Royal HaskoningDHV
Enhancing Society Together





Cornubia Mixed-Use Phased Development, Phase 2, Mount Edgecombe

Draft Environmental Impact Assessment Report

24 November 2014

KZN EDTEA Reference No.: DM/0030/2012

ETHEKWINI MUNICIPALITY

Tongaat Hulett DEVELOPMENTS

CORNUBIA
Building Tomorrow

Document Description

Client:

Tongaat Hulett Developments and eThekwini Municipality

Project Name:

Environmental Impact Assessment for the Proposed Cornubia Mixed-Use, Phased Development, Phase 2, Mount Edgecombe

Royal HaskoningDHV Reference Number:

E02.DUR.000375

Authority Reference Number:

DM/0030/2012

KZN/EIA/000762/2012

Compiled by:

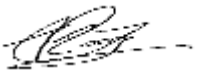
Humayrah Bassa

Date:

24 November 2014

Location:

Durban

Reviewed by:	Signature:
Prashika Reddy *(Pr.Sci.Nat.)*	
Approved by:	**Signature:**
Malcolm Roods *(EAPSA)*	

REVIEW OF THE
DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

This Draft Environmental Impact Assessment Report is available for comment for a period of ***40 days*** (excluding the December vacation period) from **Monday, 24 November 2014** until **Monday**, **26 January 2014**. Copies of the Environmental Impact Assessment Report are available at strategic public places in the project area (see below) and upon request from Royal HaskoningDHV. The report is available for viewing at:

- Libraries
  - Phoenix Library - Playpark Place, Shastri Park, Phoenix
  - Umhlanga Library, 4 Lagoon Drive, Umhlanga
  - Verulam Library, 8 Groom Street, Verulam
- Councillors' offices
  - Cllr Mxolisi Ndzimbomvu, Ward 58, Support Centre, 187 Woodpecker Rd, Waterloo
  - Cllr Musa Dludla, Ward 102, Room 102, White House Shopping Centre Mt Edgecombe
  - Cllr Solly Singh, Ward 50, Suite 3, 1st Floor, Gem City, 80 Parthenon Street, Phoenix
  - Cllr Patrick Pillay, Ward 61, Suite 3, 1st Floor, Gem City, 80 Parthenon Street, Phoenix
  - Cllr Heinz de Boer, Ward 35, SizakalaCentre327 Umhlanga Rocks Drive, Umhlanga Rocks
- Mount Edgecombe Country Club
- Tongaat Hulett Developments Offices: 305 Umhlanga Rocks Drive, La Lucia
- Royal HaskoningDHV Website: www.rhdhv.co.za/pages/services/environmental.php

OPPORTUNITIES FOR PUBLIC REVIEW

The following methods of public review of the Environmental Impact Assessment Report are available:

- Completing the comment sheet enclosed with the Background Information Document (BID);
- Written submissions by e-mail or fax; and/or
- Telephonic submissions.

DUE DATE FOR COMMENT ON DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT
MONDAY 26 JANUARY 2014

SUBMIT COMMENTS AND QUERIES TO

Ms. Humayrah Bassa
Royal HaskoningDHV
6 Payne Street, Pinetown, 3606
Tel: (031) 719 5551
Fax: (031) 719 5505
E-mail: humayrah.bassa@rhdhv.com

Executive Summary

Introduction and Background

Tongaat Hulett Developments and the eThekwini Municipality, on their own respective properties, propose to develop a mixed-use, phased development on the remainder of Cornubia. The Cornubia Phase 2 site area is located west of the N2 toll road and north of the Mount Edgecombe/ M41 freeway within eThekwini Municipality.

The Cornubia Mixed-Used Phased Development (hereafter referred to as the Greater Cornubia Development) aims to leverage, assemble, and systematically align multiple institutional, financial, human and managerial resources, in a creative and innovative manner, covering aspects such as informal settlement eradication, inter-and intra-settlement integration, urban restructuring and renewal, densification, tenure diversification, improved settlement design, better quality shelter, poverty eradication, and greater responsiveness to livelihood strategies. The Greater Cornubia Development is about "Breaking New Ground" through the creation of Integrated Human Settlements. These are key components of Cornubia and relate directly to the strategic mandate of Government, its constitutional obligations and the priorities of creating a better life for all.

The above proposal is based upon the Cornubia Development Framework Plan for the Greater Cornubia Development which was accepted by the eThekwini Municipality for the Greater Cornubia Development in 2011. Due to the extent of the development, it is being developed in a phased manner. This Environmental Impact Assessment Process is for the remainder of Cornubia, referred to as Cornubia Phase 2 which is separate to the Cornubia Phase 1 (DM/Amend/0189/08) and Cornubia Retail Park (DM/Amend/0034/2014) Environmental Impact Assessments for which Environmental Authorisations have been obtained and construction has commenced at these sites.

