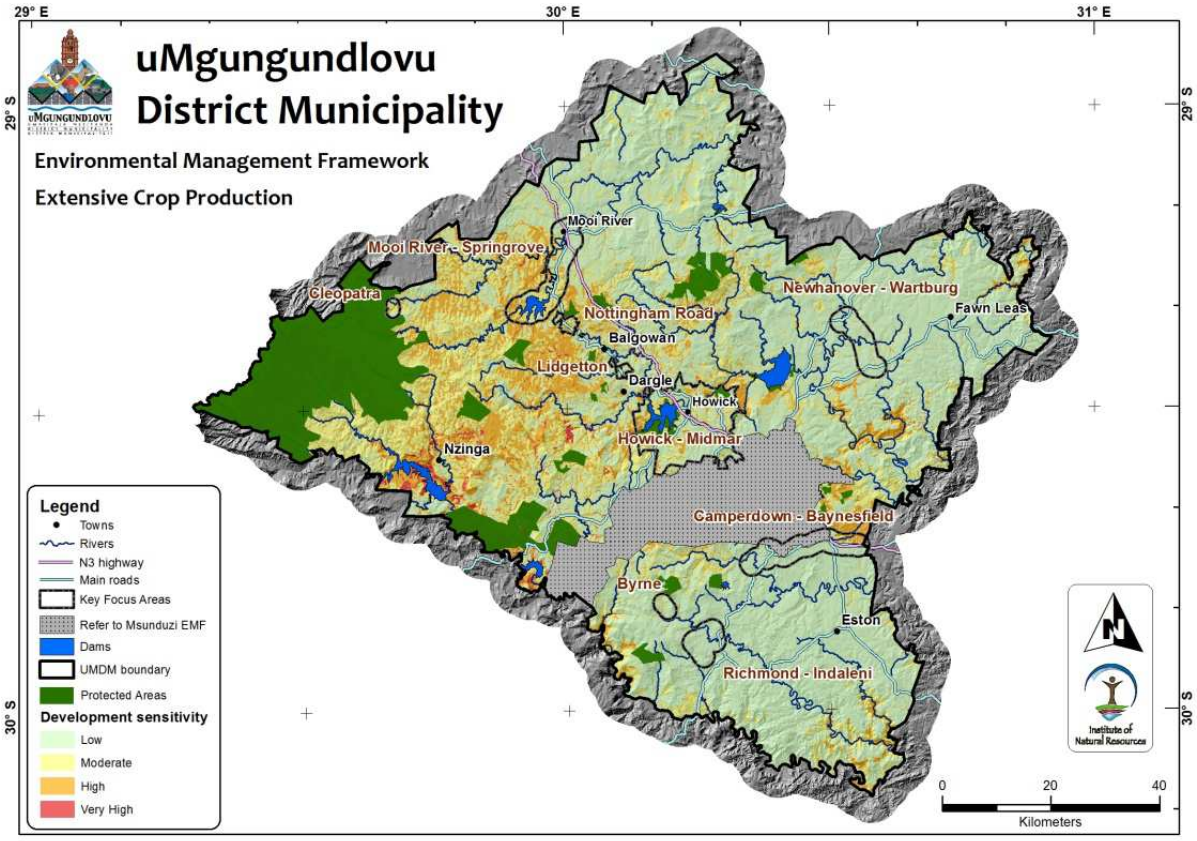
Constraint Ratings

	Environmental Feature	1. EXTENSIVE CROP PRODUCTION
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	Any cultivated land (inc. cropland, sugar cane, forestry, orchards, pasture etc.)	1
	Uncultivated land with high potential (Category A&B) and moderate potential (Category C)	1
	Uncultivated Restricted potential (Category D)	3
	Uncultivated Very restricted potential (Category E), and land unavailable to agriculture (transformed land, protected areas etc.)	4
Infrastructure	Very Low/No Service Provision	2
	Low Service Provision	2
	Moderate Service Provision	2
	High service Provision	1
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood	1:100 yr flood	2
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Other Natural Areas (Threatened)	3
	Other Natural Areas (Not Threatened)	2
Water Production	Very High Yield	4
	High Yield	3
	Moderate Yield	2
	Low Yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality. The transformation of the wetland catchment also impacts the hydrology of the system. Crop production will also result in run-off of pollutants into the wetland in the form of insecticides, fertilizer and sediment.
Recommendations	Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. The primary impact is the conversion of large areas of natural vegetation to agricultural use. In addition to the direct loss of habitat, cropping introduces various forms of infrastructure in the form of roads, fences and other infrastructure. This infrastructure and cropping activities create disturbance and barriers to the movement of wildlife. The disturbance also creates opportunity for infestation by invasive alien plant species
Recommendations	- Cropping should be avoided in high sensitivity areas. However, development applications need to confirm whether the area mapped as high value biodiversity warrants retention for agricultural production. - Where development does proceed, the cropping plan needs to show how areas/features of biodiversity value have considered e.g. retention of natural areas/corridors through cropland. An EIA or Basic Assessment to be followed to establish impacts from the development and appropriate mitigation and offset measures should be implemented. - An alien invasive plant management plan must be a condition of planning approval. - In Ecological Support areas may be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas. The agricultural component should rely on uncultivated/fallow land by avoiding ploughing of virgin land
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	This activity is will reduce streamflow in high yield sensitive areas. Therefore any such activity should be avoided in these areas. However, this activity may proceed on condition of detailed specialist investigations in support of an environmental authorisation process. This will require the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment.

Spatial Overview of Constraints



5.2 Intensive Crop Production

This category includes intensive commercial crop production on small areas. This area is generally 50 ha or less which may require infrastructure such as tunnels, irrigation, and buildings for processing and storage. **Examples**: Vegetables, avos/fruit orchards, nurseries, etc.

Development Constraints and Guidelines

The constraint ratings highlight the high constraint imposed by wetlands and terrestrial biodiversity on crop production, arising from the transformation of these systems if converted to cropland.

Constraint Ratings

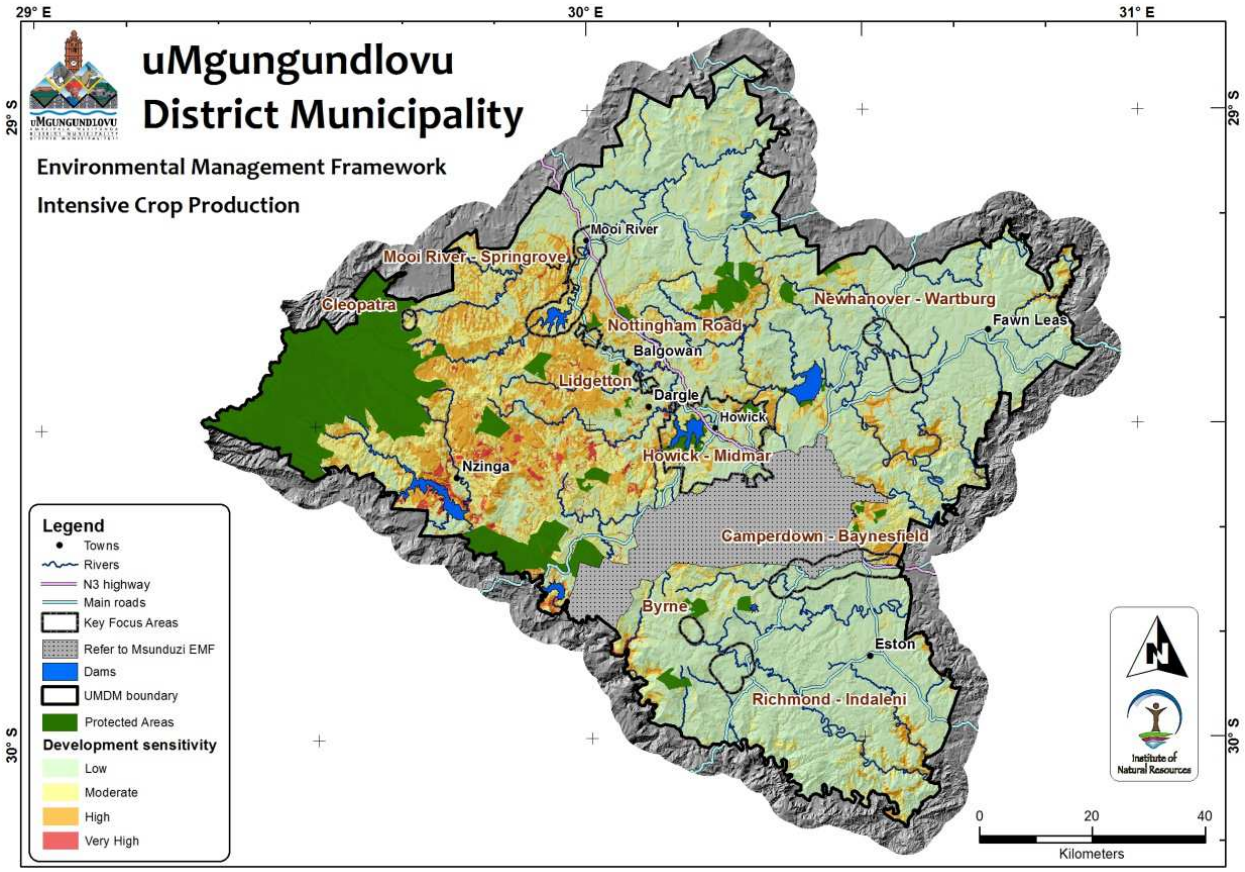
Environmental Features	Components	AGRICULTURE 2. INTENSIVE CROP PRODUCTION
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	2
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	3
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	To maximise production, crops are often planted into wetland areas. This destroys the habitat and ability of these systems to provide important services like improvement of water quality (which is essential in this area).
Recommendations	Preferably no development within wetlands/riparian areas or their buffers, which may require the following assessments to determine extent of activity permissible: - Delineation of all wetland and riparian areas and an appropriate buffer. - A wetland/riparian rehabilitation and management plan is required as a condition of planning approval.
Terrestrial Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. The primary impact is the conversion of large areas of natural vegetation to agricultural use. Apart from possible low impact ecotourism activities, development in these areas is a high constraint.

Recommendations	Cropping should be avoided in high sensitivity areas. However, development applications need to confirm whether the area mapped as high value biodiversity warrants retention for agricultural production. Where development does proceed, the cropping plan needs to show how areas/features of biodiversity value have considered e.g. retention of natural areas/corridors through cropland. An EIA or Basic Assessment to be followed to establish impacts from the development and appropriate mitigation and offset measures should be implemented. An alien invasive plant management plan must be a condition of planning approval. In Ecological Support areas may be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas. The agricultural component should rely on uncultivated/fallow land by avoiding ploughing of virgin land.

Spatial Overview of Constraints



5.3 Intensive Production of Animals

This category accounts for activities involving the concentration of animals for the production of animal products (eggs, milk and meat) **Examples:** feedlots, poultry houses, piggeries, crocodile farms, rabbit hatcheries and dairies.

Development Constraints and Guidelines

As shown in the constraints summary table, these activities generate effluent high in nutrients so water quality is a constraint, as are the impacts on wetlands, water quality, flood zones and areas with high biodiversity value. While they are dependent on and linked to primary agricultural production, these activities should not be located on highly productive land.

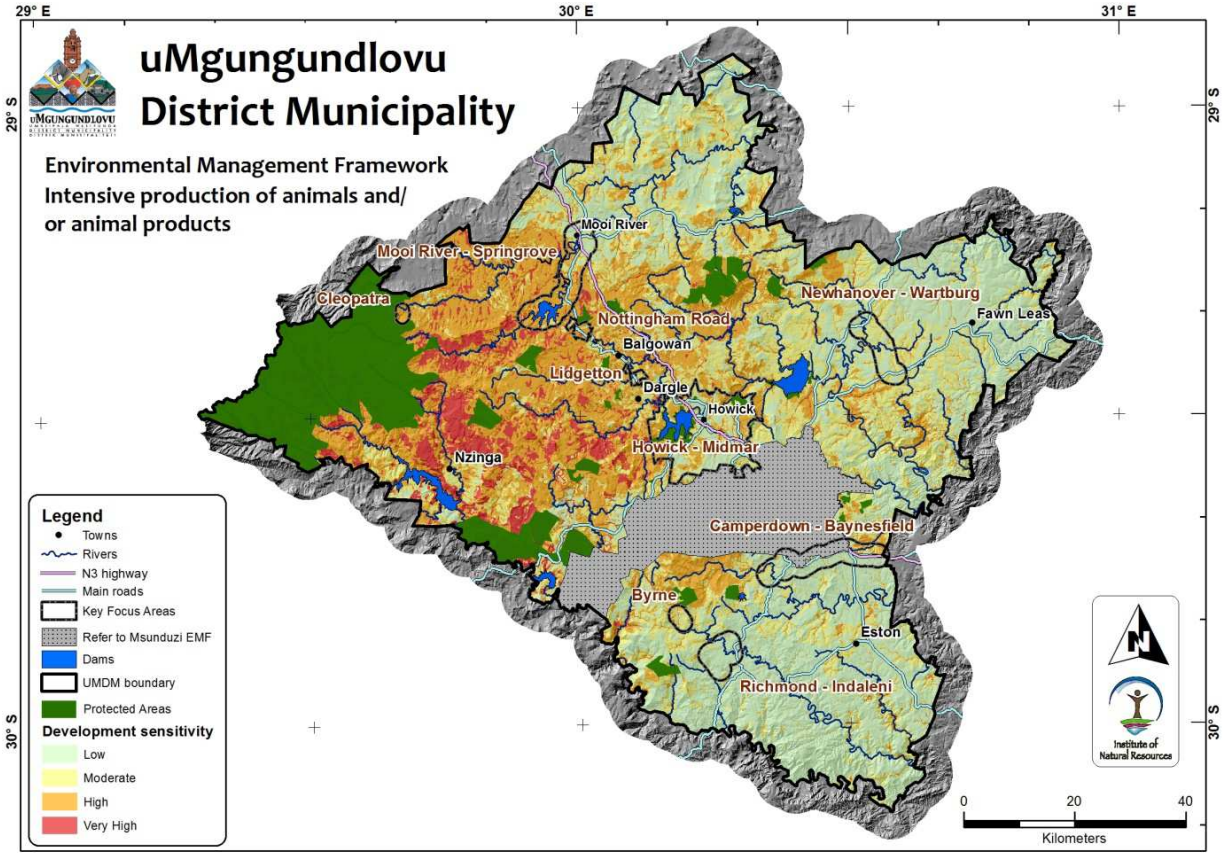
Constraint Ratings

Environmental Features	Components	AGRICULTURE
		4.INTENSIVE PRODUCTION
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	3
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	3
	Moderate potential (Category C)	2
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	4
	with high potential for elevated pollutant concentrations	4
	with low pollutant concentrations	4
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	3
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	2
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	Runoff/effluent is nutrient rich due to the concentration of animals and the associated faecal matter. Water for processing/cleaning/cooling processing plants also establishes a point source of water pollution of nutrient and bacterial contamination. Excessively high levels of bacterial contamination reduce dissolved oxygen to levels that result in the death of aquatic species
Recommendations	At least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible in the quinary catchments areas. Only activities which have a negligible impact on water quality should be permitted in these areas. In proximal catchment areas water treatment facilities must be designed to treat effluent to higher than the current standards if to achieve the desired improvement in water quality in the Mgeni catchment. Development applications should show that all options have been explored, including recycling, best available technology and biological treatment options e.g. use of the ameliorative services of wetlands
Wetlands	
Constraint	To maximise production, crops are often planted into wetland areas. This destroys the habitat and ability of these systems to provide important services like improvement of water quality (which is essential in this area).
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area.
Terrestrial Biodiversity	
Constraint	Transformation and disturbance of natural systems resulting in a loss of habitat. The impact is permanent so the constraint is high, and the higher the conservation value, the higher the impact. Disturbance also increases the opportunity for increased infestation of alien invasive plants. A further issue is the disturbance in the form of noise from such plants and movement of people and vehicles. Processing plants also require power, and powerlines present a threat to large bird species.
Recommendations	- No development within high value conservation areas. - Where development does proceed, the development plan needs to show how areas/features of biodiversity value have considered e.g. retention of natural areas/corridors through cropland. An EIA or Basic Assessment to be followed to establish impacts from the development and appropriate mitigation and offset measures should be implemented. - An alien invasive plant management plan must be a condition of planning approval. - In Ecological Support areas may be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas.
Flood Zone	
Constraint	While these areas are often fertile and close to water for irrigation, floodplains provide important ecological functions that are lost if converted to agriculture.
Recommendations	No infrastructural development is appropriate in this zone (1:100 year). Activities other than infrastructure may be considered subject to being assessed by the activity proponent as part of a development application and environmental authorisation process.

Spatial Overview of Constraints



5.4 Extensive Animal Production

The breeding and production of animals on extensive areas of natural veld at appropriate carrying capacities. Examples: sheep, cattle, and/or game farming.

Development Constraints and Guidelines

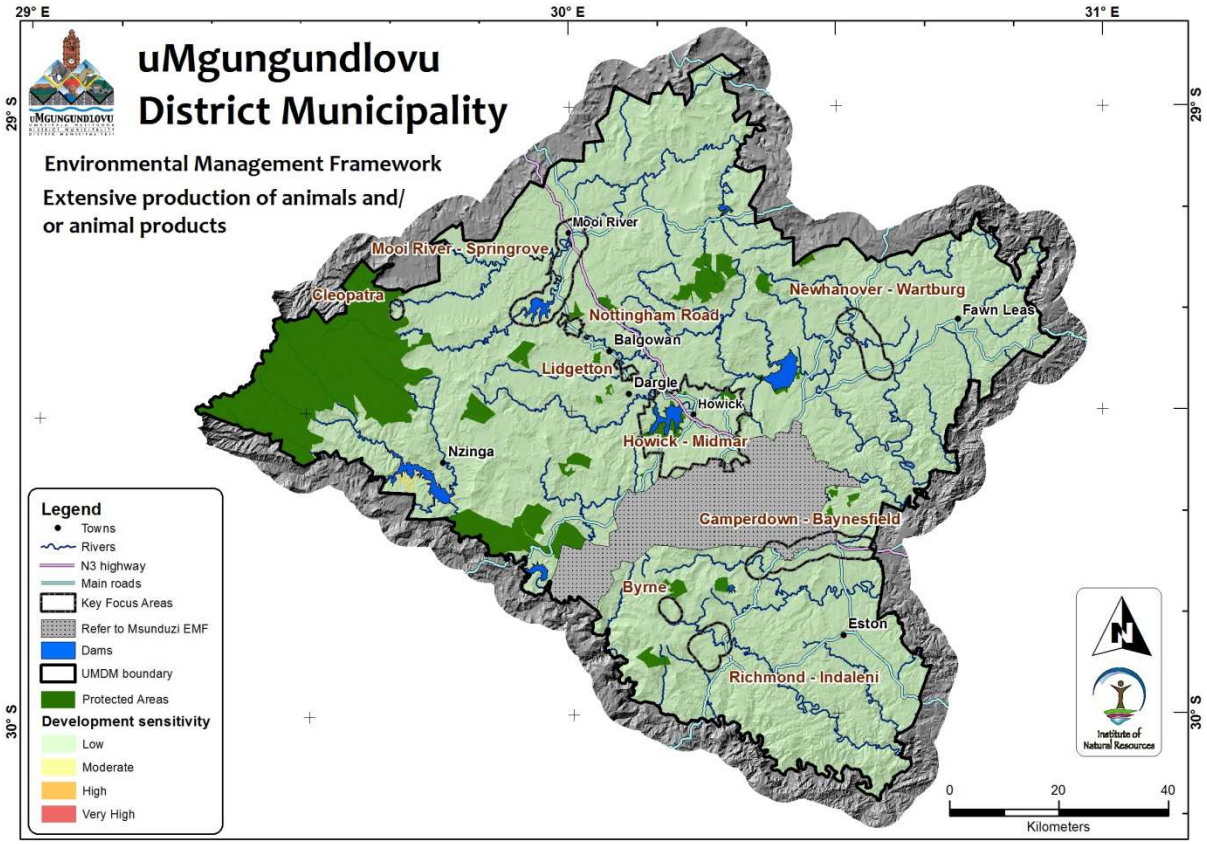
Grazing has relatively limited impacts on sensitive environments if managed correctly. The exception is wetlands and biodiversity, as animals create disturbance in these systems.

Environmental Features	Components	AGRICULTURE
		5.EXTENSIVE PRODUCTION
Wetlands	Wetland Footprint	3
	32m Buffer	2
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	1
	Low Service Provision	2
	Very Low/No Service Provision	2
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	1
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	1
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	2
	Ecological Support Area (ESA)/Environmental Management Zone	2
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Cattle walking through wetlands to access points to drink from leads to the trampling and of natural vegetation and compaction of sols. It also creates potential for erosion channels and 'head cuts which erode backwards altering natural flow patterns and a general degradation of wetland condition. The disturbance also results in increased infestation of alien invasive plant species.
Recommendations	Permissible on condition of a wetland/riparian rehabilitation and management plan is required as a condition of authorisation. The plan should account specifically for the management of cattle grazing and drinking patterns within wetlands.
Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas that present a constraint to this activity.
Recommendations	- Not permissible in protected areas where only low impact activities may be considered. - A grazing management plan may accompany a development and environmental authorisation processes.

Spatial Overview of Constraint



5.5 Agri-Industry

This zone accounts for the facilities used in secondary extraction or processing of raw agricultural products. Examples include saw mills, sugar mills, abattoirs, factories for the processing of dairy products, tanneries, charcoal making, composting.

Development Constraints and Guidelines

The constraint ratings highlight the high constraint imposed by a number of features including wetlands and terrestrial biodiversity on agri-industry, arising from the transformation of these systems if converted to agri-processing activities. In terms of inputs, several of these 'factories' also utilise high volumes of water in the processing process. In terms of outputs nutrient rich effluent is a common issue so they impact on water quality. They also generate a range of air pollution issues in the form of odour and smoke (particulate matter) which impact human health.