The Cornubia Phase 2 site area of approximately 895 ha is approximately 70% of the total land area of the entire Cornubia Development (some 1 333 ha). Based upon the accepted Cornubia Development Framework Plan, approximately 531 ha of the site is developable with the remaining 392 ha comprised of open space. The Cornubia Development Framework Plan suggests that the Phase 2 development will consist of Breaking New Ground Housing units together with associated social facilities (all of which the eThekwini Municipality will be developing in partnership with other government departments); an industrial and commercial/ mixed-use component; a component of integrated, middle income housing including mixed-use and a substantial amount of rehabilitated open space developed on a phased basis over the next 10-20 years. This Environmental Impact Assessment Report is based broadly on the Cornubia Development Framework Plan already approved for Cornubia as well as the Cornubia Phase 2 Land Use Management Precinct Plan. It is noted that there are two primary landowners included in Cornubia Phase 2 – eThekwini Municipality who own 581 ha, and Tongaat Hulett Developments who own 314 ha.

In addition, the construction of three interchanges (i.e. Blackburn Interchange, Marshall Dam Interchange and R102 / Northern Drive Interchange) are proposed and have been assessed. There are various additional landowners for these interchanges as presented in this report.

The report has been structured to comply with the format required by the EIA Regulations (2010)(as amended). The contents are as follows:

Chapter	Content
Chapter 1 Introduction	Introduction and overview of the proposed project, including the status of previous phases of Cornubia which have been authorised and details of the proponent and EAP
Chapter 2 Environmental Legal Requirements	Provides the environmental legal framework and the approach to the integrated regulatory process
Chapter 3 Project Context	Contextualises the study area, outlines the need for and motivation of the proposed project, provides the spatial informants and framework and introduces the social sustainability and innovation programme
Chapter 4 Description of the Receiving	A description of the biophysical and social environment

Chapter	Content
Environment	
Chapter 5 Project Description	Includes a description of the proposed activities and engineering services proposed
Chapter 6 Project Alternatives	Consideration of alternatives (design/layout, site and do-nothing) for the project
Chapter 7 Findings of the Specialist Assessments	An overview of the findings of the various specialist reports undertaken for this project
Chapter 8 Public Participation Process	Overview of the public participation process conducted to date
Chapter 9 Environmental Impact Assessment	Methodology used in the assessment of significant impacts and a description of the environmental impacts on the biophysical and social environment and a rating of these impacts
Chapter 10 Environmental Impact Statement	A comparative assessment of the positive and negative impact of each alternative and a statement as to the significance of the environmental impacts assessment
Chapter 11 Conclusion and Conditions of Authorisation	Conclusions and recommendations of the Environmental Impact Study

Regulatory Environmental Requirements

The KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, is the lead authority and any Environmental Impact Assessment process in KwaZulu-Natal needs to be authorised by this Department in accordance with the National Environmental Management Act (NEMA) (No 107 of 1998)(as amended).

The Environmental Impact Assessment Regulations (2010) under NEMA consist of three categories of activities namely: Listing Notice 1 Activities (GNR. 544 of 2010) which require a Basic Assessment study, Listing Notice 2 Activities (GNR. 545 of 2010) which require both a Scoping and an EIA study for authorisation and Listing Notice 3 Activities (GNR 546 of 2010) which require a Basic Assessment study to be undertaken in specific geographical areas.

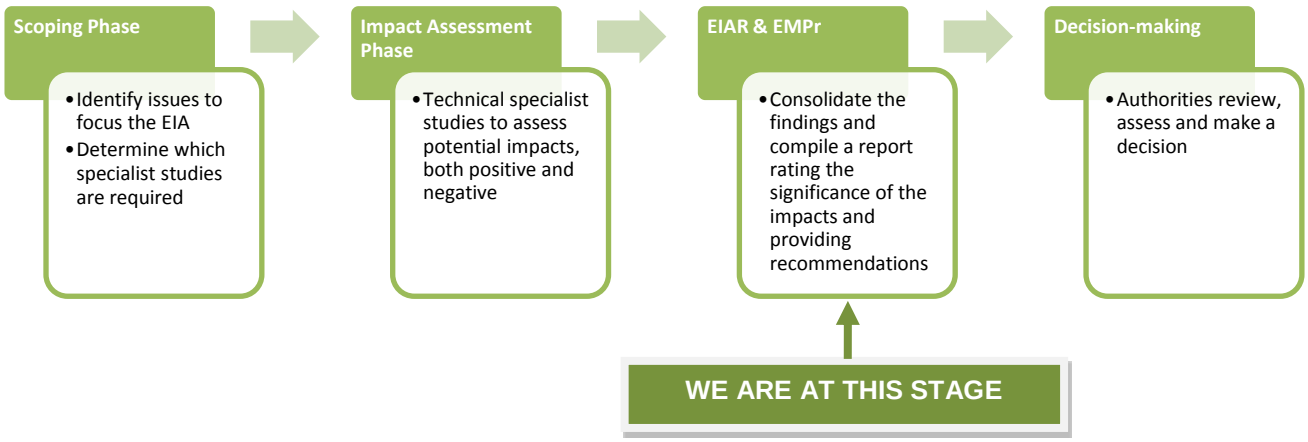
The activities associated with the proposed project, amongst others, triggered activities contained in GNR 545 and as such a Scoping and EIA process will be undertaken for the development.

Public Participation Process

Real Consulting is working with Royal HaskoningDHV on the Public Participation Process (PPP) for the Cornubia Project. Royal HaskoningDHV (previously known as SSI Engineers and Environmental Consultants) are conducting the Public Participation Process for this project. In recent years Tongaat Hulett Developments has actively promoted a participatory approach to their property development projects, with the understanding that the socio-political and economic context as well as environmental legislation requires this public engagement and consultation. Interested and affected parties are invited to “inform and be informed” about developments in order to achieve the widest possible participation. It is also noted that engaging stakeholders even before developments are built can be seen as best environmental practice. It is for this reason that the Public Participation Process which forms part of the EIA becomes the basis of a long-term stakeholder engagement process.

Environmental Impact Assessment Report and Purpose of the Report

In line with the requirements of the National Environmental Management Act (No 107 of 1998)(as amended) Environmental Impact Assessment Regulations, this Environmental Impact Assessment Report provides a detailed description of the pre-development environment, specifically in terms of the biophysical and socio-economic environment of the study area. Furthermore, the report provides a comprehensive description of the activities as well as numerous specialist studies undertaken for the Environmental Impact Assessment Phase and Public Participation Process, as well as the way forward in the form of conclusions, recommendations and a draft Environmental Management Programme.



To ensure the completeness of the Environmental Impact Assessment and draft Environmental Management Programme, specialists surveyed the area to identify the potential impacts of the project on the area. The following specialist studies were conducted for the Cornubia Phase 2 Development and are included within the Appendices of this Environmental Impact Assessment Report:

Specialist Study	Organisation
Agricultural Potential Assessment	Mottram and Associates
Geotechnical Investigation	Drennan, Maud & Partners
Heritage Assessment	eThembeni Cultural Heritage
Vegetation Assessment	SiVEST
Wetland Assessment	SiVEST
River and Estuary Report	Marine and Estuarine Research
Social Impact Assessment	Real Consulting
Socio-economic Study	Jeff McCarthy
Traffic Impact Assessment	Hatch GOBA
Attenuation Facilities within Wetlands Report	SMEC South Africa

In addition to the above specialist studies, the following reports have been prepared in support of the EIA study:

Specialist Study	Organisation
Urban Planning Report	Iyer Urban Design Studio
Engineering Services Report	SMEC South Africa
Electrical Services Report	Bosch

Alternatives

No offsite or other site alternatives have been investigated given the fact that the development proposal is a massive new integrated human settlement development project being undertaken in collaboration and partnership between the existing landowners and its strategic location and positioning within the region dictate the dire need, urgency and desirability of the development. Furthermore, all other alternative potential land in the region is earmarked for similar type of development going forward with much of it being assessed in separate EIA processes.

There has equally been no investigation into land use alternatives given the nature of the development as an integrated human settlement development and the existing physical, legal and technical constraints on site which has directed the spatial planning. Further to this is the fact that the eThekwini Municipality and Tongaat Hulett Developments undertook a lengthy and detailed planning process that ultimately resulted in the Cornubia Development Framework Plan being formally adopted by the eThekwini Municipality.

It was this Cornubia Development Framework Plan that enabled the approval and development of the Cornubia Pilot Housing Phase, Cornubia Phase 1 and the Cornubia Retail Park and which has also directed the more detailed precinct layout for Phase 2 which is the subject of this application.

It must be reiterated that any proposed development within Cornubia is required to be aligned, in broad terms, with the accepted Cornubia Development Framework Plan. Given these critical constraints together with the extent of land required, the potential site locations for such a development, within the broader region are limited.

The Cornubia Development Framework Plan has been based upon a number of, in essence, existing constraints including topography, geology, water resources, existing servitudes and services, roads and rail links and limited access and linkage opportunities. As such there is limited scope for alternatives related to the primary structure of the Cornubia Development Framework Plan. Without doubt each and every potential access opportunity has been utilised together with identifying potential new linkages to existing and future development in the region.

It is therefore acknowledged that the Cornubia Development Framework Plan structure is sound and, critically, delivers upon the strategic objectives that have been identified by both Tongaat Hulett Developments and the eThekwini Municipality. Furthermore, it should be noted that the two parties have spent a considerable amount of time and effort in the planning and contextualisation of the development and there is broad acceptance that the Cornubia Development Framework Plan (at a principle level at least) is appropriate and will add value to the region and enable the Greater Cornubia Development to fulfil its regional responsibilities, objectives and mandate.

The accepted Cornubia Development Framework Plan was finalised in February 2011. Whilst every effort has been made to ensure alignment with this Plan, it must be reiterated that the Cornubia Development Framework Plan is a high-level plan intended to strategically guide the overall development intent of the Greater Cornubia Development. Given the fact that no detailed assessment was undertaken for the main roads in the Cornubia Development Framework Plan, with the level of detail that has now become available, there have been a number of minor adjustments to the main road framework, specifically around Cornubia Boulevard, Dube East, Dube West and Blackburn Link.

Through the course of the development, as land use plans for surrounding regions have evolved, as lessons have been learnt from earlier phases and after many meetings between the Developer, Engineers, Urban Planners, various technical specialists and scientists and various service authorities, the Cornubia Phase 2 Land Use Management Precinct Plan was developed.

With the more detailed assessment and now the proposal to develop Cornubia Phase 2, the proposed Cornubia Phase 2 Land Use Management Precinct Plan includes the next level of road network which links into the main arterial network. In all other respects, the proposed plan aligns with the adopted Cornubia Development Framework Plan.

The adjustments to the main road network and the inclusion of the next level of road network have all been fully assessed as part of this Environmental Impact Assessment.