Constraint Ratings

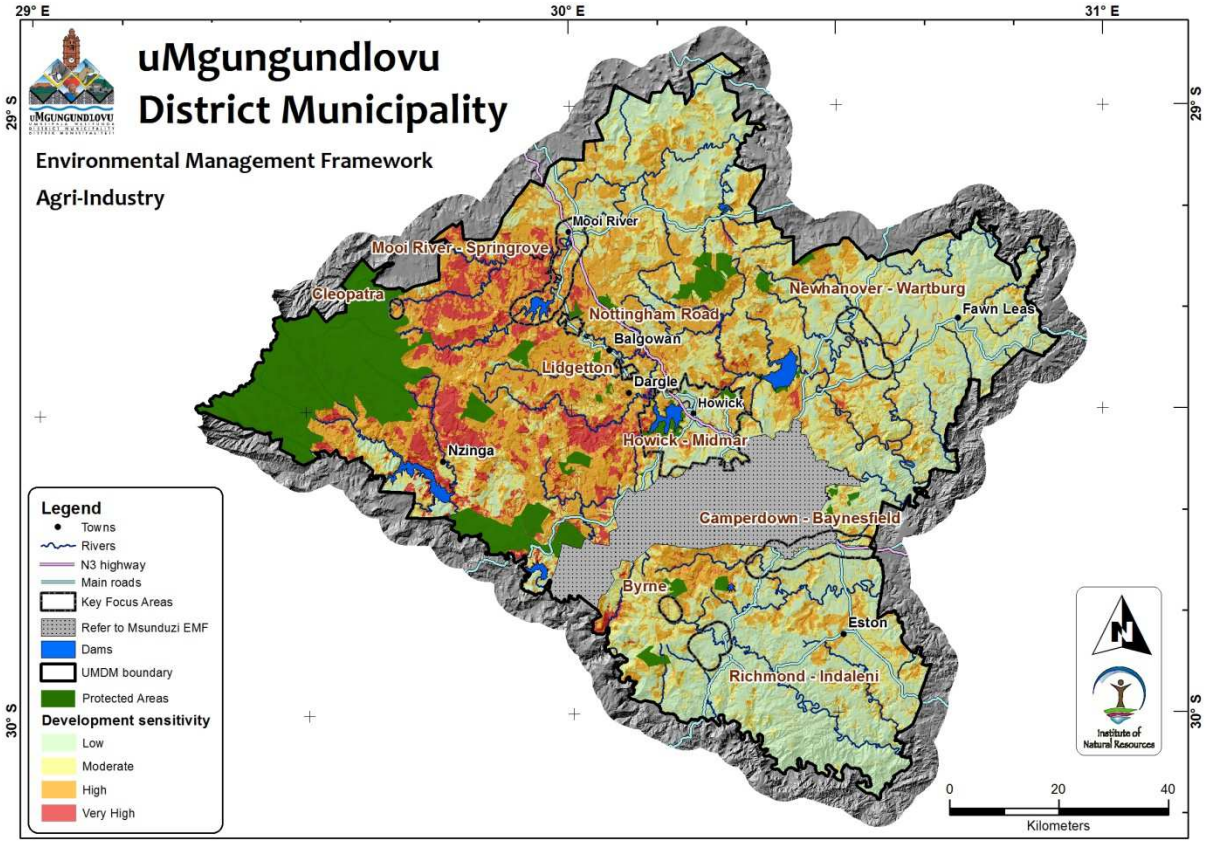
Environmental Features	Components	AGRICULTURE 3.AGRI-INDUSTRY
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	3
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	4
	with high potential for elevated pollutant concentrations	4
	with low pollutant concentrations	3
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Agriculture	
Constraint	Regarded as very high to high potential agricultural land that should be retained exclusively for agricultural use
Recommendations	- Preferably do not locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality. The transformation of the wetland catchment also impacts the hydrology of the system. Crop production will also result in run-off of pollutants into the wetland in the form of insecticides, fertilizer and sediment
Recommendations	Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. The primary impact is the conversion of large areas of natural vegetation to agricultural use. In addition to the direct loss of habitat, cropping introduces various forms of infrastructure in the form of roads, fences and other infrastructure. This infrastructure and cropping activities create disturbance and barriers to the movement of wildlife. The disturbance also creates opportunity for infestation by invasive alien plant species.
Recommendations	- This activity must be avoided in high sensitivity areas (protected areas, critical biodiversity areas). However, development applications need to confirm whether the area mapped as high value biodiversity warrants retention for other uses. - Where development does proceed, important to show how areas/features of biodiversity value have considered e.g. retention of natural areas/corridors through cropland. An EIA or Basic Assessment to be followed to establish impacts from the development and appropriate mitigation and offset measures should be implemented. - An alien invasive plant management plan must be a condition of planning approval. - In Ecological Support areas may be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas.
Flood Zone	
Constraint	High constraints apply to areas that are flood prone such as the 1:100 year flood zone. While these areas are often fertile and close to water for irrigation, floodplains provide important ecological functions that are lost if converted to other land uses. The risk of infrastructure damage is also high constraint in this zone.
Recommendations	Do not construct within areas prone to flooding including any ancillary infrastructure and particularly the effluent management plant. A detailed flood line delineation would be necessary.
Water Quality	
Constraint	Agri-Industry production provides a point source of nutrients due to effluent produced by processing of raw materials. Quinary and Proximal catchments are particular sensitive to this impact. This will add to the nutrient levels which have already exceeded thresholds across the entire study area.
Recommendations	In the quinary and proximal catchments, at least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. Only activities which have a negligible impact on water quality should be permitted in these in WQ areas. These are typically activities that:

	1. do not generate large volumes of waste (activities associated with low numbers of people) and no waste should be discharged in critical catchments (Any waste generated in these areas must be treated and discharged outside of WQ1 areas), 2. Any activity must at least abide by the requirements of any issued water use licence, environmental authorisation and the Resource Quality Objectives for the catchment.

Spatial Overview of Constraint



5.6 Forestry

Commercial timber production as authorised and licensed by DWS Examples: All commercial tree species i.e. pine, eucalyptus, wattle.

Development Constraints and Guidelines

The primary constraints relate to the impact of timber on natural systems based on the direct transformation of habitat. In the case of wetlands, the added impact is the alteration of hydrology that feeds wetlands and disturbance which reduces the quality of the remaining habitat.

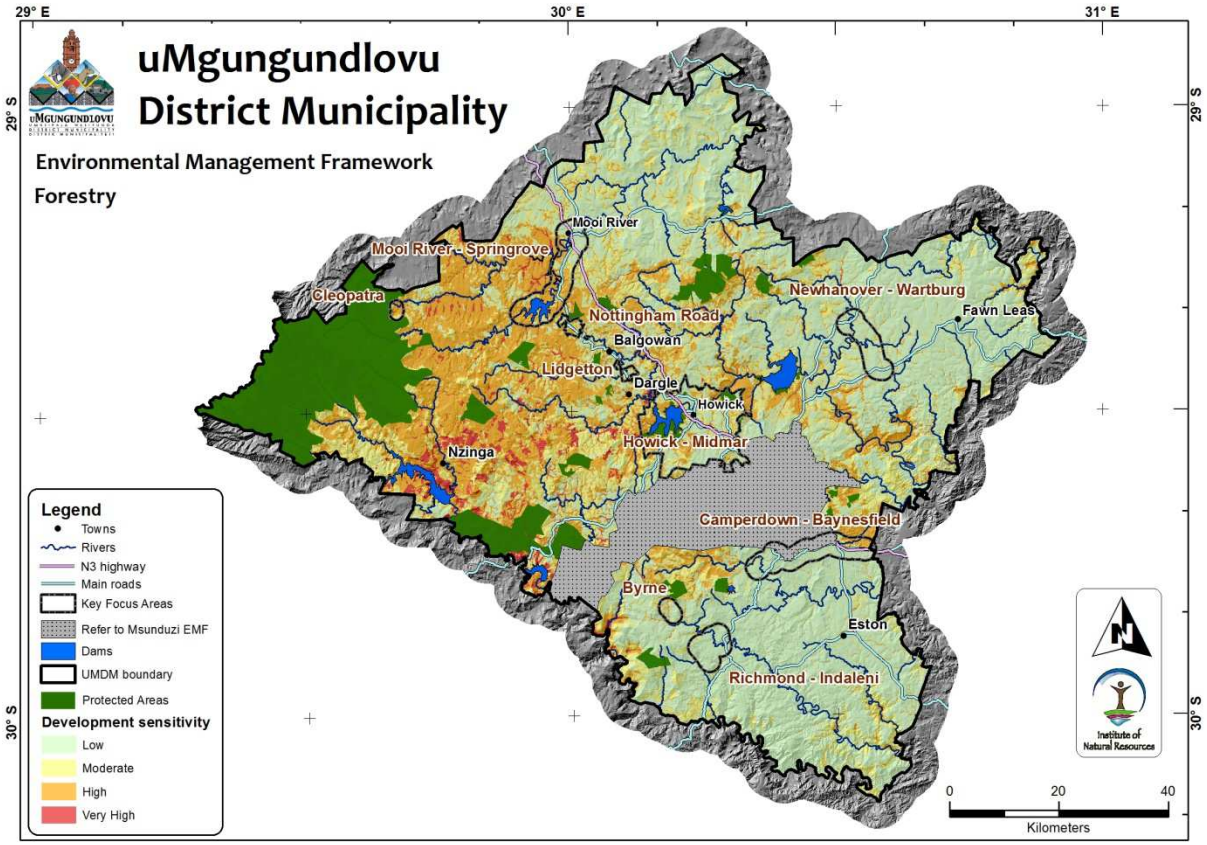
Constraint Ratings

Environmental Features	Components	AGRICULTURE 6.FORESTRY
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	3
	> 500m from a wetland	2
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	3
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	4
	High water yield	4
	Moderate water yield	3
	Low water yield	2

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The primary impact of forestry on wetlands is from the significant reduction in flow to the wetland system where large portions of a catchment are planted to pine, and particularly gum species. Secondary impacts are disturbance which results in increased infestations of alien invasive species and sedimentation when the trees are felled, and from roads running through plantations.
Recommendations	- Timber may only be planted outside of appropriate buffer zone to wetlands (as defined in forestry guidelines). - Any roads must go over and allow for flow through the systems and/or cross at the narrowest point possible. Following forestry best practice standards (See Forestry SA) - A wetland/riparian rehabilitation and management plan is required as a condition of authorisation. - An alien invasive management plan must be developed and implemented.
Terrestrial Biodiversity	
Constraint	Plantations are established in grassland. They consequently result in complete transformation of the natural habitat (the large proportion of grassland has been lost in the study area, and what remains is in poor condition). As for wetlands, the issues of disturbance and associated alien infestations also apply in the case of grasslands that do remain. The change from grass to trees negatively impacts all dependant species.
Recommendations	No plantation development within areas high conservation value. Exclude areas of moderate value biodiversity from planted areas and establish corridors between areas of grassland.
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	This activity will reduce streamflow in high yield sensitive areas. Therefore any such activity should be avoided in these areas. However, this activity may proceed on condition of detailed specialist investigations in support of an environmental authorisation process. Forestry is also a water-use as defined in section 21 of the National Water Act, and a water-use license is therefore required. This will require the necessary specialist studies to assess the impact of the development on the water resource. The department of water and Sanitation have provided guidance as to the scope of such specialist studies (see Volume II), but such studies generally require but are not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment.
Infrastructure Service Provision	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources.
Water Quality	
Constraint	Forest harvesting can lead to higher levels of sediment in nearby waterbodies. Removal of vegetation can leave the land exposed to erosion by wind or water.
Recommendations	In the quinnary and proximal catchments, at least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. These impacts on water quality can be mitigated through the establishment of effective buffers to rivers and wetlands, appropriate management of chemicals and pesticides as per forestry best practice guidelines.

Spatial Overview of Constraint


uMgungundlovu
District Municipality
Environmental Management Framework
Forestry
29° E
30° E
31° E
29° S
30° S
Mooi River
Mooi River - Springrove
Cleopatra
Newhanover - Wartburg
Fawn Leas
Nottingham Road
Balgowan
Lidgetton
Dargle
Howick
Howick - Midmar
Nzinga
Camperdown - Baynesfield
Byrne
Eston
Richmond - Indaleni
Legend
Towns
Rivers
N3 highway
Main roads
Key Focus Areas
Refer to Msunduzi EMF
Dams
UMDM boundary
Protected Areas
Development sensitivity
Low
Moderate
High
Very High
Institute of Natural Resources
0
20
40
Kilometers

6. CIVIC AND SOCIAL

6.1 Municipal and Government Services

This category is intended for buildings erected and used for civic and social purposes such as administration services, health and welfare, accommodation of the aged, places of safety, and education.

Development Constraints and Guidelines

Being an urban land use the main impacts relate to the permanent transformation of wetlands and riparian areas, high value agricultural and conservation land. There is also a need to locate this development away from flood risk areas. Areas of existing low infrastructure services also present a constraint.

Constraint Ratings

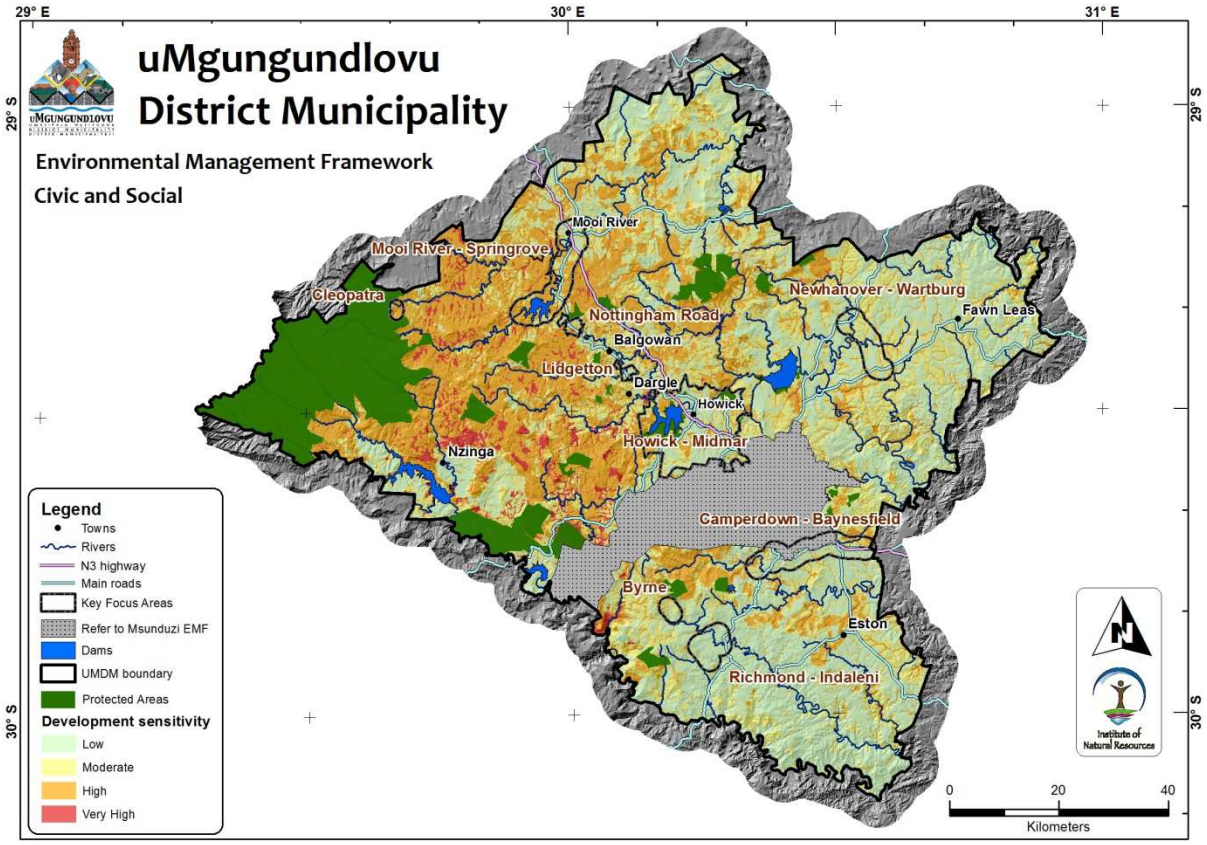
Environmental Features	Components	CIVIC AND SOCIAL 9. CIVIC AND SOCIAL
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	2
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	3
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	2
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion
Recommendations	- No development may take place within a wetland or its buffer. - Wetland and buffer delineation must be a requirement of the development application - Wetland rehabilitation and management plan should be a condition of authorisation. - Any roads must go over and allow for flow through the systems and/or cross at the narrowest point possible.
Terrestrial Biodiversity	
Constraint	The development of hard infrastructure results in the total and permanent transformation of natural habitat. The higher the conservation values of the habitat, the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site. Poorly managed solid waste results in pollution and a health risk to animals and people. It also reduces the aesthetic value such areas.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - A solid waste management plan based on recycling must be a requirement of the development plan and application.
Infrastructure Service Provision	
Constraint	The development of civic and social areas makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Infrastructure services to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sanitation recommendations apply as per Water Quality above. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Flood Risk	
Constraint	The use of such infrastructure and facilities by many people makes it inappropriate to establish such facilities in the flood risk zones of the 1:100 year flood zones. Locating infrastructure in such areas also exposes the infrastructure to risk of damage.
Recommendations	Locate such development outside of flood zones. Should the developer wish to proceed in development plans, a 1:100 year flood zone presents lower risk than other flood zone areas but should only be pursued after a detailed flood line assessment by a hydrologist and with a municipal engineer approved consents and permissions.
Agriculture	
Constraint	Such infrastructure results in the permanent transformation of arable/productive land, thereby

	making it a constraint where it is proposed on productive land. The higher the productive capacity of the land, the higher the constraint. Land use restricted to those that support primary agricultural production only.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).

Spatial Overview of Constraint



6.2 Cemetery

This zone is intended for public and private cemeteries, memorial parks, and funeral chapels.

Development Constraints and Guidelines

The primary issues associated with this land use are the transformation of wetlands and terrestrial biodiversity. Because these facilities are used by people there is also a need to locate this development away from point sources of air pollution and the lower lying areas where these impacts accumulate. Steep slopes, flood areas and unstable geology also present high level constraints.

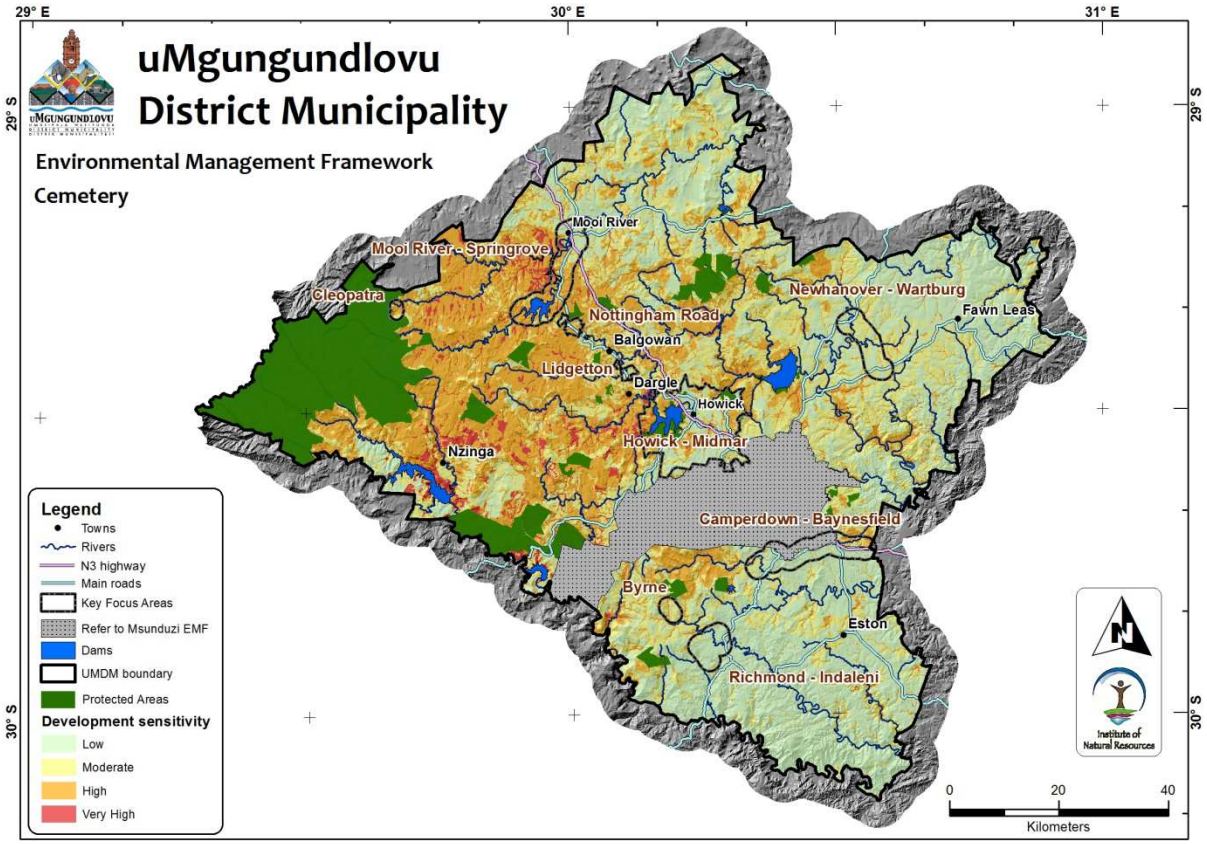
Constraint Ratings

Environmental Features	Components	CIVIC AND SOCIAL 8. CEMETERY
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	2
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Cemeteries would require the disturbance through actual grave sites and the associated gardens that would alter the natural state of wetlands. The greater impact is of the wetlands on this land use as it is inappropriate to locate graves in water logged conditions.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	Cemeteries would require the clearing of the majority of existing natural vegetation and alteration to gardens, with elements of hard infrastructure such as roads and ablution facilities and also small chapels. While not permanent, such transformation is unsuitable in areas of high conservation value. The higher the conservation values of the habitat, the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements.
Agriculture	
Constraint	The change in zoning and use will take this land out of circulation for agricultural production, thereby making it a constraint where it is proposed on productive land. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Risk	
Constraint	Bodies should not be buried in areas where there is a high risk of flood. Neither should they be located within low lying flood prone areas where there is the risk that floods will expose grave sites in wash away situations.
Recommendations	Do not locate cemeteries within flood zones (1:100yr flood zone).

Spatial Overview of Constraint



7. MIXED USE

7.1 Medium Impact Mixed Use

This category includes conventional urban activities such as, retail, offices, and commercial workshops, places of public amusement, restaurants, and warehouses. It also includes fuel filling stations. This use demands the full range of ancillary infrastructure including roads and storm water, telecommunications, power, etc. Small-scale mixed use is considered to be in the region of up to 1 hectare in extent, or a single property development.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on the loss of wetland and natural habitat (terrestrial biodiversity) and productive agricultural land. As these land uses involve people using them on a frequent basis, it is preferable that they are located away from flood risk areas. Development options must carefully consider the constraints imposed by lack of adequate infrastructure services.