Two options are presented as part of the Precinct Plan for Cornubia Boulevard between the N2 and Dube West. It is proposed that both options be authorised in order to enable the Applicants to make a final decision at the appropriate time ahead of construction and development occurring. The differences between the 2 options relate to the width of the road reserve. The development footprint does not change neither does the quantum of units or bulk. The one option (Type A) provides for development within the median and smaller adjacent properties whilst the second option (Type B) provides for a narrower road reserve with larger adjacent properties.

Several land use alternatives were considered by the design team in consultation with the service authorities. However, whilst many alternatives were considered, only the most feasible alternatives have been integrated into the current proposed Cornubia Phase 2 Land Use Management Precinct Plan. Hence, no other land use alternative will be presented in the EIA, as the current plan satisfies the objectives of Cornubia and all service authorities whilst aligning with environmental and technical considerations. Furthermore, the eThekwini Municipality is responsible for decisions pertaining to land use within the Municipality and hence there is no further reason to consider alternative land use options. Furthermore, given that the entire Development Framework is to be developed over time, there is no rationale to consider alternative site locations.

The No-Go option involves retaining the existing land use i.e. agriculture. The property would remain under sugarcane cultivation, and would continue to operate as a working sugarcane farm. The Cornubia site and its

soils offer reasonable value agricultural potential but the context and prime location of the site within the broader region necessitates the transformation of the land use for the greater societal good. Furthermore, it is noted that urban agriculture is proposed within Cornubia as part of the Cornubia Social Sustainability and Innovation Programme (SSIP). Presently members from the recently established community at Cornubia are being mentored and trained to act as community growers and to engage in market gardening. Tongaat Hulett, who currently farm this land, have been proactive with regard to the replacement of agricultural land lost (which loss will be gradual over a number of years) in more, long-term and more appropriate locations. It must be reiterated that this is a mixed-use development that entails a huge component for housing; as such the no-go alternative will prevent all the positives that can be associated with housing developments as well as for economic growth. This option does not facilitate integration nor does it address the housing backlog and opportunity to redress the spatial planning imbalances of apartheid.

It should also be noted that the current farm estate has already been impacted upon by the Cornubia Phase 1 development and as development increases there will be increasing pressures and the associated difficulties of farming land that is surrounded by development.

Two design and construction method alternatives have been considered and assessed during the Environmental Impact Assessment as follows:

- Stormwater attenuation facility alternatives (i.e. stormwater attenuation facilities within wetlands or stormwater attenuation facilities outside wetlands but within the 30 m wetland buffers); and
- Surplus fill material site alternatives (i.e. location of three surplus fill material sites at Cornubia Phase 2 or haulage off-site for disposal).

As part of the Cornubia SSIP programme, it is proposed to utilise portions of wetland buffer areas for small scale urban agriculture as well as for more formalised recreational opportunities in the form of linear parks. This is an alternative to the option of solely utilising the buffers for ecological purposes and is limited to only the most degraded systems. The core wetland areas in all options would be rehabilitated and maintained as wetlands.

Furthermore, significant quantities of surplus fill material are expected to be produced during construction activities for Cornubia Phase 2, due to a number of factors including inter alia the topography and poor soil quality (for construction purposes) within the area. The challenge within the context of the development lies in how to ensure the amount of surplus fill material can be minimised through re-use, reduction and/or recycling, so as to make it easier and more cost effective for the Developers to deal with it whilst taking cognisance of the natural environment and environmental legislation in South Africa.

Environmental Impact Assessment

The impact of the project activities was determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment has considered all phases of the project namely, construction phase and operational phase. It is not anticipated that the proposed infrastructure will be developed in the short-medium term and the date of decommissioning is unknown. Therefore, the decommissioning impacts have not been considered.

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. During the Environmental Impact Assessment, the impact of the Cornubia Phase 2 Development on the biophysical and socio-economic environments was assessed. It was this assessment that enabled the Environmental Assessment Practitioner to make an informed analysis and provide an opinion of the proposed development.

Key Findings

A considerable amount of planning has gone into the formulation of the Cornubia Phase 2 Precinct Plan which has been informed by rigorous scientific assessments, strategic discussions with many stakeholders and lessons learnt from earlier phases of Cornubia presently under occupation or construction.

The most notable impact as a result of the proposed development is the loss to wetland habitat. It is proposed that 27.59 ha of degraded wetland area (which includes Cornubia Phase, Cornubia Retail Park and the N2 Cornubia Bridge and Interchange) be infilled in order to enable the creation of a sufficiently large platform area and service infrastructure that will accommodate the extensive development proposed. Given the extremely degraded state of most of the wetland units across the site, it is proposed that the rehabilitation of the remaining wetlands on site will lead to a significant improvement in the ecological goods and services being provided by the wetlands in the long-term. To this end, 99.25 ha of wetland area is earmarked for rehabilitation as part of the Cornubia Phase 2 Wetland and Open Space Rehabilitation Plan. This as a result, exceeds the 1:3 offset requirements as proposed by Ezemvelo KZN Wildlife.