Constraint Ratings

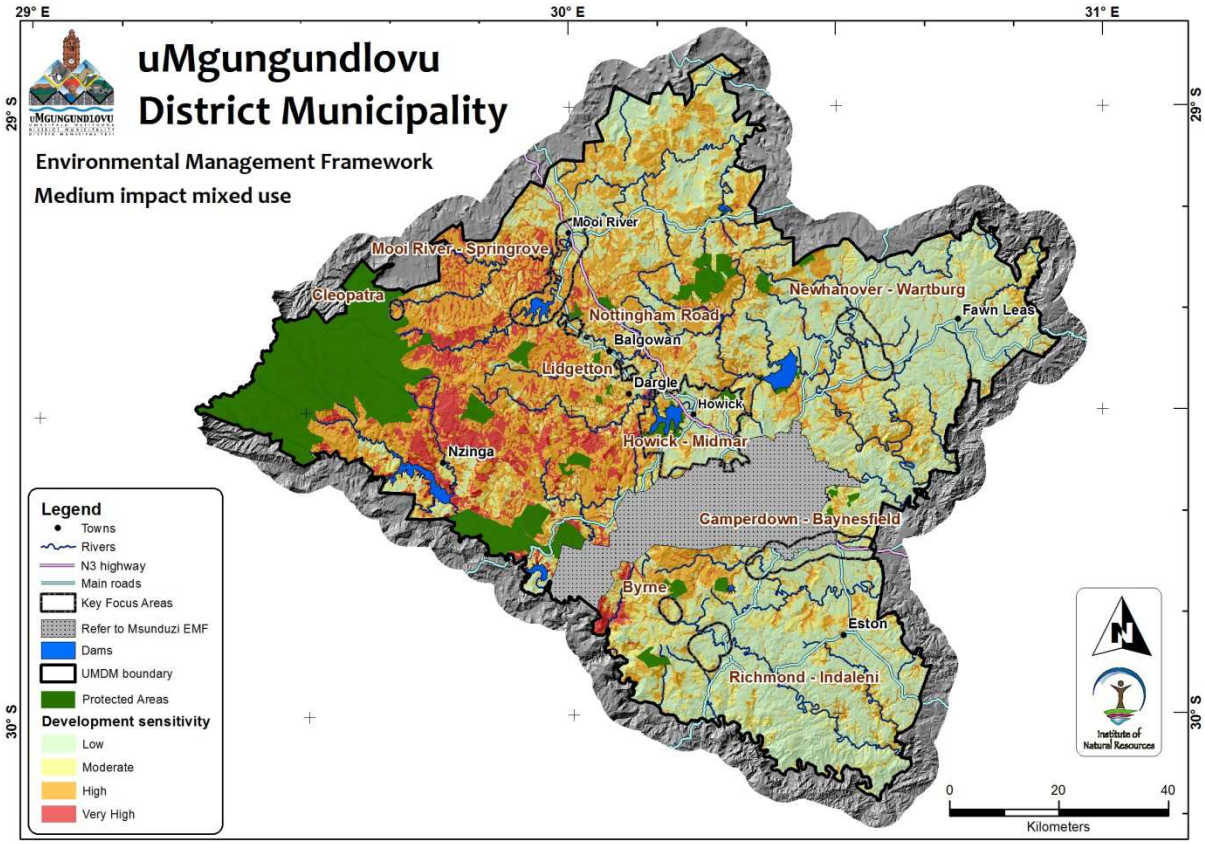
Environmental Features	Components	MIXED USE 10. MEDIUM IMPACT MIXED USE
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	2
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- No development may take place within a wetland or its buffer. Wetland and buffer delineation must be a requirement of the development application. - Wetland rehabilitation and management plan should be a condition of authorisation. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Agriculture	
Constraint	This land use will permanently transform productive land and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Terrestrial Biodiversity	
Constraint	This land use will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site. Poorly managed solid waste result sin pollution and a health risk to people and animals.
Recommendations	- No development should take place within areas of high biodiversity conservation value. In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - A solid waste management plan based on recycling should be included in the application.
Infrastructure Service Provision	
Constraint	All mixed use in medium to high impact scales, make it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Services to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality).

	- Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the flooding risks. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical investigation. - Do not construct within areas prone to flooding 1:100 year flood zone.

Spatial Overview of Constraint



7.2 Intensive Mixed Use

This category includes the same activities and ancillary infrastructure as for small and medium scale mixed use. Large scale differs in terms of the area to be impacted which is considered to be in excess of 1 hectare and requiring several properties. It is a zone that is intended to provide for the use of retail, entertainment, offices, residential, public facilities and related commercial uses at high intensities that comprise a Town Centre.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on water quality, the loss of wetland and natural habitat (terrestrial biodiversity) and productive agricultural land. As these land uses involve people using them on a frequent basis, it is preferable that they are located away from flood risk areas. Development options must carefully consider the constraints imposed by lack of adequate infrastructure services.

Constraints Ratings

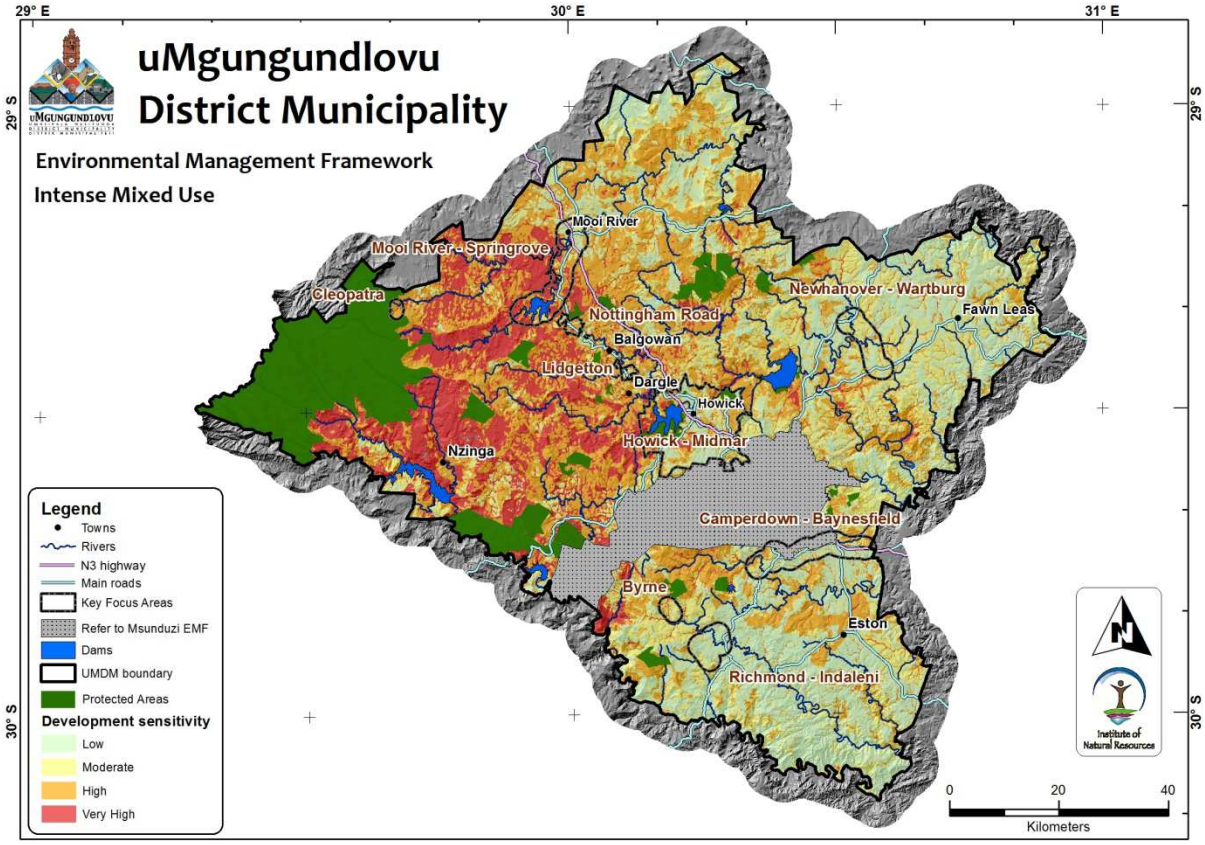
Environmental Features	Components	MIXED USE 9. Intense Mixed Use
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	3
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	Infrastructure and facilities such as these will involve relatively large numbers of people using them on a daily basis, generating sewage as well as a range of other effluent and adding to the cumulative impact in a catchment where levels exceed standards and may impact both human users and aquatic biota. Hardened surfaces also increase the frequency of runoff with the potential to erode river banks and instream habitat. Riparian areas form part of the river habitat and are often cleared to increase development area or for associated landscaping.
Recommendations	- The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable Urban Storm water Design principles must be applied in designing the system. - Riparian areas need to be protected (see below).
Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- No development may take place within a wetland or its buffer. Wetland and buffer delineation must be a requirement of the development application. - Wetland rehabilitation and management plan should be a condition of authorisation. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Terrestrial Biodiversity	
Constraint	This land use will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site. Poorly managed solid waste result sin pollution and a health risk to people and animals.
Recommendations	- No development should take place within areas of high biodiversity conservation value. In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - A solid waste management plan based on recycling should be included in the application.
Infrastructure Service Provision	
Constraint	All mixed use in medium to high impact scales, make it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Services to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the

	volumes and intensity of water runoff from the development area.
Agriculture	
Constraint	This land use will permanently transform productive land and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the flooding risks. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical investigation. - Do not construct within areas prone to flooding 1:100 year flood zone.

Spatial Overview of Constraints



8. RESIDENTIAL

Residential development takes place at varying densities and scales. All categories described below require ancillary infrastructure associated with the range of basic services including roads, telecommunications, power, water and sanitation.

8.1 Residential Detached Dwelling

This zone is intended to promote the development of primarily detached dwelling units in small to large planning development scales. It does permit multifamily dwellings, and where a limited number of compatible ancillary uses which have a non-disruptive impact on a neighbourhood amenity may be allowed.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on water quality, the loss of wetland and natural habitat (terrestrial biodiversity) and productive agricultural land. As these land uses involve people using them on a frequent basis, it is preferable that they are located away from flood risk areas. Development options must carefully consider the constraints imposed by lack of adequate infrastructure services.

Constraints Ratings

Environmental Features	Components	RESIDENTIAL 11.RESIDENTIAL ONLY DETACHED
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

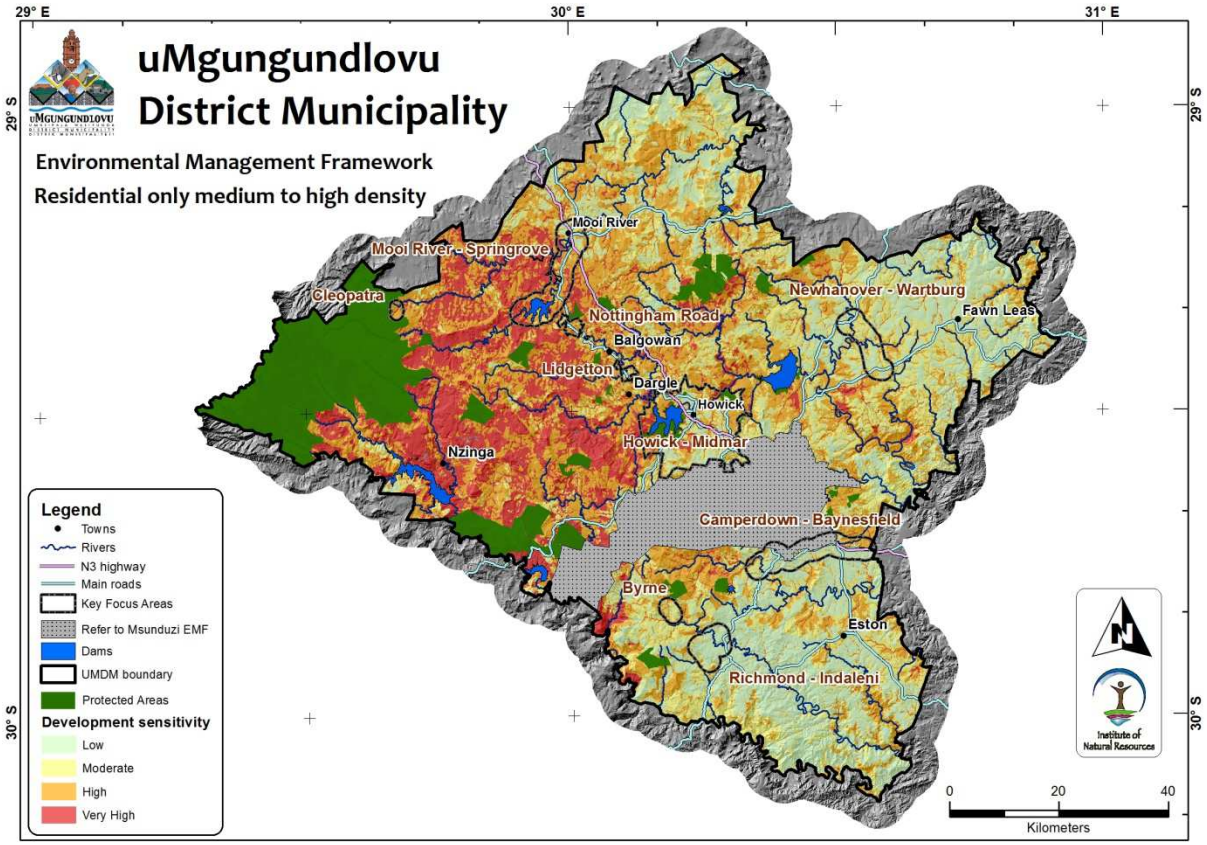
Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	All residential development involves the production of sewage, hereby adding to the cumulative impact in a catchment where levels exceed standards and are a significant sustainability issue. Poor water quality impacts both human users (recreational and domestic) and aquatic biota. Residential land use also increases the volumes and intensity of runoff which has the potential to erode river banks and instream habitat.
Recommendations	In areas of important water resources such quinary and proximal catchment areas, there should not be no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. Only activities which have a negligible impact on water quality should be permitted in these areas. These are typically activities that: 1. do not generate large volumes of waste (activities associated with low numbers of people) and no waste should be discharged in critical catchments (Any waste generated in these areas must be treated and discharged outside of quinary areas), 2. activities that do not carry a significant spill pollution risk (avoid fuel and hazardous substance storage and manufacture) and 3. Activities with limited landscape disturbance (where sediment generation can be meaningfully controlled). 4. Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment. For other less sensitive catchment areas, the development application must show that the following recommendations have been considered in the case of infrastructure for the containment and treatment of sewage: - The quality of the effluent released to the surface water systems (rivers) from Waste Water Treatment Works (WWTW) exceeds standards to assist in working towards a state of improved water quality. - Contamination of groundwater is avoided. Pit latrines and VIPs are not recommended due to the impact on groundwater – particularly in the case of high density, large scale low cost housing. Alternative technologies should be investigated such as Urine Diversion Dehydration (UDD) toilets as those utilised in eThekwini. - Conservancy tanks are used rather than septic tanks are used in the case of isolated dwellings with regular removal and treatment at a WWTW. - The location of all sewage containment and treatment facilities is informed by a detailed geohydrological investigation and layout indicating the location of facilities in relation to natural water resources. - Protection/maintenance of wetlands and riparian areas to buffer water quality issues (see below).
Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands and riparian vegetation destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist

	wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	This land use will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site. Solid waste also reduces the condition of land and natural resources, particularly in isolated areas where there are no collection facilities.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - Applications should include a solid waste management plan that is focussed on recycling. The practice of 'bury and burn' is not acceptable.
Infrastructure	
Constraint	The infrastructure needs for all residential development make it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Infrastructure to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sanitation recommendations apply as per Water Quality above. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Agriculture	
Constraint	This land use will permanently transform productive land and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Zones	
Constraint	Locating infrastructure and residential units in such areas therefore also exposes the infrastructure to risk of damage and loss of lives.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical and flood line investigation. - Do not construct within areas prone to flooding (1:100yr flood zone).

	- No development should occur on slopes steeper than 1:3.

Spatial Overview of Constraint



8.2 Residential Only

A zone that is intended to promote the development of attached and detached dwelling units as part of a larger planned residential development. This zone includes multiunit residential units for a wide range of residential accommodation at a high density. This includes a mix of low impact land use activities to cater for broader community needs.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on water quality, water yield, the loss of wetland and natural habitat (terrestrial biodiversity) and productive agricultural land. As these land uses involve people using them on a frequent basis, it is preferable that they are located away from flood risk areas. Development options must carefully consider the constraints imposed by lack of adequate infrastructure services.

Constraints Ratings

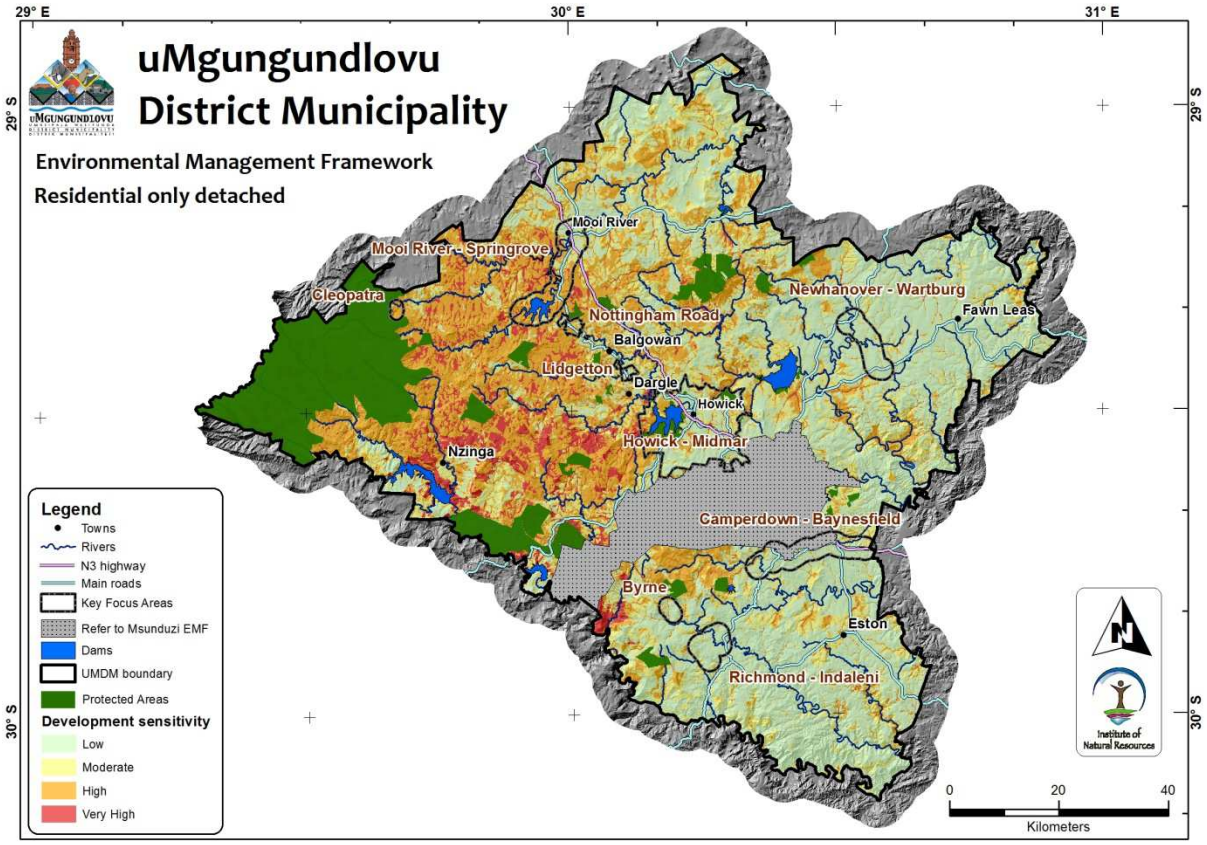
Environmental Features	Components	RESIDENTIAL 12. RESIDENTIAL ONLY
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	2
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	4
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	All residential development involves the production of sewage, hereby adding to the cumulative impact in a catchment where levels exceed standards and are a significant sustainability issue. Poor water quality impacts both human users (recreational and domestic) and aquatic biota. Residential land use also increases the volumes and intensity of runoff which has the potential to erode river banks and instream habitat.
Recommendations	In areas of important water resources such quinary and proximal catchment areas, there should not be no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Therefore, no high density residential developments are permitted in important water quality areas. Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment. For other less sensitive catchment areas, the development application must show that the following recommendations have been considered in the case of infrastructure for the containment and treatment of sewage: - The quality of the effluent released to the surface water systems (rivers) from Waste Water Treatment Works (WWTW) exceeds standards to assist in working towards a state of improved water quality. - Contamination of groundwater is avoided. Pit latrines and VIPs are not recommended due to the impact on groundwater – particularly in the case of high density, large scale low cost housing. Alternative technologies should be investigated such as Urine Diversion Dehydration (UDD) toilets as those utilised in eThekwini. - Conservancy tanks are used rather than septic tanks are used in the case of isolated dwellings with regular removal and treatment at a WWTW. - The location of all sewage containment and treatment facilities is informed by a detailed geohydrological investigation and layout indicating the location of facilities in relation to natural water resources. - Protection/maintenance of wetlands and riparian areas to buffer water quality issues (see below).
Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands and riparian vegetation destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	This land use will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site. Solid waste also reduces the condition of land and natural resources, particularly in isolated areas where there are no collection facilities.
Recommendations	- No development should take place within areas of high biodiversity conservation value.

	- In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - Applications should include a solid waste management plan that is focussed on recycling. The practice of 'bury and burn' is not acceptable.
Infrastructure	
Constraint	The infrastructure needs for all residential development make it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Infrastructure to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sanitation recommendations apply as per Water Quality above. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Agriculture	
Constraint	This land use will permanently transform productive land and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Zones	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome risk of flooding. Locating infrastructure and residential units in such areas therefore also exposes the infrastructure to risk of damage and loss of lives.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical and flood line investigation. - Do not construct within areas prone to flooding (1:100yr flood zone). - No development should occur on slopes steeper than 1:3.

Spatial Overview of Constraint



8.3 Small Holdings

A zone that is intended to contain small holdings and that sets aside land for both low density housing and related urban scale agriculture.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on the loss of wetland, natural habitat (terrestrial biodiversity) and productive agricultural land. As these land uses involve people using them on a frequent basis, it is preferable that they are located away from flood risk areas. Development options must carefully consider the constraints imposed by lack of adequate infrastructure services.