Stormwater management and attenuation also remains a high priority for a development of this nature. The specialist studies have shown that mitigation of the potentially negative effects of the proposed development with regard to storm events can be successfully mitigated through the implementation of the policy, regulations and guidelines contained in the Stormwater Management Plan, as well as the specific recommendations given in the specialist reports. The case for the placement of stormwater attenuation measures within wetlands or within the wetland buffers have been assessed. Whilst the location of stormwater attenuation facilities within wetland units are more viable in terms of reduced earth-works and lower capital costs, it has been found that the installation of stormwater attenuation facilities within wetlands results in a loss of wetland area. All stormwater attenuation facilities presently proposed to be located within wetland units therefore cannot be accommodated as the required wetland offset ratio of 1:3 will not be maintained. Therefore, stormwater attenuation facilities can only be accommodated within 4.12 ha of wetlands. . Consequently, the stormwater engineers must investigate the option of some (maximum of 4.12 ha) 'within' wetland facilities, and some 'outside' wetland facilities, in an attempt to balance costs and wetland losses. Furthermore, additional investigation is required by the stormwater engineers to investigate the cost impacts of on-site attenuation through the use of alternative materials, such as porous paving systems, and on-site tank attenuation facilities.

From an ecological perspective, to ensure the long-term sustainability and integrity of the open space network, it is important to ensure the local community at Cornubia can utilise this space in a responsible and resilient manner. Therefore, as part of the Cornubia SSIP, it has been proposed that the wetland buffers be used for market gardening opportunities by the local community as well as for green linear walkways and trails. The Developers have committed to maintaining a 10 m ecological buffer directly adjacent to the wetland, however, the remaining 20 m buffer will be utilised for communal benefit. Whilst some concerns pertaining to possible siltation of the wetland have been noted, it has been found that with appropriate mitigation measures, this impact is of medium significance. Moreover, the overwhelming positive impact of utilising this space for communal benefit in the long-term necessitates the use of these buffers.

An additional challenge for the project will be the re-use and recycling of surplus fill material. In an effort to address the matter in a strategic and practical manner, the Developers, together with their specialist team, have embarked on the formulation of a management plan for the surplus fill material for the Greater Cornubia Development. Whilst the level of detail required for such a plan is not available at the pre-construction phase, the formulation of the Soil Management Framework Strategy presented in this EIA is a positive step towards this. Whilst many options have been presented in the Strategy, to ensure the beneficial end-use of surplus fill material, surplus fill material sites are required – three sites have been proposed and assessed in this study. Whilst there are negative implications for the establishment of such sites, upon decommissioning they will be rehabilitated and integrated into the open space network according to the Cornubia Phase 2 Wetland and Open Space Rehabilitation Plan.

From a biodiversity point of view, it is envisaged that the construction of roads and development of fill embankments will result in a minor loss of vegetation deemed to be of low significance post mitigation. The loss of the indigenous vegetation, which for the most part only forms a small component of the entire biomass of the individual areas, will be offset and mitigated by the planting of indigenous woody vegetation that is commonly occurring in the area into the open space network that is proposed for Cornubia Phase 2. Furthermore, the applications for necessary DAFF licence and Ezemvelo KZN Wildlife Permits have been initiated.

This EIA study has also been cognisant of the Greater Cornubia Development and the subsequent alignment of the Cornubia Phase 2 LUM Precinct Plan with the accepted Cornubia Development Framework Plan. The proposed Cornubia Phase 2 development, therefore, cannot be viewed in isolation and the cumulative impacts have been identified and addressed.

Conclusion

The Greater Cornubia Development is a significant development within the context of the eThekwini Municipality, province of KwaZulu-Natal and potentially South Africa. The site's location, situation and its surrounding context dictates that it has to fulfil a number of strategic governmental objectives which will have a regional impact.

In line with the requirements of the National Environmental Management Act (No 107 of 1998)(as amended) Environmental Impact Assessment Regulations, this Environmental Impact Assessment Report has provided a description of the Cornubia Development Framework and its associated activities including a detailed Land Use Management Precinct Plan for Cornubia Phase 2. In addition, an explanation of the activities undertaken during the EIA Phase and PPP was also provided. Importantly the report addresses the impacts identified during the scoping phase that were anticipated for the development, as well as providing mitigation measures to ensure for the environmentally sustainable development of Cornubia.

The development of Cornubia, in the preferred mix of land uses as part of an Integrated Human Settlement, will see the provision of a substantial amount of new housing opportunities for thousands of families who are currently living in poor conditions across the city. A core component of the Integrated Human Settlement approach is the provision of employment and economic opportunities, again at an appropriate scale, which will provide support and new urban opportunities for both the new residents as well as for those residing in the surrounding communities.

The transformation of the land to enable the development of Cornubia is therefore not only inevitable but a necessity and will ultimately provide a significant overall societal gain including environmental, social and economic benefits which will provide the basis for a value adding, sustainable development.

There is a huge need for new industrial space in the city and the need for new subsidised housing is unquestionable. Cornubia Phase 1 has already delivered 482 housing units in the short-term with additional units expected for delivery in May/June 2015. Cornubia Phase 2 has learnt from the lessons of earlier phases and this Environmental Impact Assessment responds to many of the challenges encountered during the construction phases for Cornubia Phase 1 and the Cornubia Retail Park respectively.