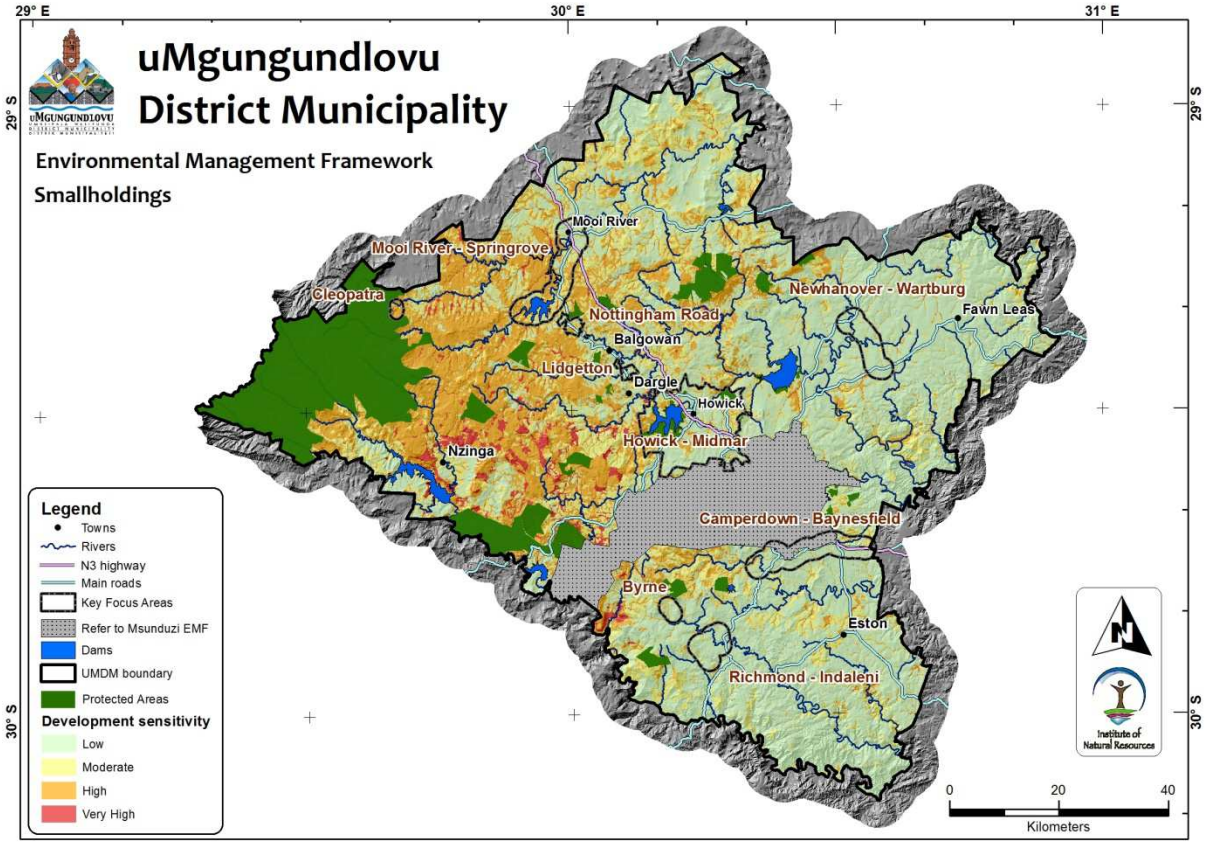
Constraint Ratings

Environmental Features	Components	RESIDENTIAL
		13.SMALLHOLDINGS
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	3
	Moderate potential (Category C)	3
	Restricted potential (Category D)	2
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	2
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	2
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	2
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands and riparian vegetation destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	This land use will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site. Solid waste also reduces the condition of land and natural resources, particularly in isolated areas where there are no collection facilities.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - Applications should include a solid waste management plan that is focussed on recycling. The practice of 'bury and burn' is not acceptable.
Flood Zones	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome risk of flooding. Locating infrastructure and residential units in such areas therefore also exposes the infrastructure to risk of damage and loss of lives.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical and flood line investigation. - Do not construct within areas prone to flooding (1:100yr flood zone). - No development should occur on slopes steeper than 1:3.

Spatial Overview of Constraints



9. TOURISM

9.1 Large-scale Multifaceted Tourism

This category includes large tourism developments with extensive infrastructure and associated activities. Examples include large hotels and conference centers with various sporting and recreational facilities such as golf courses, arenas, and for this category tourism is the primary economic activity.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on water quality, the loss of wetland and natural habitat (terrestrial biodiversity), and productive agricultural land. It is also important that such land use is located away from areas prone to flooding. Large multifaceted developments will have a larger footprint than a small tourism lodge and so the scale of the impact will be larger. However, because the significance of the impact relates to the cumulative impact, and in the case of habitat, water quality and agricultural land thresholds have already been exceeded, the constraints remains high even for small scale ecotourism developments. Poor infrastructure service provision will be a specific constraint to medium and large scale tourism development.

Constraint Ratings

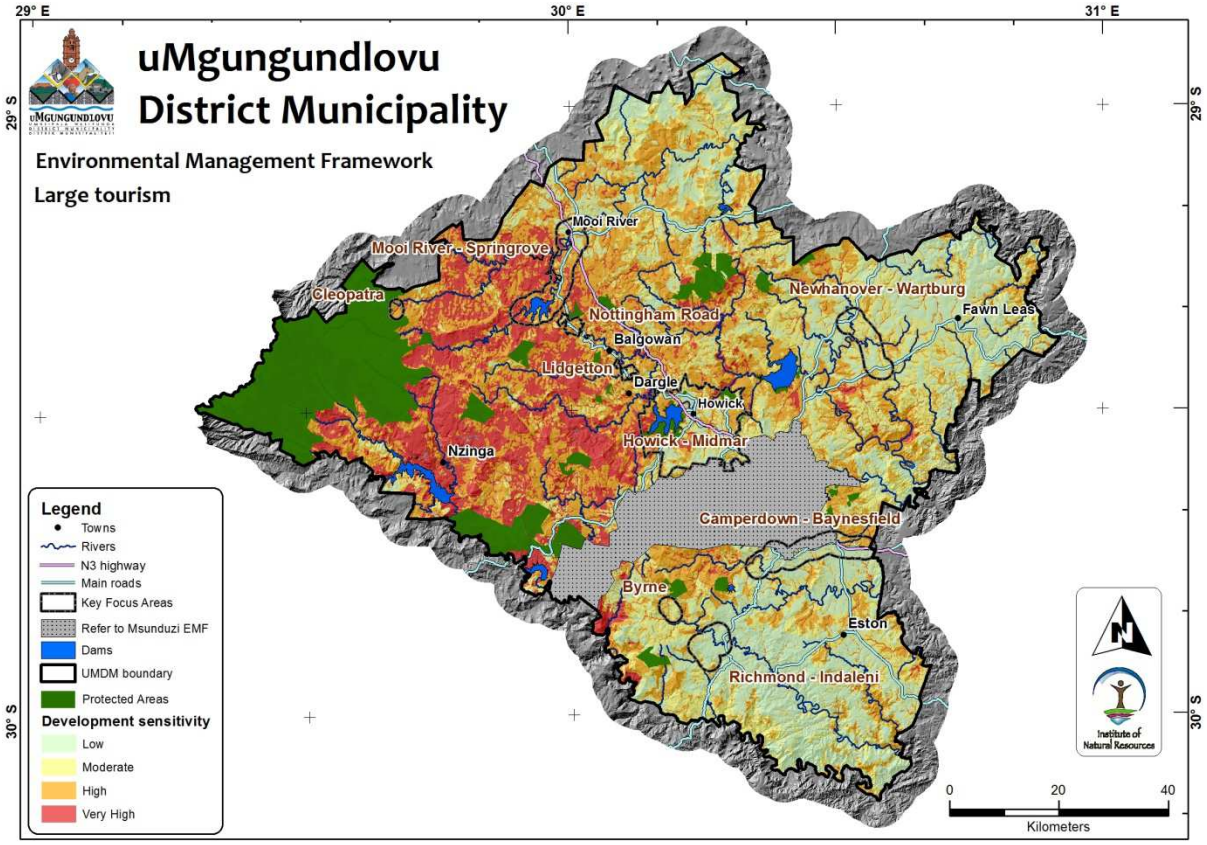
Environmental Features	Components	RESIDENTIAL TOURIST RELATED 16.Large Tourism
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	2
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	4
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	All tourism development involves the production of sewage and other water pollutants, hereby adding to the cumulative impact in a catchment where levels exceed standards and are significant sustainability issue.
Recommendations	- At least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. Only activities which have a negligible impact on water quality should be permitted in quinary areas. These are typically activities that: - 1. do not generate large volumes of waste (activities associated with low numbers of people) and no waste should be discharged in critical catchments (Any waste generated in these areas must be treated and discharged outside of WQ1 areas), - 2. Activities with limited landscape disturbance (where sediment generation can be meaningfully controlled). Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment. In all other catchment areas, the development application must show that the following recommendations have been considered in the case of infrastructure for the containment and treatment of sewage: - The quality of the effluent released to the surface water systems (rivers) from Waste Water Treatment Works (WWTW), exceeds standards to assist in working towards a state of improved water quality. - In the case of large scale multifaceted activities that require a WWTW, recycling of water for use in irrigation of gardens, golf courses and other playing areas should be a requirement. This reduces the demand on water resources and improves the quality of effluent released to the environment. - Contamination of groundwater must be avoided. Pit latrines and VIPs are therefore not recommended. Conservancy tanks rather than septic tanks are therefore recommended in the case of small scale rural based developments that cannot link into a reticulated system, and for which an independent WWTW is not warranted. - The location of all sewage containment and treatment facilities is informed by a detailed geohydrological investigation and layout indicating the location of facilities in relation to natural water resources.
Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	The infrastructure associated with tourism will permanently transform natural habitat resulting in a

	loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - Applications should include a solid waste management plan that is focussed on recycling. The practice of 'burn and bury' is not acceptable.
Infrastructure Services	
Constraint	The development of medium to large scale tourism makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Infrastructure services to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sanitation recommendations apply as per Water Quality above. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Agriculture	
Constraint	Tourism infrastructure will permanently transform productive land, particularly if rezoned and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the unstable geological conditions found in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical investigation. - Do not construct within areas prone to flooding (1:100 year flood zone).

Spatial Overview of Constraints



9.2 Medium Scale Tourism

This category includes the full range of rural based tourism land uses and aims to enhance the existing rural tourism character such as that found in the uMDM. Examples include campsites, B&Bs, small hotels and lodges. Tourism activity is in keeping with rural landscape, agriculture and natural environment. Tourism infrastructure is utilized on a temporary basis.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on the loss of wetland and natural habitat (terrestrial biodiversity), and productive agricultural land. It is also important that such land use is located away from areas prone to flooding. Poor infrastructure service provision will be a specific constraint to medium scale tourism development.

Constraint Ratings

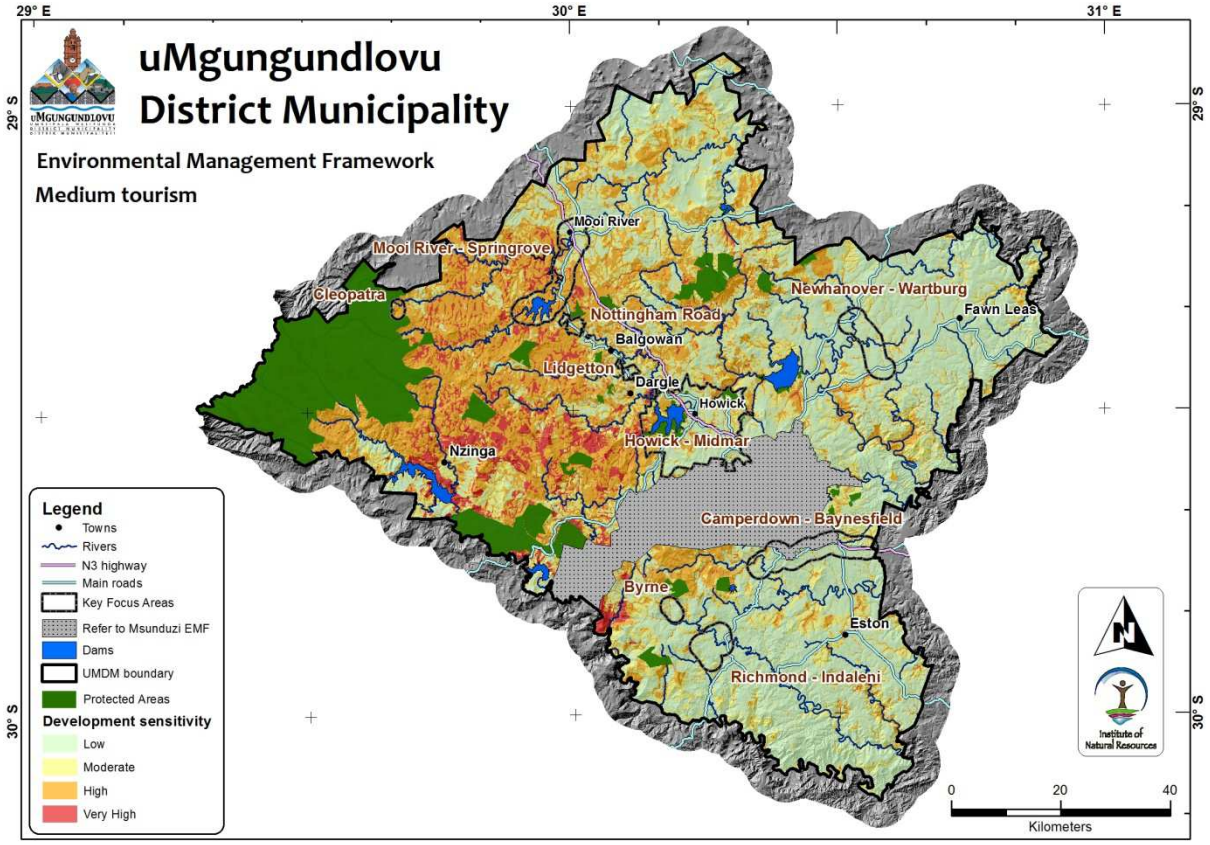
Environmental Features	Components	RESIDENTIAL TOURIST RELATED 15.Medium Tourism
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	2
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	2
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	The infrastructure associated with tourism will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - Applications should include a solid waste management plan that is focussed on recycling. The practice of 'burn and bury' is not acceptable.
Infrastructure Services	
Constraint	The development of medium to large scale tourism makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Infrastructure services to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sanitation recommendations apply as per Water Quality above. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Agriculture	

Constraint	Tourism infrastructure will permanently transform productive land, particularly if rezoned and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the unstable geological conditions found in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical investigation. - Do not construct within areas prone to flooding (1:100 year flood zone).

Spatial Overview of Constraints



9.3 Small Scale – Eco sensitive Tourism

Tourism developments located in or linked to sensitive or unique rural environments. Tourism developments in this category have a focus on the natural, cultural and agricultural resources. Development is designed and managed in support of, or in keeping with existing land use. Applications involving large scale land transformation and intrusive infrastructure and activities are not included in this category.

Development Constraints and Guidelines

As illustrated in the table below, the issues of concern relate to the impact on water quality, the loss of wetland and natural habitat (terrestrial biodiversity), and productive agricultural land. It is also important that such land use is located away from areas prone to flooding.

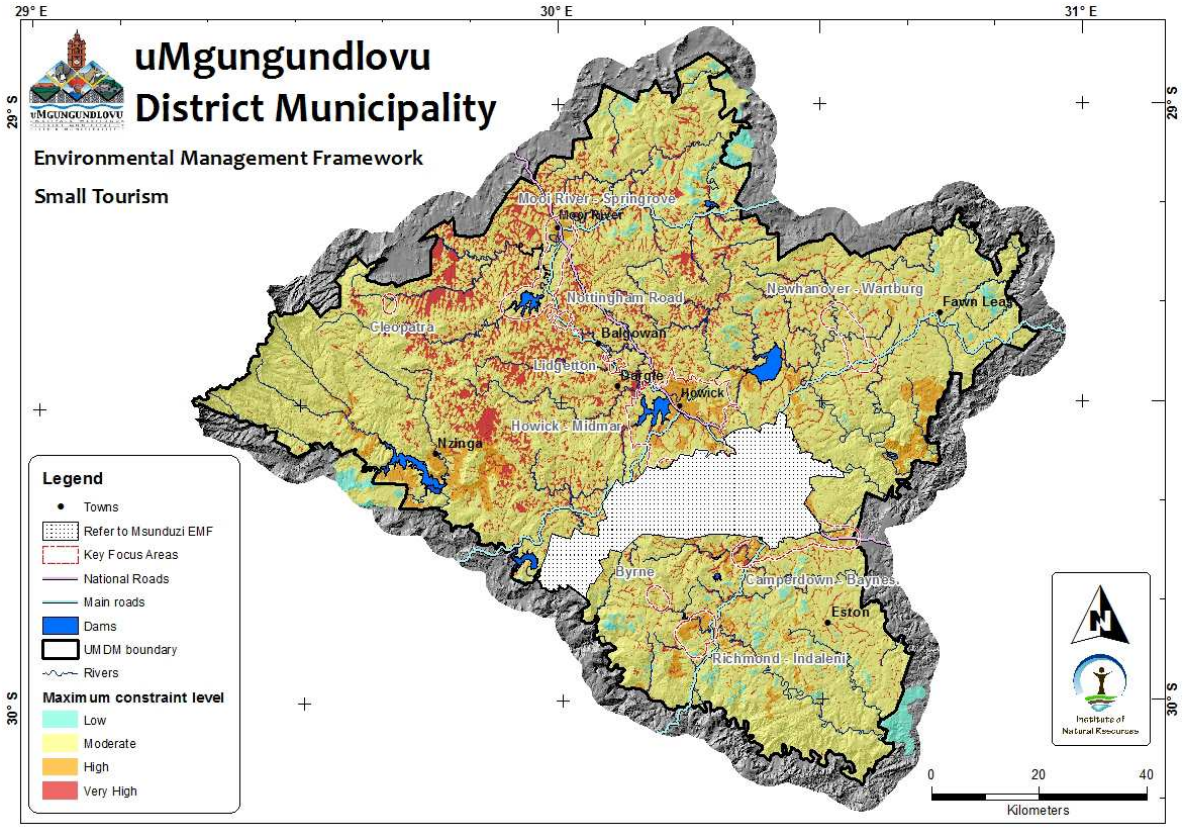
Constraint Ratings

Environmental Features	Components	RESIDENTIAL TOURIST RELATED 14.Small Tourism
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	1
	Low Service Provision	2
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	2
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	2
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	2
	Ecological Support Area (ESA)/Environmental Management Zone	2
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the unstable geological conditions found in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical and hydrological investigation. - Do not construct within areas prone to flooding (1:100 year flood zone).

Spatial Overview of Constraints



10. INFRASTRUCTURE AND SERVICES

This section covers the range of infrastructure and facilities required to deliver essential and basic services such as access (rail, roads and airstrips), solid waste , sanitation and bulk infrastructure and bulk linear infrastructure (power lines, pipelines, WWTW etc.). The nature of the impacts on sensitive features and systems varies between the development categories within this group and individual maps and constraint ratings, guidelines and maps are provided for each.

10.1 Airstrips

This category makes provision for aircraft landing and takeoff, usually equipped with hangars, facilities for refueling and repair. Given the proximity of regional and international airports applications in this area are likely to be for small tourism or agricultural (crop sprayers) related use on an intermittent basis by small aircraft.

Development Constraints and Guidelines

The constraint ratings show the need to avoid the loss of wetlands, areas of high conservation value and areas with high production potential due to the footprint associated with developing an airstrip. It is also recommended that airports are located away from existing sites of social sensitivity due to noise impacts.

Constraints Ratings

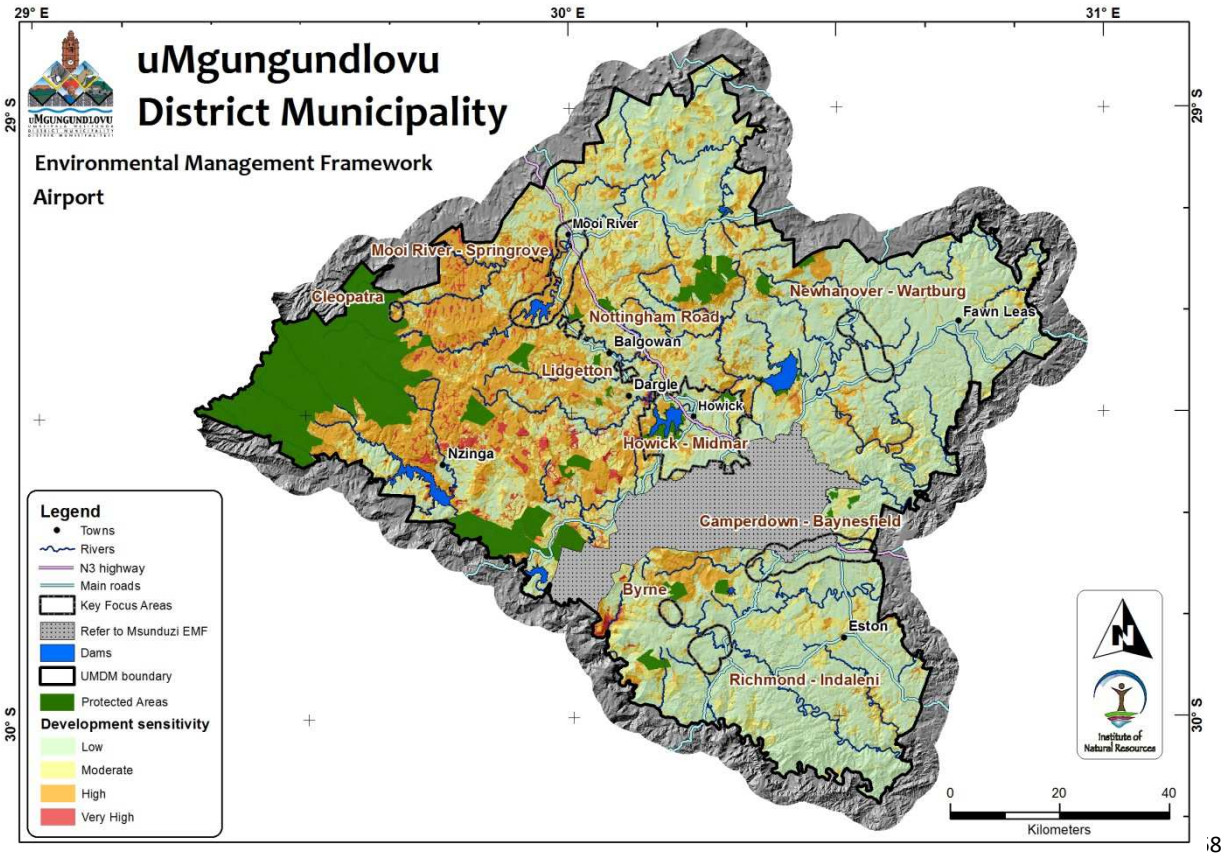
Environmental Features	Components	INFRASTRUCTURE AND SERVICES 17.AIRPORT
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	4
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	3
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	2
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from a large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	The infrastructure associated with airports, even small ones will transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The noise and disturbance associated with airplanes and vehicles reduces the suitability of any remaining habitat on/adjacent the site.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include a waste management plan that is focussed on recycling. This plan should deal with any fuel, oil and any other hazardous substances.
Agriculture	
Constraint	Airstrips will result in the transformation of productive land, particularly if rezoned and is constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Do no locate such development within areas with high or medium agricultural value. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the unstable geological conditions found in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- Do not construct within areas prone to flooding – all flood zones are to be avoided. Within 1:100 year flood zone, detailed flood line assessments must be conducted to support any possible consideration of development.
Water Quality	
Constraint	Airstrips and their supporting development (terminal buildings, workshops etc.) involve the production of sewage and other water pollutants, hereby adding to the cumulative impact in a catchment where levels exceed standards and are significant sustainability issue.
Recommendations	- At least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment.

	The development application must show that the following recommendations have been considered in the case of infrastructure for the containment and treatment of sewage: - The quality of the effluent released to the surface water systems (rivers) from Waste Water Treatment Works (WWTW), exceeds standards to assist in working towards a state of improved water quality. - Contamination of groundwater must be avoided. - The location of all sewage containment and treatment facilities is informed by a detailed geohydrological investigation and layout indicating the location of facilities in relation to natural water resources.
Infrastructure Service Provision	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - The infrastructure is to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sanitation recommendations apply as per Water Quality above. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.

Spatial Overview of Constraints



10.2 Roads and Railways

This category covers all major arterial roads including district, provincial and national and railway routes, open areas for the storage and repairs of trains, stations and passenger facilities and warehouses for freight operations.

Development Constraints and Guidelines

The constraint ratings show the need to avoid the loss of wetlands, areas of high conservation value and areas with high production potential due to the footprint associated with developing hard infrastructure such as roads and rail. It is also recommended that this infrastructure, particularly major provincial and regional roads are located away from flood prone areas.

Constraints Ratings

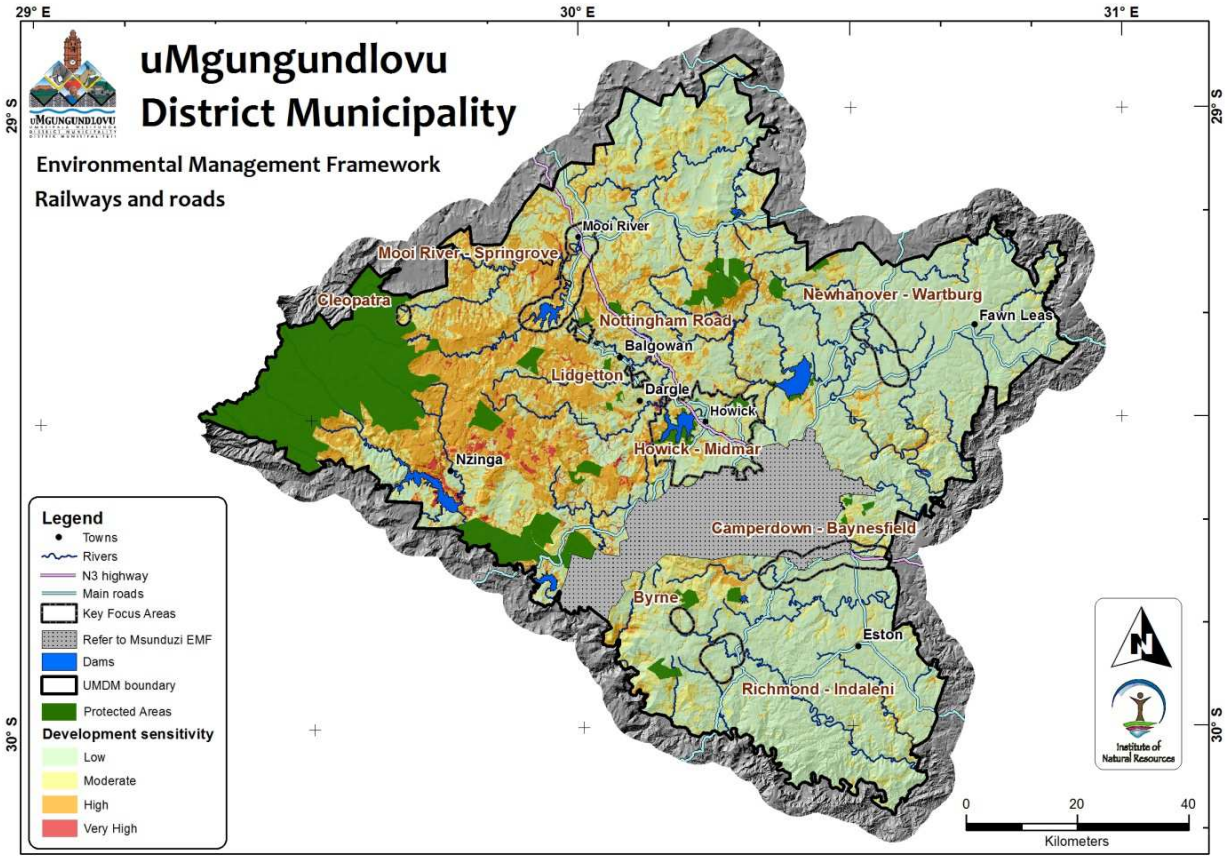
Environmental Features	Components	INFRASTRUCTURE AND SERVICES
		18.RAILWAYS & ROADS
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	3
	Moderate potential (Category C)	3
	Restricted potential (Category D)	2
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	4
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The noise disturbance from vehicles and rail also affects any species that utilise this habitat.
Recommendations	- No development should take place within a wetland and to a lesser degree within its buffer. The road and rail routes should be designed to limit the number of wetland and river crossings. - Where it is unavoidable to cross a wetland or a river, it should be at the narrowest point in the system possible and the bridge/culvert structure must provide for sustained flow of water across the system – a specialist should be consulted in the design process. - A rehabilitation and management plan must be a condition of authorisation to assist in addressing the water quality issues in the catchment. - Sustainable urban storm water design (SUDS) principles should be applied to design of the storm water system to increase infiltration and reduce the volumes and intensity of water runoff from roads and rail lines into nearby water courses.
Terrestrial Biodiversity	
Constraint	Road and rail transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. They also create barriers to the movement of species and fragment natural habitat, thereby potentially affecting the viability of populations. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with road and rail also reduces the suitability of adjacent habitat. Linear transport infrastructure cause disturbance along the routes which increases the levels of infestation by alien invasive plant species.
Recommendations	- No development should take place within areas of high biodiversity conservation value. Routes should be selected to reduce the area of high value biodiversity that is affected. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan.
Agriculture	
Constraint	Transport infrastructure transforms productive land, particularly if rezoned and is therefore constrained where it is proposed in areas of existing, or potentially high agricultural production value. The higher the productive capacity of the land or economic value secondary agricultural activity, the higher the constraint.
Recommendations	- Select routes with the lowest impact on productive land. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. - The contribution of the land to downstream/secondary agricultural activities also needs to be considered. - Detailed agricultural impact assessment by a SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning is broad, and a downgrading of the category is justified where site specific studies show that land potential should be downgraded).
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the unstable geological conditions found in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical investigation. - Do not construct within areas prone to flooding (1:100 year flood zone).
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)

Recommendations	Ensure that the ecological Reserve is maintained such that aquatic ecosystems will continue to supply goods and services to society. Ensure the development is flood neutral and does not result in significant hydrological alteration. Avoid streamflow reduction activities (e.g. plantation forestry and dryland agriculture). Development (e.g. dam) is not permitted; unless the social economic value is assessed in relation to aquatic ecosystems (i.e. the social economic value of the dam must then be significantly greater than the importance of aquatic ecosystems). Maintain and/or enhance ecological infrastructure (wetlands, riparian areas, grasslands, etc.) to improve water supply to downstream users and safeguard ecological requirements. Ensure adequately sized buffers for aquatic ecosystems are maintained and/or reinstated, and managed in an optimum, natural/near natural condition (i.e. good vegetation cover free of alien vegetation).

Spatial Overview of Constraints



10.3 Transport Focus Points

A zone that makes provision for the parking, drop-off and collection of passengers by public and private bus services and mini bus taxis. This may include rank manager's offices, ablutions and small retail facilities for the convenience of passengers.

Development Constraints and Guidelines

The constraint ratings show the need to avoid the loss of wetlands, areas of high conservation value and areas with high production potential due to the footprint associated with developing hard infrastructure such as roads and rail.

Constraints Ratings

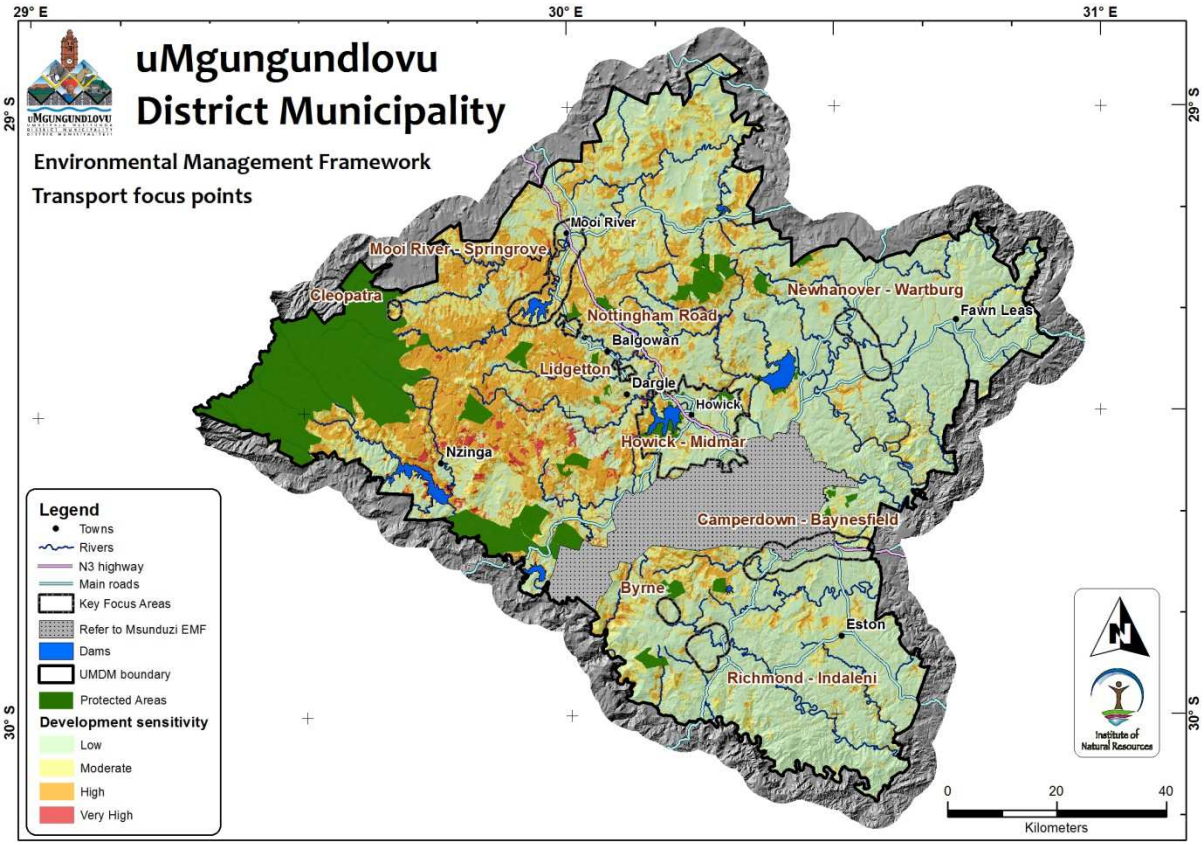
Environmental Features	Components	INFRASTRUCTURE AND SERVICES 19.TRANSPORT FOCUS POINTS
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	3
	Moderate potential (Category C)	3
	Restricted potential (Category D)	2
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	4
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process.
Terrestrial Biodiversity	
Constraint	- The infrastructure associated with transport activities will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan and a detailed biodiversity assessment in environmental authorisation processes.
Flood Risk	
Constraint	Zones of low development potential increase the costs of establishing and maintaining infrastructure to overcome the unstable geological conditions found in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical investigation. - Do not construct within areas prone to flooding (1100yr flood zone).
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	Ensure that the ecological Reserve is maintained such that aquatic ecosystems will continue to supply goods and services to society. Ensure the development is flood neutral and does not result in significant hydrological alteration. Avoid streamflow reduction activities (e.g. plantation forestry and dryland agriculture). Development (e.g. dam) is not permitted; unless the social economic value is assessed in relation to aquatic ecosystems (i.e. the social economic value of the dam must then be significantly greater than the importance of aquatic ecosystems). Maintain and/or enhance ecological infrastructure (wetlands, riparian areas, grasslands, etc.) to improve water supply to downstream users and safeguard ecological requirements.

	Ensure adequately sized buffers for aquatic ecosystems are maintained and/or reinstated, and managed in an optimum, natural/near natural condition (i.e. good vegetation cover free of alien vegetation).

Spatial Overview of Constraints



10.4 Refuse Sites

This is a zone that makes provision for refuse disposal works and infrastructure necessary for the Municipality to dispose of or recycle solid waste. Solid waste sites also impact socially sensitive sites such as residential areas and schools, commercial centres and tourism activities through air pollution issues associated with the noise of large vehicles, odour from the waste and burning. Solid waste sites also impact socially sensitive sites such as residential areas and schools, commercial centres and tourism activities through air pollution issues associated with the noise of large vehicles, odour from the waste and burning.

Development Constraints and Guidelines

Constraints Ratings

The constraint ratings show the high impact of this land use on several environmental sensitivities. Solid waste sites also impact socially sensitive sites such as residential areas and schools, commercial centres and tourism activities through air pollution issues associated with the noise of large vehicles, odour from the waste and burning.

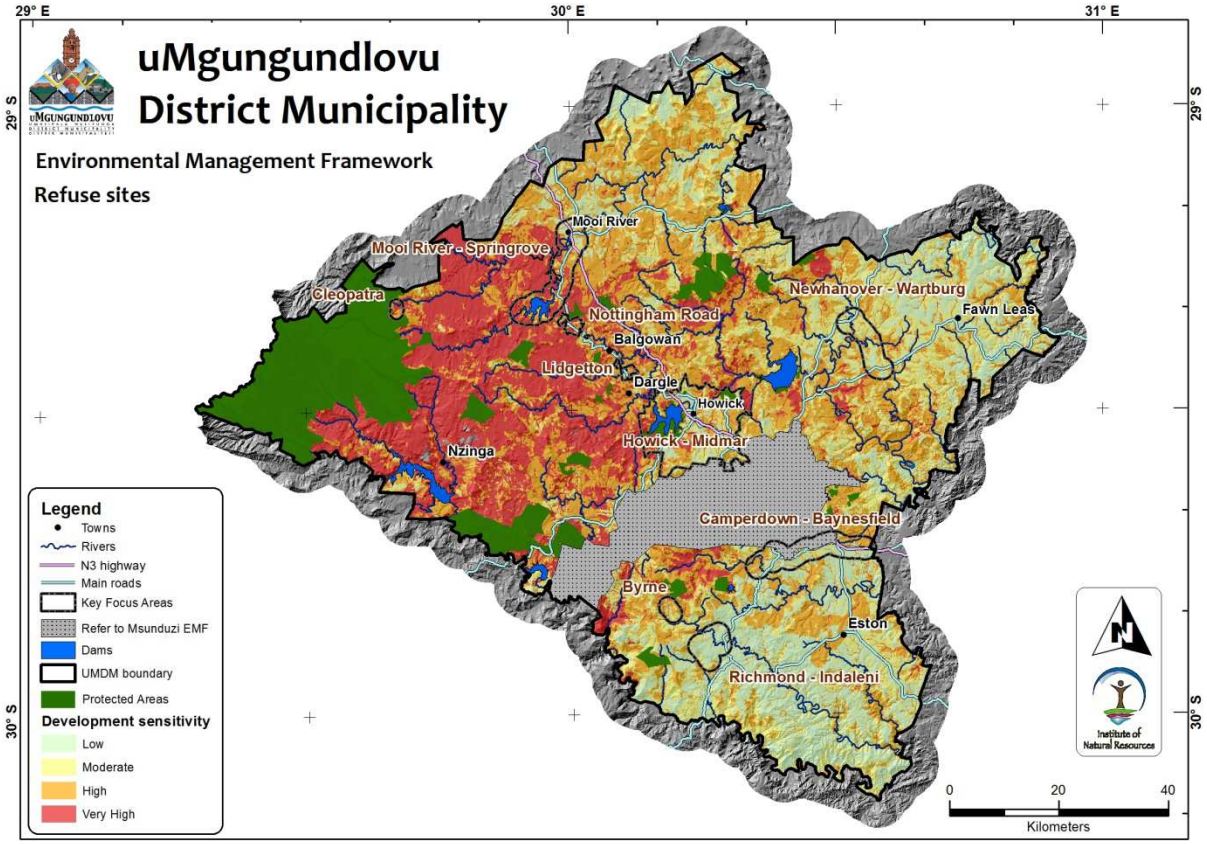
Environmental Features	Components	INFRASTRUCTURE AND SERVICES 20.REFUSE SITES
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	4
	with high potential for elevated pollutant concentrations	4
	with low pollutant concentrations	4
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	2
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	Quinnary and Proximal catchments are particular sensitive to this impact as they are close to water resources. This will add to the pollutant levels which have already exceeded thresholds across these catchments. Solid waste sites have the potential to contaminate both surface and groundwater resources.
Recommendations	- In terms of surface water resources, sites should be located as far as possible from sensitive water resources(Quinary to Proximal catchments)in order to reduce the risk of water pollution. - Only activities which will impose no discernible change from present nutrient and microbiological diffuse sources should be permissible. The exception is where such a facility is between distal and less sensitive catchment areas or is located upstream of a wetland to benefit from the water quality purification function of a these systems (in this case the issues discussed below need to be properly investigated). - A detailed geohydrological study is required to ensure that site is not located in an area where there is likely to be contamination. The design needs to adhere to best practice in terms of sealing the site to avoid/limit groundwater pollution. - In all instances, a detailed water quality assessment through monitoring should be conducted to define the exact capacity of point source pollution the water resource can assimilate. Where discharge of waste is unavoidable, effluent should be environmentally neutral (nutrient and microbiological concentrations should be the same as or lower than receiving environment concentration to increase dilution).
Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality. Solid waste sites involve the removal of vegetation and altered topography which affect run off and may lead to erosion points where the concentrated flow is discharged from sites located above a wetland. The noise disturbance associated with frequent disposal of waste by large vehicles and graders moving waste may impact species that utilise this habitat.
Recommendations	- No development of refuse sites should take place within a wetland or within its buffer. - Where it is unavoidable for access roads to cross a wetland, it should be at the narrowest point in the system possible and the bridge/culvert structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process. - A wetland rehabilitation and management plan must be a condition of authorisation to assist in addressing the water quality issues in the catchment. - Wetlands located downstream of a solid waste site have the ability to treat poor water quality arising from the site. However, this requires that the storm water plan is designed to ensure that water is released evenly (not specific points that can lead to erosion) and at appropriate rates. A decision to site a solid waste site above a wetland to benefit from its water quality treatment capacity would require a wetland specialist to inform the design. It would also be important to ensure that the location of the facility upstream of the wetland would not compromise any important biodiversity related to the system. - Applicable environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	- A solid waste disposal site will transform natural habitat reducing the overall extent and impacting associated species. The higher the conservation value the higher the constraint. - The associated noise and disturbance associated with waste disposal sites reduces the suitability of adjacent habitat. - Solid waste presents a threat to bird and other species that are commonly attracted to such sites to scavenge. - The disturbance increases the risk of increased infestation by alien invasive plant species.
Recommendations	- Development is to ensure a "no nett loss" of biodiversity, with management measures and mechanisms put in place to conserve and/or enhance the biodiversity value of the land. No development should take place within areas of high biodiversity conservation value. - Development should utilise already transformed and/or heavily degraded land as far as possible.

	- Development must be planned and designed according to principles of conserving biodiversity by maintaining and/or enhancing biodiversity features onsite. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan and a detailed biodiversity assessment in environmental authorisation processes.
Infrastructure	
Constraint	The infrastructure needs to support this land use includes roads, sanitation, electricity and water. Where the service provision is low there is a high constraint to this development option.
Recommendations	- All development applications must consider increased costs to allow for infrastructure services development. High infrastructure needs developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - National Norms and Standards for waste to Landfills to be complied with. All applicable environmental authorisations and development applications must be supported by mitigation plans to ensure energy efficient, green building and water efficiency technologies. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Agriculture	
Constraint	Solid waste sites will result in the transformation and pollution of productive land. The higher the productive capacity of the land, the higher the constraint.
Recommendations	- Avoid locating sites within areas with high and medium potential agricultural use, or upstream of areas where food crops are being produced due to the risk of contamination.
Flood Zone	
Constraint	Solid waste sites located in flood zones are prone to risk of flooding with associated water quality issues. Steep slopes also make it difficult manage runoff of materials.
Recommendations	- Avoid locating solid waste sites within the 1:100 year flood zone. - Avoid locating sites on steep slopes.
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	This activity is will impact on ground water resources and therefore dry season base flow. Thus any such activity should be avoided in these areas. Any consideration of consideration of activity in a high water yield area will require the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment in support of an environmental authorisation process

Spatial Overview of Constraints



10.5 Sewage Works

This category makes provision for waste water treatment works and associated infrastructure necessary for the Municipality to treat waste water. It also accounts for smaller facilities such as package plants that are developed for large scale housing or tourism developments.

Development Constraints

The constraint ratings show the need to avoid the loss of wetlands, areas of high conservation value, high agricultural production potential, high water quality areas, high water yield areas and flood zones. Due to the footprint associated with the sometimes extensive areas required for WWTWs. These plants will add to the cumulative odour issues in the lower lying areas of the study area and for the same reason pose a high constraint (particularly in the case of large municipal works) if located within close proximity to socially sensitive sites such as residential areas, schools and commercial centres. While WWTWs need to be located close to the resource into which they release, the infrastructure needs to be located outside the flood line zones.