Whilst Cornubia Phase 2 will see some 'negative' impacts on environmental resources, many of these are to be expected as part of any construction activity, the development will enable the rehabilitation and management of a substantial amount of open space, providing such space is an integral component of the development and instituted in a manner that allows appropriate utilisation by the resident community.

The open space plays an important role within the development. Careful planning has created value by incorporating the open space within the design conceived in a manner that serves as a lattice that allows for continuity for habitat and for recreational purposes. A focus on public transportation is a key priority for Cornubia Phase 2. The development allows for a range of public transportation modes and is aligned with the Integrated Rapid Public Transport Networks and Bus Rapid Transport depots are proposed within Cornubia Phase 2.

Sustainability is a key objective and the mixed-use and high density planning will go a long way, in conjunction with the overall societal gain, towards providing a platform for sustainability. Furthermore, the formalisation of the Cornubia Social Sustainability and Innovation Programme is the first step to delivering on the promises and ideals laid forth for Cornubia.

Holistically, almost all communities likely to be affected are excited and enthusiastic about the Greater Cornubia Development, noting the positive potential in terms of housing opportunities, employment and business opportunities, access to social amenities and overall development of the northern and western corridors.

The results of the Cornubia Phase 2 assessment show overwhelmingly the positive overall impact from a sustainable development perspective with the development providing economic and employment opportunities, housing and social facility opportunities as well as the rehabilitation of a significant quantum of natural habitat and biodiversity.

Table of Contents

List of Tables

Table of Figures

List of Appendices

Glossary

Activity (Development)	An action either planned or existing that may result in environmental impacts through pollution or resource use. For the purpose of this report, the terms 'activity' and 'development' are freely interchanged.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.
Applicant	The project proponent or developer responsible for submitting an environmental application to the relevant environmental authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Breaking New Ground	An initiative by the National Department of Human Settlements in order to establish benchmark Integrated Human Settlement developments around the country.
Buffer	A buffer is seen as an area that protects adjacent communities from unfavourable conditions. A buffer is usually an artificially imposed zone included in a management plan.
Bus Rapid Transport	A high performance public transport bus service which aims to combine bus lanes with high-quality bus 'stations', vehicles, amenities and branding to achieve the performance and quality of a light rail or metro system, with the flexibility, cost and simplicity of a bus system.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
Cumulative Impact	The impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.
Decommissioning	The demolition of a building, facility, structure or infrastructure.
Direct Impact	Impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.
Ecological Reserve	The water that is necessary to protect the water ecosystems of the water resource. It must be safeguarded and not used for other purposes. The Ecological Reserve specifies both the quantity and quality of water that must be left in the national water resource. The Ecological Reserve is determined for all major water resources in the different water management areas to ensure sustainable development.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous.
Environment	In terms of the National Environmental Management Act (NEMA) (No 107 of 1998)(as amended), "Environment" means the surroundings within which humans exist and that are made up of:

	i. the land, water and atmosphere of the earth; ii. micro-organisms, plants and animal life; iii. any part or combination of (i) of (ii) and the interrelationships among and between them; and iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Assessment	The generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.
Environmental Authorisation	An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.
Environmental Control Officer (ECO)	An individual nominated through the Client to be present on site to act on behalf of the Client in matters concerning the implementation and day to day monitoring of the EMPr and conditions stipulated by the authorities.
Environmental Impact	Change to the environment (biophysical, social and/ or economic), whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.
Environmental Impact Assessment (EIA)	In relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application as defined in NEMA.
Environmental Issue	A concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.
Environmental Management	Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.
Environmental Management Programme (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.
Fatal Flaw	An event or condition that could cause an unanticipated problem and/or conflict which will could result in a development being rejected or stopped.
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater run-off are supplied.
Hazardous Waste	Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles as outlined in the National Environmental Management: Waste Amendment Act (No 26 of 2014).Schedule 3: Category A - Hazardous Waste.
Hydrology	The science encompassing the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Indirect Impacts	Indirect or induced changes that may occur as a result of the activity. These types if impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Integrated Environmental Management	A philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision-making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity - at local, national and international level - that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).
Interested and Affected Party (I&AP)	Any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.
Method Statement	A method statement is a written submission by the Contractor to the Engineer in response to the specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting a Method Statement. It contains sufficient detail to enable the Engineer to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.
Mitigate	The implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.
No-Go Option	In this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.
Non-motorised Transport	All forms of movement that are human powered such as cycling, walking etc. This form of movement is encouraged and shift people away from the use of private motor vehicles.
Planning and Development Act	The KwaZulu-Natal Planning and Development Act, 2008 (Act No. 6 of 2008) (PDA) directs and regulates planning and development in the Province and ensures that all planning and development decisions now occur at municipal level.
Pollution	The National Environmental Management Act, No. 107 of 1998 defines pollution to mean any change in the environment caused by – substances; radioactive or other waves; or noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.
Public Participation Process	A process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.
Re-use	To utilise articles from the waste stream again for a similar or a different purpose without changing the form of properties of the articles.
Rehabilitation	A measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.
Sand Mining	Sand mining is the activity of extracting sand from the earth for the purpose of commercial sale and/or use.
Scoping	The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addresses in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues

	and reasonable alternatives are examined.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value judgements and science-based criteria (i.e. biophysical, social and economic).
Stakeholder Engagement	The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.
Surplus Fill Material	Layers of topsoil and subsoil obtained through earth-works which is in excess and cannot be accommodated an engineering fill due to the excess and/or geological content.
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
Watercourse	Defined as: i. a river or spring; ii. a natural channel or depression in which water flows regularly or intermittently; iii. a wetland, lake or dam into which, or from which, water flows; and iv. any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998) and a reference to a watercourse includes, where relevant, its bed and banks.
Water Pollution	The National Water Act, 36 of 1998 defined water pollution to be the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it – less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful (aa) to the welfare, health or safety of human beings; (bb) to any aquatic or non-aquatic organisms; (cc) to the resource quality; or (dd) to property”.
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.