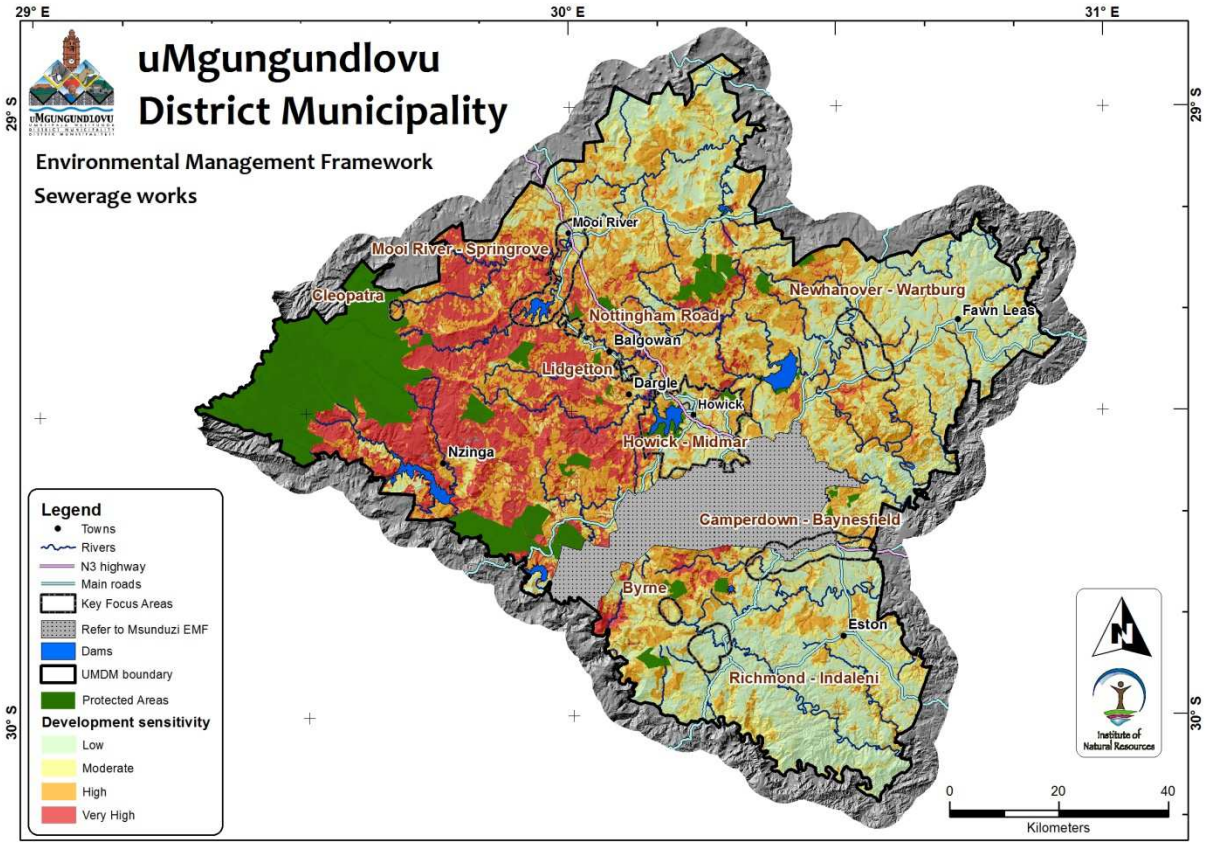
Environmental Features	Components	INFRASTRUCTURE AND SERVICES 21.SEWERAGE WORKS
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	2
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	4
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	4
	with high potential for elevated pollutant concentrations	4
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	2
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	It must be noted that while WWTWs are a point source of pollution, they are essential to avoid far more significant pollution where they are not in place i.e. one could not say they are not suitable across the development area because they will add to the existing issue of high nutrients and bacterial levels.
Recommendations	- As WWTWs are required to address the pollution issues in the catchments, a requirement is that they are designed to treat the effluent to higher than current standards to meet the objective of improving water quality. The selected standards need to be set in collaboration with the relevant authority (DWS). - In the case of large scale multifaceted activities that require a WWTW, recycling of water for use in irrigation of gardens, golf courses and other playing areas should be a requirement. This reduces the demand on water resources and improves the quality of effluent released to the environment. - Contamination of groundwater must be avoided. Pit latrines and VIPs are therefore not recommended. Conservancy tanks rather than septic tanks are therefore recommended in the case of small scale rural based developments that cannot link into a reticulated system, and for which an independent WWTW is not warranted. - The location of all sewage containment and treatment facilities is informed by a detailed geohydrological investigation and layout indicating the location of facilities in relation to natural water resources.
Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. The point at which effluent is released from a WWTA forms a concentration of flow which establishes a risk of erosion. The noise disturbance from such facilities may negatively impact species that utilise this habitat.
Recommendations	- No development should take place within a wetland and to a lesser degree within its buffer. - It may however be beneficial to locate a WWTW above a wetland to take advantage of the purification services they provide. In such a case, it will be important that the storm water management plan is designed to spread flow evenly across the system and at rates that do not erode it and optimise the wetlands 'treatment capacity '. A wetland specialist needs to be consulted in the design process. - An environmental authorisation processes must be supported by appropriate mitigation measures to ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	Highly sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. Development of the WWTW is not permissible in these areas.
Recommendations	- Development is to ensure a "no nett loss" of biodiversity, with management measures and mechanisms put in place to conserve and/or enhance the biodiversity value of the land. No development should take place within areas of high biodiversity conservation value. - Development should utilise already transformed and/or heavily degraded land as far as possible. - Development must be planned and designed according to principles of conserving biodiversity by maintaining and/or enhancing biodiversity features onsite. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). Applications should include an alien invasive management plan and a detailed biodiversity assessment in environmental authorisation processes.
Agriculture	
Constraint	A WWTW will transform productive land permanently. The higher the productive capacity of the land, the higher the constraint.

Recommendations	WWTW are not permissible within high agricultural potential areas.
Flood Zones	
Constraint	Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage. The risk of flood damage and water resource contamination is also high and therefore 1:100 year flood zones must be avoided.
Recommendations	- Do not construct WWTW within areas prone to flooding 1:100 year flood zone.
Infrastructure	
Constraint	The infrastructure needs to support this land use includes roads, sanitation, electricity and water. Where the service provision is low there is a high constraint to this development option.
Recommendations	- All development applications must consider increased costs to allow for infrastructure services development. High infrastructure needs developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - All WWTW standards and discharge effluent standards to be confirmed with DWS. All applicable environmental authorisations and development applications must be supported by mitigation plans to ensure energy efficient, green building and water efficiency technologies. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.

Spatial Overview of Constraints



10.6 Bulk Linear Infrastructure

This zone accounts for all types of bulk and bulk linear infrastructure such as power lines, pipelines and servitudes. It also includes cell phone masts. Also includes substations and water works. Excludes roads, railway, sewage works.

Development Constraints

The constraint ratings show the need to avoid the loss of wetlands, areas of high conservation value and areas with high production potential due to the footprint associated with the sometimes extensive areas required for such infrastructure. In addition to the direct impact on productive land, the conditions associated with the management of servitudes in relation to specific infrastructure may result in the sterilisation of the land for production. The avoidance of high flood zones is also important.

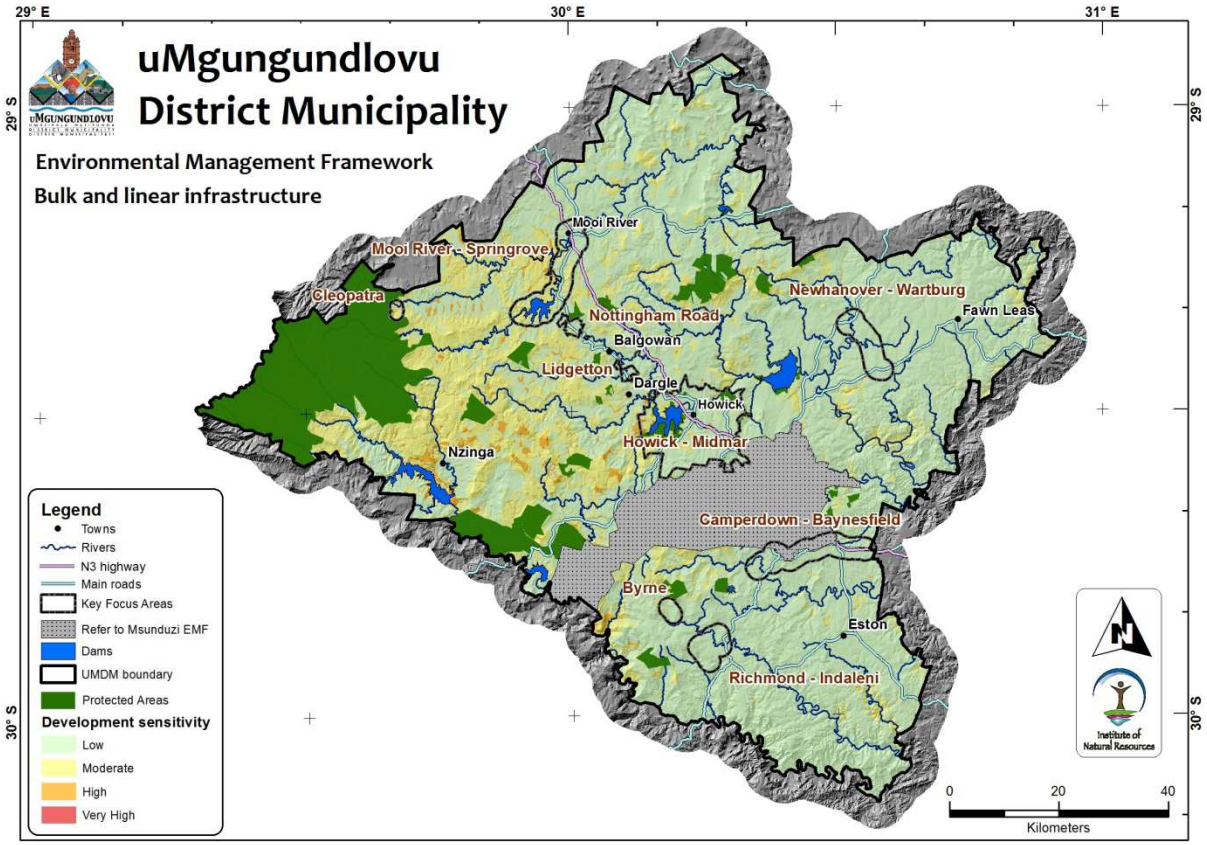
Environmental Features	Components	INFRASTRUCTURE AND SERVICES 22.BULK & LINEAR INFRASTRUCTURE
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	2
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	2
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	3
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	3
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	2
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment. - A wetland rehabilitation and management plan must be a condition of an authorisation to assist in addressing the water quality issues in the catchment - Sustainable urban storm water design (SUDS) principles should be applied to all infrastructures to increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process
Terrestrial Biodiversity	
Constraint	- Linear infrastructure transforms natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. They may also create barriers to the movement of species particularly birds in the case of powerlines, and fragment natural habitat, thereby potentially affecting the viability of populations. The higher the conservation value the higher the constraint. - Linear infrastructure cause disturbance along the routes which increases the levels of infestation by alien invasive plant species.
Recommendations	- No development should take place within areas of high biodiversity conservation value. Routes should be selected to reduce the area of high value biodiversity that is affected. - Development is to ensure a "no nett loss" of biodiversity, with management measures and mechanisms put in place to conserve and/or enhance the biodiversity value of the land. No development should take place within areas of high biodiversity conservation value. - Development should utilise already transformed and/or heavily degraded land as far as possible. - Development must be planned and designed according to principles of conserving biodiversity by maintaining and/or enhancing biodiversity features onsite. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan and a detailed biodiversity assessment in environmental authorisation processes.
Agriculture	
Constraint	Linear infrastructure has the potential to sterilise productive land depending on the nature of the infrastructure and the land use. The higher the productive capacity of the land and the nature of the constraint imposed by management conditions in the servitude, the higher the constraint.
Recommendations	- Select routes with the lowest impact on productive land. - The development application must confirm the production value of the property in question and its suitability for the range of potential crop types and grazing. The contribution of the land to downstream/secondary activities such as sugar and saw mills should be considered.
Flood Risk	
Constraint	The potential increase in the costs of establishing and maintaining infrastructure to overcome the flood risk in such areas. Such zones are also located in low lying areas prone to flooding. Locating infrastructure in such areas therefore also exposes the infrastructure to risk of damage.
Recommendations	- It is preferable to develop infrastructure outside areas with low and medium development potential. Where this is unavoidable, the design must be informed by a detailed geotechnical

	investigation. - Where possible do not route infrastructure areas prone to flooding 1:100 year flood zone. - Where routes are required to cross rivers, ensure that design capacity accounts for the flood frequencies.

Spatial Overview of Constraints



11. CONSERVATION AND OPEN SPACE

11.1 Environmental Services

This category includes independent or linked open space areas that are in their natural state and which are providing important ecosystem services within a transformed landscape (rural or urban) and important examples are riverine corridors. This category also provides for large contiguous areas in natural condition that warrant classification as a formally protected area (Conservation).

Development Constraints

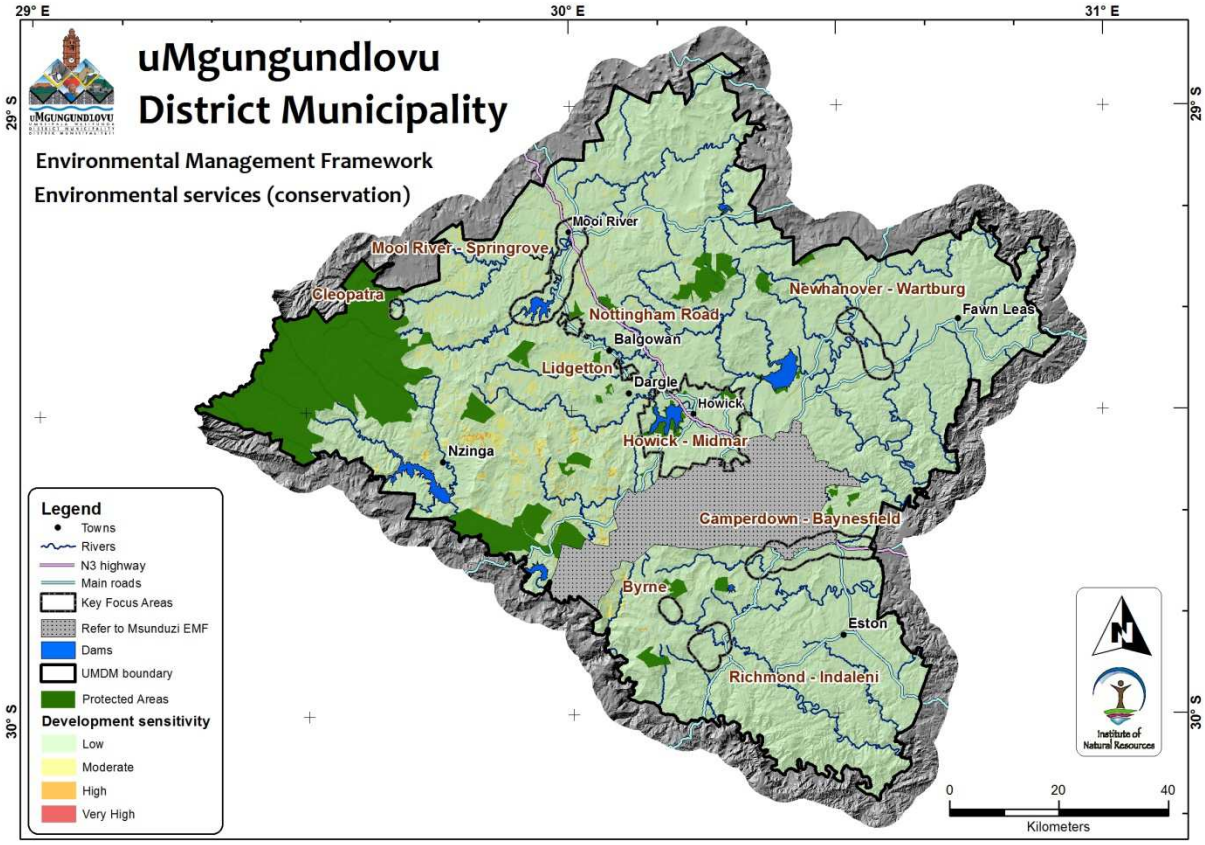
The only sensitive feature which will conflict with the preservation of natural systems in their natural state is the lack of infrastructure in these areas which could lead to use of the areas inappropriately for unsustainable harvesting of fuel or impacts on the environmental services linked to water quality and other environmental services.

Environmental Features	Components	CONSERVATION AND OPEN SPACE
		23.ENVIRONMENTAL SERVICES
Wetlands	Wetland Footprint	1
	32m Buffer	1
	500m Buffer	1
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	1
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	1
Biodiversity	Protected area	1
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	1
	Ecological Support Area (ESA)/Environmental Management Zone	1
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	1
	High water yield	1
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Infrastructure	
Constraint	Areas of environmental services are limited to receive increasing impacts related to the use of these areas to meet resource needs of local people.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area. - Enforcement of laws related to the overutilization of natural resources.

Spatial Overview of Constraints



11.2 Active Open Space

This land use category includes active open space that is transformed from its natural state and is managed as a public amenity. Examples include parks, sports fields and golf courses, country clubs, equestrian centers/race courses, polo fields.

Development Constraints

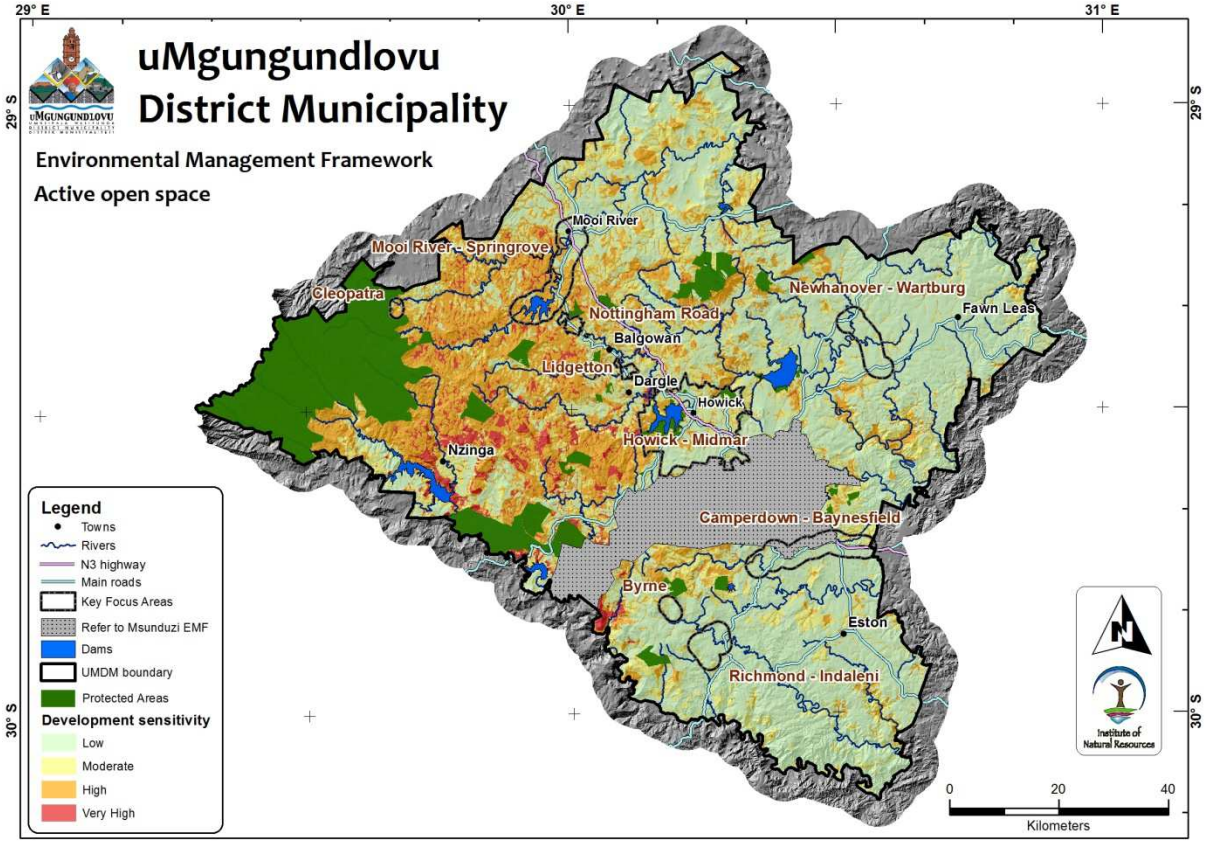
As summarized below, active open space, as the name suggest involves a level of transformation from a natural condition imposes a constraint where it is proposed on areas with high biodiversity value, areas including wetlands, flood prone areas and areas with low infrastructure services. It also constrains the use of land for agricultural production and is not suited to location in low lying flood prone areas.

Environmental Features	Components	CONSERVATION AND OPEN SPACE 24.ACTIVE OPEN SPACE
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	2
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	1
Biodiversity	Protected area	3
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	2
	Ecological Support Area (ESA)/Environmental Management Zone	1
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Development within wetlands destroys the habitat and ability of these systems to provide important services. Sports fields for example are often locate on flatter areas where wetlands occur and wetlands are in filled to increase playing areas.
Recommendations	- No development should take place within a wetland and to a lesser degree within its buffer. Wetland boundaries and buffers should be delineated. - A wetland rehabilitation and management plan must be a condition of authorisation to assist in addressing the water quality issues in the catchment.
Terrestrial Biodiversity	
Constraint	- Transformation of natural habitat, although not permanent does reduce the biodiversity value of habitat. The associated infrastructure may also impact the value of the natural habitat. The higher the conservation value the higher the constraint. - Disturbance associated with the use of open areas also reduces its value for associated species.
Recommendations	- No development should take place within areas of high biodiversity conservation value. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan.
Agriculture	
Constraint	Although not permanent, transformed open space minimises the area available for agricultural production. The higher the productive capacity of the land and the nature of the constraint.
Recommendations	- No transformation of high production areas. - Detailed agricultural impact assessment by SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning data is broad, and a down grading of the category is justified where site-specific studies show that land potential should be downgraded)
Infrastructure	
Constraint	The development of country clubs and other facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All suitable land uses permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Flood Risk	
Constraint	Locating infrastructure in such areas therefore also exposes the infrastructure and people to risk of damage and harm.
Recommendations	Do not locate infrastructure areas prone to flooding 1:100 year flood zone.

Spatial Overview of Constraints



11.3 Passive Open Space

This land use category includes a zone that provides for developed formal and informal parks with associated recreational facilities. Examples include parks and picnic sites.