Acronyms

ADD	Average Daily Demand
ADF	Average Daily Flow
AMSL	Above Mean Sea Level
BEE	Black Economic Empowerment
BNG	Breaking New Ground
BRT	Bus Rapid Transport
BRU	Bio Resource Unit
CBD	Central Business District
CBR	California Bearing Ratio
CIBE	Cornubia Industrial and Business Estate
CIHD	Cornubia Integrated Housing Development
CMA	Catchment Management Agency
CV	Curriculum Vitae
DAF	Dry Attenuation Facility
DAFF	Department of Agriculture, Fisheries and Forestry
dB	Decibels
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EGL	Existing Grade Level
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
EMS	Environmental Management System
ENPAT	Environmental Protection Atlas
EO	Environmental Officer
ESR	Environmental Scoping Report
ETA	eThekwini Traffic Authority
eTM	eThekwini Municipality
EWS	eThekwini Water and Sanitation
FAR	Floor Area Ratio
GIS	Geographic Information System
HGM	Hydrogeomorphic Unit
I&AP	Interested and Affected Party
ICB	Interim Certification Board
IDP	Integrated Development Plan
IWULA	Integrated Water Use Licence Application
KZN	KwaZulu-Natal
LAP	Local Area Plan
LIDP	Local Integrated Development Plans
LOS	Level of Service
LUM	Land Use Management
MAR	Mean Annual Run-off
mast	Meter Above Sea Level
MSL	Mean Sea Level
NEM:WA	National Environmental Management – Waste Act (No 59 of 2008)

NEMA	National Environmental Management Act (No 107 of 1998)
NFA	National Forests Act (Act No. 84 of 1998)
NUDC	Northern Urban Development Corridor
NWA	National Water Act (No 36 of 1998)
PDA	Planning and Development Act (no 30 of 2000)
PES	Present Ecological State
POS	Plan of Study
PPE	Personnel Protective Equipment
PPP	Public Participation Process
PT	Public Transport
QBS	Quality Bus Service
RHDHV	Royal HaskoningDHV
ROW	Right of Way
RSA	Republic of South Africa
SACNASP	South African Council of Natural Science Professionals
SANRAL	South African National Roads Agency Limited
SASA	South African Sugar Association
SDF	Spatial Development Framework
SFMS	Surplus Fill Material Site
SMME	Small Medium and Microenterprise
SMP	Stormwater Management Plan
SSIP	Social Sustainability and Innovation Programme
SUDS	Sustainable Urban Drainage System
THD	Tongaat Hulett Developments
TIA	Traffic Impact Assessment
TOD	Transit Orientated Development
VAT	Value Added Tax
WML	Waste Management Licence
WUL	Water Use Licence
WWTW	Waste Water Treatment Works

1 INTRODUCTION

1.1 Background

The Greater Cornubia Mixed-Used Phased Development (hereafter referred to as the "Greater Cornubia Development") is an initiative of the eThekwini Municipality (eTM) and Tongaat Hulett Developments (THD) which aims to leverage, assemble, and systematically align multiple institutional, financial, human and managerial resources, in a creative and innovative manner, covering aspects such as informal settlement eradication, inter-and intra-settlement integration, urban restructuring and renewal, densification, tenure diversification, improved settlement design, better quality shelter, poverty eradication, and greater responsiveness to livelihood strategies. The Greater Cornubia Development[1] is about "Breaking New Ground" (BNG) through the creation of Integrated Human Settlements. These are key components of the development and relate directly to the strategic mandate of Government, its constitutional obligations and the priorities of creating a better life for all.

Integrated Human Settlements provide living and work opportunities for the broad spectrum of society, from the poorest to the wealthy, in a modern South Africa. The Greater Cornubia Development presents an ideal opportunity of delivering an integrated human settlement which not only provides housing and services but also delivers on commercial, retail and industrial opportunities as well as recreational and social facilities.

Due to the Development's strategic location, it provides a unique and significant opportunity to create meaningful and viable new east-west and north-south linkages and the integration of peripheral areas into the urban economy, as well as address the integration of the City and redress imbalances of apartheid planning. The planning and development of Cornubia is, therefore, not solely about Cornubia but involves, fundamentally, the surrounding region e.g. Umhlanga Ridge, Sibaya, Dube TradePort/King Shaka International Airport, Tongaat and beyond.