Development Constraints

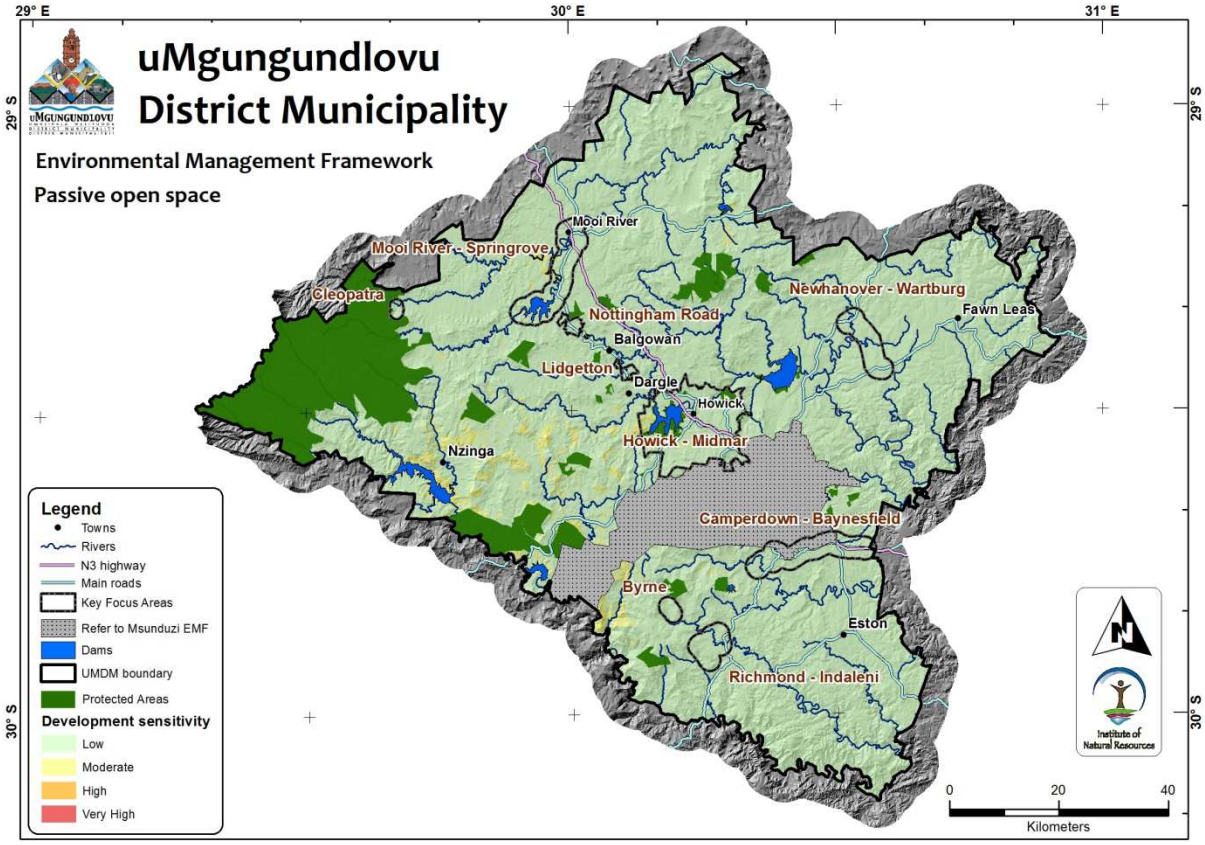
As summarized below, passive open space, as the name suggest involves a level of transformation from a natural condition imposes a constraint where it is proposed on areas with high biodiversity value, high agricultural potential, areas including wetlands, flood prone areas and areas with low infrastructure services. It specifically constrains the use of land for agricultural production and is not suited to location in low lying flood prone areas.

Environmental Features	Components	CONSERVATION AND OPEN SPACE 25.PASSIVE OPEN SPACE
Wetlands	Wetland Footprint	2
	32m Buffer	1
	500m Buffer	1
	>500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	1
	Low Service Provision	2
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	2
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	1
Biodiversity	Protected area	2
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	2
	Ecological Support Area (ESA)/Environmental Management Zone	1
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	1
	High water yield	1
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Agriculture	
Constraint	Although not permanent, transformed open space minimises the area available for agricultural production. The higher the productive capacity of the land and the nature of the constraint.
Recommendations	- No transformation of high production areas regarded as very high to high potential - Agricultural land that should be retained exclusively for agricultural. Other uses which should all be preferably located on the lowest potential areas within the category. - Detailed agricultural impact assessment by SACNASP registered scientist that has sufficient motivation for a change of land use (e.g. where available zoning data is broad, and a down grading of the category is justified where site-specific studies show that land potential should be downgraded.

Spatial Overview of Constraints



11.4 Nature Reserves

This land use category includes a zone that is intended to demarcate formally managed public and private Conservation areas, such as Nature Reserves and Amenity Reserves.

Development Constraints

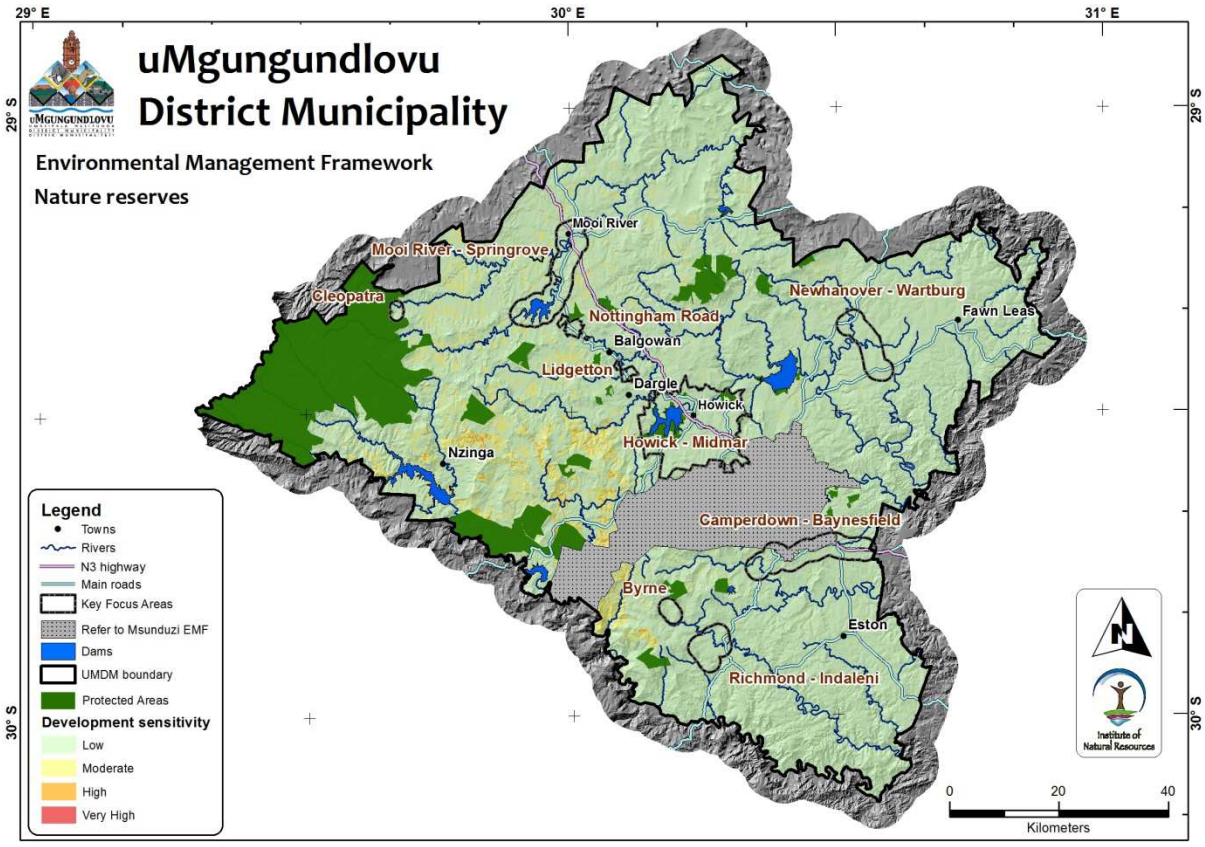
As summarized below, a nature reserve, as the name suggest involves a limited level of transformation from a natural condition and therefore imposes a limited constraint where it is proposed on areas. It is specifically constrained by the lack of infrastructure services and the impact that developing these services in these areas may have of the environmental sensitivity and importance of the area.

Environmental Features	Components	CONSERVATION AND OPEN SPACE 26.NATURE RESERVES
Wetlands	Wetland Footprint	1
	32m Buffer	1
	500m Buffer	1
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	2
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	1
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	1
Biodiversity	Protected area	1
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	1
	Ecological Support Area (ESA)/Environmental Management Zone	1
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	1
	High water yield	1
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Infrastructure	
Constraint	The development of nature reserve built services and facilities are constrained in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- In low service provision context, appropriately sized building and use must be considered. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.

Spatial Overview of Constraints



11.5 Dams

This land use category includes a zone that provides for dams that are used for water supply and / or recreational purposes. Use of the water body requires permission from DWS.

Development Constraints

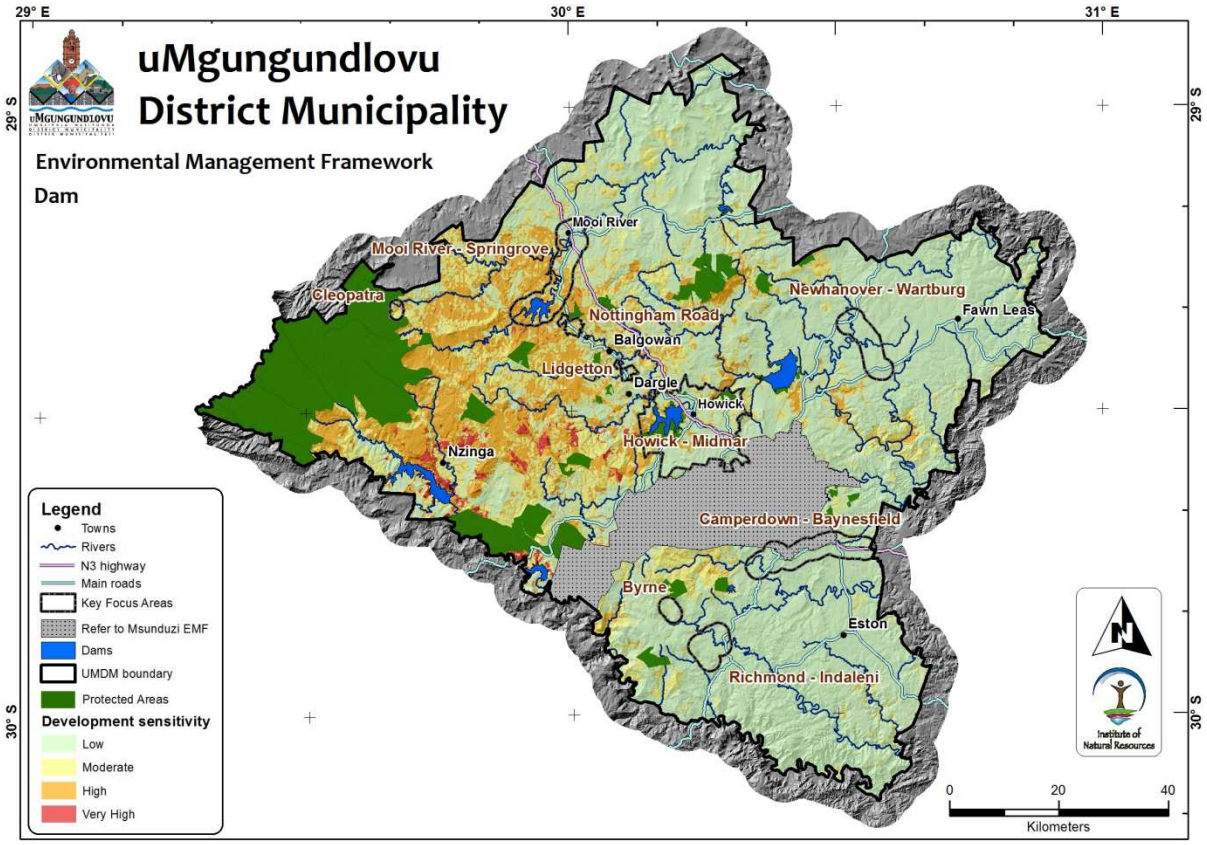
Dams are important water infrastructure that can have specific constraints as it involves the inundation and transformation of sensitive areas such as areas of high biodiversity value, high water yield areas, and wetland areas. Specific constraints are imposed on this land use by the lack of infrastructure services available. While development of dams is constrained in areas of high sensitivity as shown below, all less sensitive areas may have development applications considered on condition of detailed specialist assessments accompanying the appropriate environmental and other authorization procedures that will apply.

Environmental Features	Components	CONSERVATION AND OPEN SPACE 27.DAM
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	3
	>500m from a wetland	3
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	2
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	1
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	1
Biodiversity	Protected area	3
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	3
	Ecological Support Area (ESA)/Environmental Management Zone	2
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	4
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Dams are generally developed in wetlands resulting in their loss due to inundation.
Recommendations	Dam sites that result in the lowest loss of wetlands should be considered in selecting sites. An environmental authorisation and water use license will be required to construct a dam. A decision in terms of these processes will need to be informed by a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	- Transformation of natural habitat does reduce the biodiversity value of habitat. The associated infrastructure may also impact the value of the natural habitat. The higher the conservation value the higher the constraint. - Disturbance and transformation associated with the use of dams also reduces its value for associated species.
Recommendations	- No development should take place within areas of high biodiversity conservation value including the protected areas, critical biodiversity areas, and ecological support areas. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). Detailed biodiversity assessments should accompany applicable environmental authorisation and other permit applications. .
Infrastructure	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- Dam development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Water Yield	
Constraint	- Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	- This activity is will reduce streamflow in high yield sensitive areas. Therefore any such activity should be avoided in these areas. However, this activity may proceed on condition of detailed specialist investigations in support of an environmental authorisation process. This will require the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment.

Spatial Overview of Constraints



11.6 Nature and culture based tourism

This zone is intended to manage the development of land and buildings for ecotourism and nature based tourism development. The main focus will be on accommodation in the form of lodges, conference facilities, caravan and tented accommodation and coeducational facilities; outdoor recreation and participatory travel experience, to both natural as well as to cultural environments, that contribute to the sustainable use of these environments, respect the integrity of the host communities, and which produce economic opportunities that contribute to the long term conservation of the resource base and reinforce the concept that conservation can bring meaningful benefits.

Development Constraints

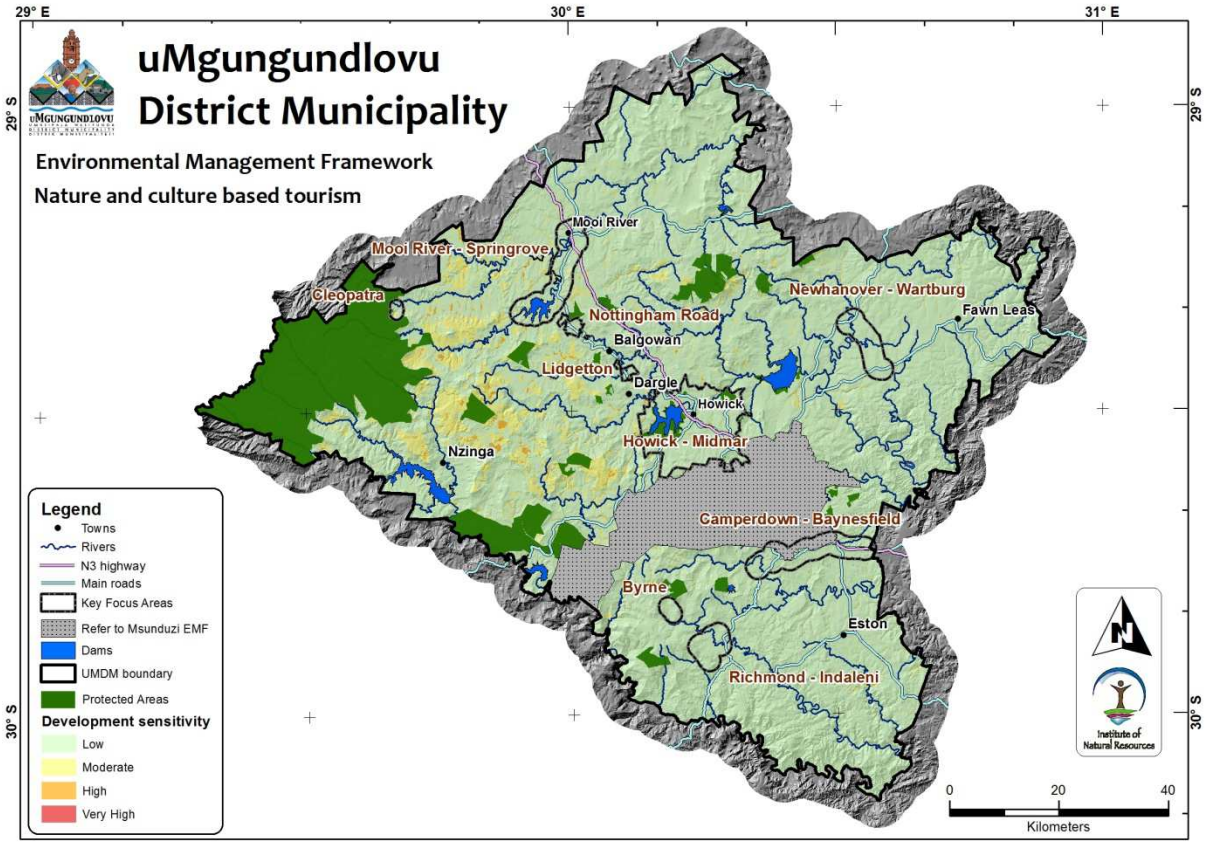
As summarized below, nature and culture based tourism, as the name suggest involves a level of transformation from a natural condition imposes a constraint where it is proposed on areas with wetlands, flood prone areas and areas with low infrastructure services.

Environmental Features	Components	CONSERVATION AND OPEN SPACE
		28.NATURE- AND CULTURE-BASED TOURISM
Wetlands	Wetland Footprint	3
	32m Buffer	1
	500m Buffer	1
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	1
	Moderate potential (Category C)	1
	Restricted potential (Category D)	1
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	1
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	2
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	2
	Ecological Support Area (ESA)/Environmental Management Zone	1
	Untransformed/Other natural areas	1
Water Yield	Very high water yield	2
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	The overarching objective from a wetland conservation and maintenance of ecosystem service perspective is to achieve a 'no net loss' of functions and values from a wetland. Development within wetlands destroys the habitat and ability of these systems to provide important services like improvement of water quality, particularly hard infrastructure as is required for this land use. Hardened surfaces also increase the rate and intensity of run off. This alters the flow of water through wetlands and establishes a risk of erosion. The disturbance from large number of people and vehicles also affects any species that utilise this habitat.
Recommendations	- Preferably no development within wetland footprint and buffers. - If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. - Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Infrastructure	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- Tourism permitted with no or very low infrastructure needs. All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality. - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Flood Risk	
Constraint	Locating infrastructure in such areas therefore exposes the infrastructure and people to risk of damage and harm.
Recommendations	Do not locate infrastructure areas prone to flooding 1:100 year flood zone.

Spatial Overview of Constraints



12. INDUSTRY

12.1 Extractive Industry / Quarrying and Mining

This category covers areas (land and rivers) used for the extraction of minerals or raw materials and associated business operations, including sand and stone, in compliance with a permit from the relevant authority. Mining activities here also include mining exploration and prospecting.

Development Constraints

As summarized below, because mining activities involve larger scale and intensive transformation they pose a major constraint where proposed in natural areas such as wetlands and high value biodiversity, high production potential, and water production areas. They also involve activities which generate dust, noise and reduce the aesthetic value of the landscape, thereby making them incompatible with socially sensitive land uses such as tourism, residential and commercial use.

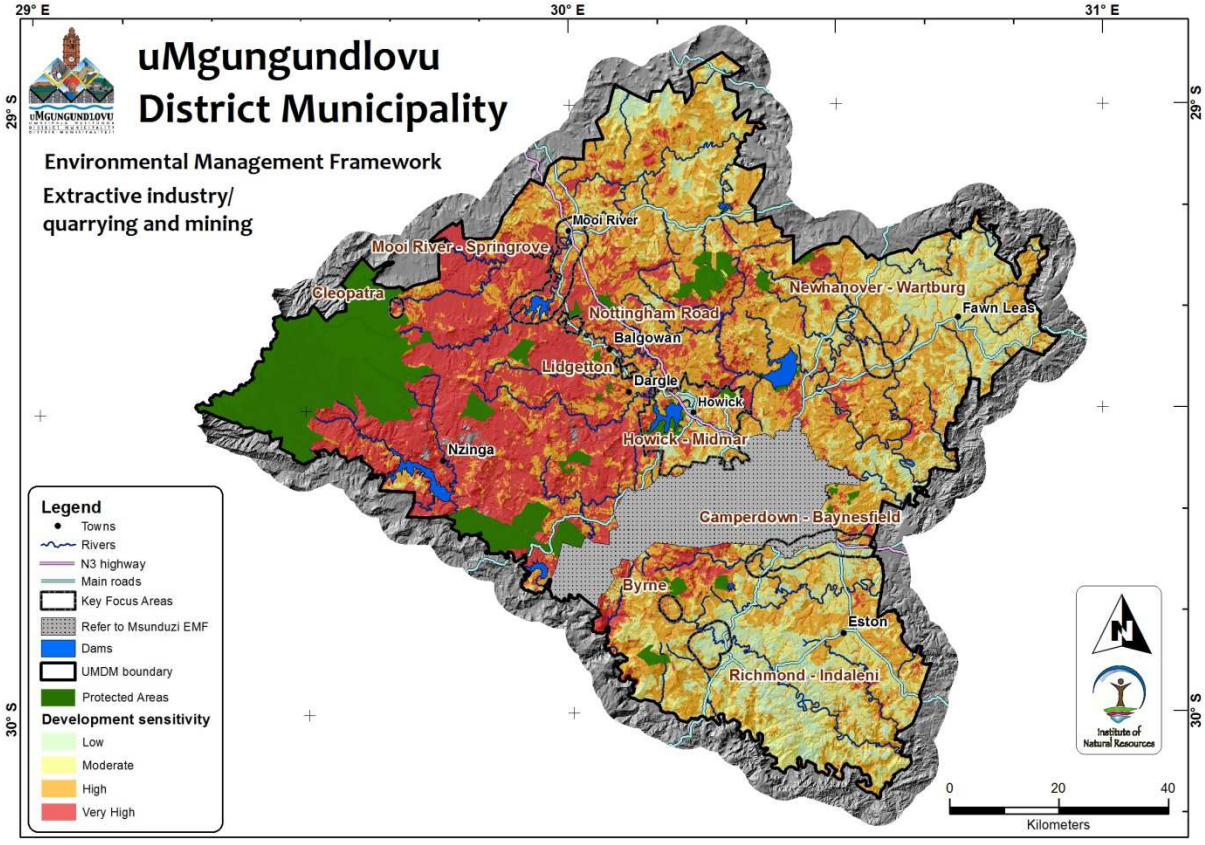
Environmental Features	Components	INDUSTRY
		29.EXTRACTIVE INDUSTRY / QUARRYING AND MINING
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	3
	> 500m from a wetland	2
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	3
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	4
	with high potential for elevated pollutant concentrations	4
	with low pollutant concentrations	4
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	2
Catchments not influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	2
Flood zones	1:100 yr flood	2
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Mining within or beneath wetlands destroys the habitat directly, while mining in the wetland buffer or catchment alters the hydrological regime which is the life blood of the system. The noise disturbance from mining operations also reduces the suitability of any habitat remaining within the mining operations. In the case of sand mining the instream and riparian habitats are altered, with issues of bank erosion and sedimentation downstream as well as alterations in flow.
Recommendations	- No development should take place within a wetland or within the buffer. - A wetland rehabilitation and management plan must be a condition of authorisation. - No sand mining can occur without appropriate authorisations and management plans in place. - To increase infiltration and reduce the volumes and intensity of water runoff from the development area. - Road layouts should be designed to go around wetlands and not through them. Where it is unavoidable to cross a wetland, it should be at the narrowest point in the system and the structure must provide for sustained flow of water across the wetland system – a specialist wetland consultant should be consulted in the design process. - Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment
Terrestrial Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. The primary impact is the conversion of large areas of natural vegetation to agricultural use. Apart from possible low impact ecotourism activities, development in these areas is a high constraint.
Recommendations	- This activity must be avoided in high sensitivity areas (protected areas, critical biodiversity areas). However, development applications need to confirm whether the area mapped as high value biodiversity warrants retention for other uses. - Where development does proceed, important to show how areas/features of biodiversity value have considered e.g. retention of natural areas/corridors through the development area. An EIA or Basic Assessment to be followed to establish impacts from the development and appropriate mitigation and offset measures should be implemented. - An alien invasive plant management plan must be a condition of planning approval. - In Ecological Support areas may be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas. The agricultural component should rely on uncultivated/fallow land by avoiding ploughing of virgin land
Agriculture	
Constraint	Mining completely destroys the productive capacity of soils making this a high level constraint when proposed in areas with high production potential.
Recommendations	- No transformation of high to restricted agricultural production areas.
Water Quality	
Constraint	The increase in sediment generation and pollutants is a significant constraint to water quality.
Recommendations	- At least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. No mining activities are permitted in high water quality resource areas including water quality areas (Quinary and Proximal catchments). - In water quality areas, status in these areas should be confirmed through monitoring before decisions are made regarding development. If monitoring indicates contamination to be low, activities should follow guidelines for quinary areas. Subject to confirmation of elevated pollutant loads (particularly nutrients and bacteria); activities undertaken here should be limited to activities with a negligible impact on water quality. - Where discharge of waste is unavoidable, effluent should be environmentally neutral (nutrient and microbiological concentrations should be the same as or lower than receiving environment concentration to increase dilution. - Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment.

Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendation	This activity is will reduce streamflow and base flow in high yield sensitive areas. Therefore any such activity should be avoided in these areas. However, this activity may proceed on condition of detailed specialist investigations in support of an environmental authorisation process. This will require the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment.

Spatial Overview of Constraints



12.2 Noxious Industry

This category includes industrial and manufacturing zone that permits manufacturing uses which may not be compatible with other manufacturing uses and which would have major externalities on adjacent land uses. This zone would permit manufacturing activities that may produce significant vibration, noise, odor, or high volume automobile and truck traffic. Warehousing of materials that may be considered noxious or hazardous may be permitted in buildings in this zone, with possible conditions and/or exceptions, i.e. via a Consent procedure. This category accounts for manufacturing and industrial activities involving processes that generate toxic effluent that can affect both water and air quality.

Development Constraints

Noxious industry is shown to conflict many environmental sensitivity zones, including the water pollution it generates.

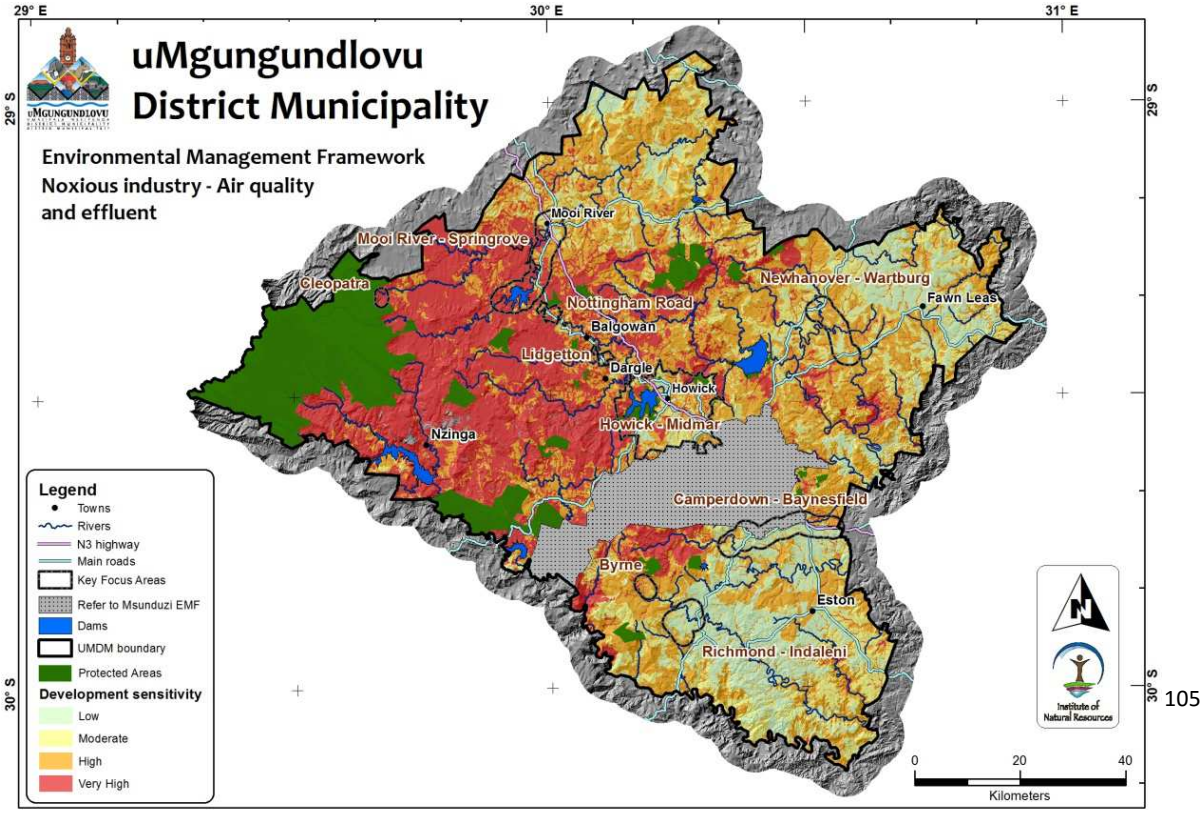
Environmental Features	Components	INDUSTRY 30.NOXIOUS INDUSTRY
Wetlands	Wetland Footprint	4
	32m Buffer	4
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	4
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	4
	with high potential for elevated pollutant concentrations	4
	with low pollutant concentrations	4
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	3
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	2
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	4
	High water yield	3
	Moderate water yield	2
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Water Quality	
Constraint	Noxious industry generates effluent with a range of different and harmful/noxious constituents, including nutrients. Given the state of water quality in large sections of District, noxious industry is constrained by this output wherever it is proposed in the development area.
Recommendations	- At least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. No noxious industry activities are permitted in high water quality resource areas including water quality areas (Quinary and Proximal catchments). - In sensitive water quality areas, status in these areas should be confirmed through monitoring before decisions are made regarding development. If monitoring indicates contamination to be low, activities should follow guidelines for quinary areas. Subject to confirmation of elevated pollutant loads (particularly nutrients and bacteria); activities undertaken here should be limited to activities with a negligible impact on water quality. - Where discharge of waste is unavoidable, effluent should be environmentally neutral (nutrient and microbiological concentrations should be the same as or lower than receiving environment concentration to increase dilution. - Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment.
Wetlands	
Constraint	Industry within wetlands destroys the habitat directly, while industry in the wetland buffer or catchment alters the hydrological regime which is the life blood of the system. The noise disturbance from operations also reduces the suitability of any habitat remaining within and adjoining the development site.
Recommendations	- Preferably no development within wetland footprint and buffers. - If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	The infrastructure associated noxious industry will permanently transform natural habitat resulting in a loss of the habitat, associated species and the ecosystem services provided by these systems. The higher the conservation value the higher the constraint. The associated noise and disturbance associated with movement of people and vehicles reduce the suitability of any remaining habitat on, or adjacent to a site.
Recommendations	- Development is to ensure a "no nett loss" of biodiversity, with management measures and mechanisms put in place to conserve and/or enhance the biodiversity value of the land. No development should take place within areas of high biodiversity conservation value. - Development should utilise already transformed and/or heavily degraded land as far as possible. - Development must be planned and designed according to principles of conserving biodiversity by maintaining and/or enhancing biodiversity features onsite. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan and a detailed biodiversity assessment in environmental authorisation processes.
Agriculture	
Constraint	Industry results in the complete and permanent alteration of productive capacity of land, and alters the water quality so that in certain cases it not suitable. This makes this a high level constraint when proposed in areas with high production potential.
Recommendations	- No transformation of on agricultural production areas.
Flood risk	
Constraint	Development within areas prone to flooding increases risk of damage to property, as does

	infrastructure constructed on unstable geology. Constructing on steep slopes also increases cost.
Recommendations	- Avoid areas, areas prone to flooding (1:100 year flood line). - Undertake geotechnical survey and flood line delineation to inform feasibility and detailed planning.
Infrastructure	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	This activity is will reduce streamflow in high yield sensitive areas. Therefore any such activity should be avoided in these areas. However, this activity may proceed on condition of detailed specialist investigations in support of an environmental authorisation process. This will require the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment.

Spatial Overview of Constraints



12.3 Large Scale Logistics Hub

This zone permits general industry activities. As a cumulative industrial zone, it would permit a combination of light manufacturing uses found in other zones and more intensive manufacturing uses that would normally be considered incompatible with sensitive land uses. Warehousing of materials considered non-noxious or nonhazardous is permitted in buildings in this zone. Outdoor storage, as an ancillary use, may be permitted in the zone, subject to certain restrictions involving the amount of area permitted on a lot, setbacks, screening, and possibly the type of materials permitted to be stored. This includes for example mechanical services for agricultural and other sectors.

Development Constraints

The primary impacts are due to the footprint and associated loss of wetlands, habitat and productive land. It is also not suitable to develop infrastructure in areas of high flood potential, unstable geology or on steep slopes. Reducing impacts on water quality must plan for in this activity.

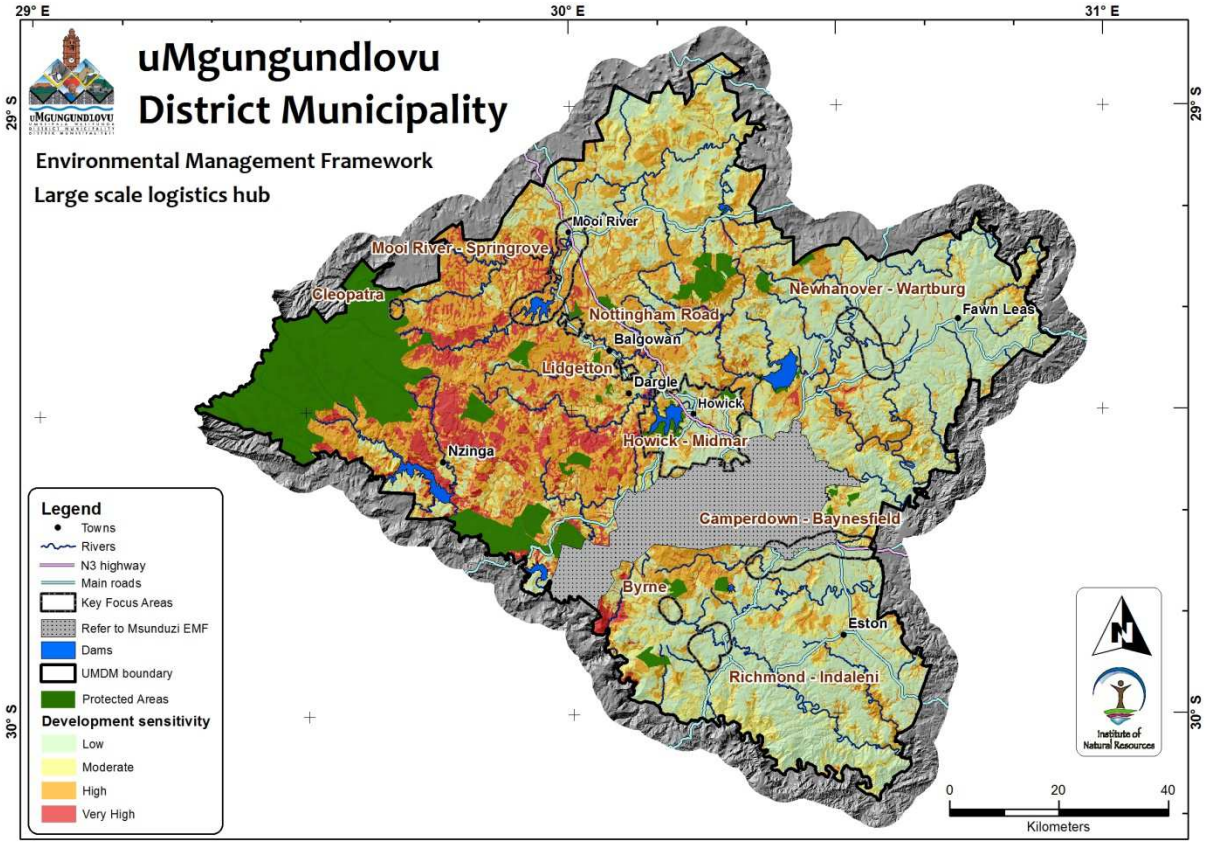
Environmental Features	Components	INDUSTRY 31.Large Scale Logistics Hub
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	> 500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	2
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	2
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	1
	with high potential for elevated pollutant concentrations	1
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	4
	Ecological Support Area (ESA)/Environmental Management Zone	4
	Untransformed/Other natural areas	3
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Constraint Descriptions and Planning Guidelines

Wetlands	
Constraint	Logistic hubs within wetlands destroy the habitat directly, while industry in the wetland buffer or catchment alters the hydrological regime which is the life blood of the system. The noise disturbance from operations also reduces the suitability of any habitat remaining within and adjoining the development site.
Recommendations	- Preferably no development within wetland footprint and buffers. If an environmental authorisation is obtained for development in a wetland, appropriate mitigation measures must ensure no net loss principle is adhered to. Environmental authorisation assessments should contain a wetland condition assessment, wetland functional assessment, wetland buffer zone assessment, and potentially wetland rehabilitation and / or offset assessment.
Terrestrial Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. The primary impact is the conversion of large areas of natural vegetation to industrial uses. Apart from possible low impact ecotourism activities, development in these areas is a high constraint.
Recommendations	- Development is to ensure a "no nett loss" of biodiversity, with management measures and mechanisms put in place to conserve and/or enhance the biodiversity value of the land. No development should take place within areas of high biodiversity conservation value. - Development should utilise already transformed and/or heavily degraded land as far as possible. - Development must be planned and designed according to principles of conserving biodiversity by maintaining and/or enhancing biodiversity features onsite. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Indigenous species should be used in landscaping to retain some level of biodiversity value, and reduce irrigation requirements. - In areas of lower conservation value, the footprint should be limited as far as possible and design should be sensitive to valuable biodiversity features (habitat, species). - Applications should include an alien invasive management plan and a detailed biodiversity assessment in environmental authorisation processes.
Agriculture	
Constraint	Industry results in the complete and permanent alteration of productive capacity of land, and alters the water quality so that in certain cases it not suitable. This makes this a high level constraint when proposed in areas with high production potential.
Recommendations	- No transformation of on agricultural production areas.
Flood risk	
Constraint	Development within areas prone to flooding increases risk of damage to property, as does infrastructure constructed on unstable geology. Constructing on steep slopes also increases the cost.
Recommendations	- Avoid areas, areas prone to flooding (1:100 year floodline). - Undertake geotechnical survey and floodline delineation to inform feasibility and detailed planning.
Infrastructure	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted. A solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment

	facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	This activity is will reduce streamflow and base flow in high yield sensitive areas. Therefore any such activity should be avoided in these areas. However, this activity may proceed on condition of detailed specialist investigations in support of an environmental authorisation process. This will require the necessary specialist studies to assess the impact of the development on the water resource. Specialist studies should include, but not limited to, wetland delineation and functional assessment and/or a river ecosystem assessment, and a hydrological assessment.

Spatial Overview of Constraints



12.4 Light Industry

A zone that permits manufacturing uses which are compatible with land uses permitted in adjacent more sensitive land use zones, such as residential, mixed-use and open space zones. As a light industrial zone, it would permit manufacturing activities that usually do not involve significant vibration, noise, odor, or high volume of automobile and truck traffic. Warehousing of materials considered non-obnoxious or nonhazardous is permitted in buildings in this zone, with possible conditions. Outdoor storage, as an ancillary use, would be extremely limited if not outright prohibited. Office uses would be permitted with conditions in this zone i.e. with a Consent Use Procedure.

Development Constraints

The primary impacts are due to the footprint and associated loss of wetlands, habitat and productive land. It is also not suitable to develop infrastructure in areas of high flood potential, unstable geology or on steep slopes.

Environmental Features	Components	INDUSTRY
		32.LIGHT INDUSTRY
Wetlands	Wetland Footprint	4
	32m Buffer	3
	500m Buffer	2
	>500m from a wetland	1
Agriculture	High potential (Category A&B)	4
	Moderate potential (Category C)	4
	Restricted potential (Category D)	3
	Very restricted potential (Category E)	1
Infrastructure	High service Provision	1
	Moderate Service Provision	3
	Low Service Provision	3
	Very Low/No Service Provision	4
Water Quality		
Quinnary Catchments containing key water supply features	All such quinnaries	3
Proximal catchments influencing key supply features	with measured elevated pollutant concentrations	3
	with high potential for elevated pollutant concentrations	3
	with low pollutant concentrations	3
Distal catchments influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Catchments not influencing key supply features	with measured elevated pollutant concentrations	2
	with high potential for elevated pollutant concentrations	2
	with low pollutant concentrations	1
Flood zones	1:100 yr flood	4
Biodiversity	Protected area	4
	Critical Biodiversity Area (CBA)/Agro-Biodiversity Zone	3
	Ecological Support Area (ESA)/Environmental Management Zone	3
	Untransformed/Other natural areas	2
Water Yield	Very high water yield	3
	High water yield	2
	Moderate water yield	1
	Low water yield	1

Water Quality	
Constraint	This industry generates effluent with a range of point source pollutants. Given the state of water quality in the catchment, industry is constrained by this output wherever it is proposed in the development area where water quality is high priority.
Recommendations	- Any development application will need to prove clearly how the proposed effluent treatment and management measures will contribute to meeting the sustainability objective of improved water quality. At least no increase in loading of pollutants, particularly nutrients, sediments and microbiological contaminants. Water quality must not be compromised in any way and should be improved where possible. Only activities which have a negligible impact on water quality should be permitted in Water Quality 1 areas. These are typically activities that: - 1. do not generate large volumes of waste (activities associated with low numbers of people) and no waste should be discharged in critical catchments (Any waste generated in these areas must be treated and discharged outside of WQ1 areas), - 2. activities that do not carry a significant spill pollution risk (avoid fuel and hazardous substance storage and manufacture) and - 3. Activities with limited landscape disturbance (where sediment generation can be meaningfully controlled). 4. Any activity must at least abide by the requirements of any issued water use licence and the Resource Quality Objectives for the catchment.
Wetlands	
Constraint	Industry within wetlands destroys the habitat directly, while industry in the wetland buffer or catchment alters the hydrological regime which is the life blood of the system. The noise disturbance from operations also reduces the suitability of any habitat remaining within and adjoining the development site.
Recommendations	- No development should take place within wetland areas or within its buffer. - A sustainable Urban Storm water Design Principles should be applied in designing the storm water management plan. - A wetland rehabilitation and management plan must be a condition of applicable environmental and water use authorisations.
Terrestrial Biodiversity	
Constraint	Sensitive biodiversity areas include protected areas, critical biodiversity areas and agrobiodiversity zones. The primary impact is the conversion of large areas of natural vegetation to light industry. Apart from possible low impact ecotourism activities, other development in these areas is a high constraint.
Recommendations	- This activity must be avoided in high sensitivity areas (protected areas, critical biodiversity areas, agrobiodiversity zones). However, development applications need to confirm whether the area mapped as high value biodiversity warrants retention for other uses. - Where development does proceed, important to show how areas/features of biodiversity value have considered e.g. retention of natural areas/corridors through cropland. An EIA or Basic Assessment to be followed to establish impacts from the development and appropriate mitigation and offset measures should be implemented. - An alien invasive plant management plan must be a condition of planning approval. - In Ecological Support areas may be maintained and managed as agricultural landscapes that encourage biodiversity through linkages and corridors that connect protected areas. The agricultural component should rely on uncultivated/fallow land by avoiding ploughing of virgin land
Agriculture	
Constraint	Industry results in the complete and permanent alteration of productive capacity of land, and alters the water quality so that in certain cases it not suitable. This makes this a high level constraint when proposed in areas with high production potential.
Recommendations	- No transformation of on agricultural production areas.
Flood risk	
Constraint	Development within areas prone to flooding increases risk of damage to property, as does infrastructure constructed on unstable geology. Constructing on steep slopes also increases the cost.
Recommendations	- Avoid areas, areas prone to flooding (1:100 year floodline).

	- Undertake geotechnical survey and flood line delineation to inform feasibility and detailed planning.
Infrastructure	
Constraint	The development of such facilities makes it inappropriate to establish in an area with no to very low service provision. The lack of infrastructure resources such as roads, water, waste collection, sanitation and electricity will put increasing pressure on natural resources leading to pollution on sensitive environments and water resources.
Recommendations	- All development applications must consider increased costs to allow for infrastructure services development. High Infrastructure need developments must confirm the planned provision of various services with the municipal and town planning officials. Further consultation will be required with Water Services Authority, Department of Transport and Eskom for future and planned projects that can address certain low service provision. All applicable consent procedures to include a detailed waste management plans, and detailed energy and water efficiency methods to reduce any negative impact on natural resources. - Further recommend to conform to national green building standards, national building standards, use of alternative energy efficient sources, and water efficiency technologies. No illegal waste dumping permitted a solid waste management plan must be developed. - The development application must show that the most appropriate sewage treatment facilities for containment and treatment before release to the natural environment will be established. The level of treatment should exceed standards to assist in working towards a state of improved water quality (in terms of nutrients and bacterial quality). - Sustainable urban storm water design (SUDS) principles should be applied to reduce the volumes and intensity of water runoff from the development area.
Water Yield	
Constraint	Development is specifically constrained in high water yield areas which include catchments that produce very high annual streamflow and/or dry season base flow, catchments that flow into main water supply dams or catchments that have a very high/high ecological importance and ecological sensitivity (EI ES)
Recommendations	Ensure that the ecological Reserve is maintained such that aquatic ecosystems will continue to supply goods and services to society. Ensure the development is flood neutral and does not result in significant hydrological alteration. Avoid streamflow reduction activities (e.g. plantation forestry and dryland agriculture). Development (e.g. dam) is not permitted; unless the social economic value is assessed in relation to aquatic ecosystems (i.e. the social economic value of the dam must then be significantly greater than the importance of aquatic ecosystems). Maintain and/or enhance ecological infrastructure (wetlands, riparian areas, grasslands, etc.) to improve water supply to downstream users and safeguard ecological requirements. Ensure adequately sized buffers for aquatic ecosystems are maintained and/or reinstated, and managed in an optimum, natural/near natural condition (i.e. good vegetation cover free of alien vegetation).

Spatial Overview of Constraints