The Greater Cornubia Development is an initiative that will eventually involve more than R24 billion investment in roads, bridges and service infrastructure, will house over 100 000 people and create more than 48 000 new permanent jobs, with more than 15 000 construction jobs sustained over a 15 year period. In addition, the proposed development is expected to bring in a minimum of R300 million in rates revenue per annum for the eTM with other public benefits including Value Added Tax (VAT) of R2,1 billion and tax receipts of a further R0,8 billion during the construction phases only. These estimates are based upon the high-level Cornubia Development Framework Plan (Figure 1-1) for the Greater Cornubia Development which was accepted by the eTM in 2011.

The Cornubia Development Framework Plan was developed taking into account current social and economic conditions, informed by the need to ensure that the development contributes to the integration and effectiveness of the City's urban structure, form and functioning, particularly in respect of the northern region. The Cornubia Development Framework Plan responds powerfully to the key challenges and policy thrusts articulated by National Government. It provides for a higher density, mixed-use and mixed-income development that significantly responds to housing demand across a broad spectrum of market segments.

The Cornubia Development Framework Plan makes provision for 25 695 units, of which 14 544 units are proposed for subsidised and partially subsidised housing, 4 400 units identified for social and GAP housing market, and the balance earmarked for mixed use development. Apart from the diverse, mix of land uses, a key focus of Cornubia is on the public realm and a concerted effort is placed on creating better environments through the concepts of walkability, convenience, connectivity, increased density and sustainability.

The Development is the first of its kind in KwaZulu-Natal and is in accordance with the country's socio-economic transformation and development agenda.

[1] *Also referred to as the Cornubia Integrated Human Development (CIHD).*

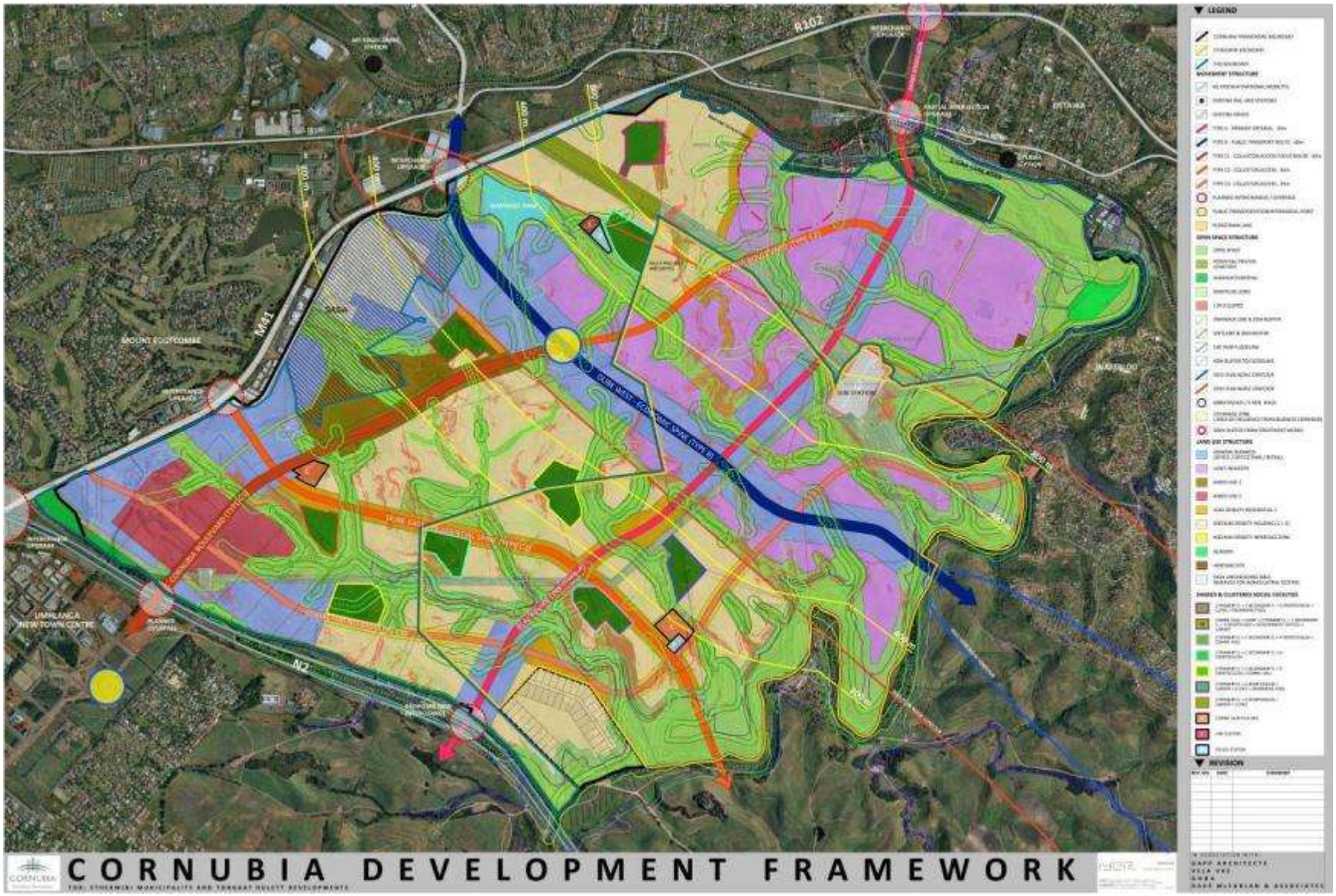


Figure 1-1: The Cornubia Development Framework Plan which was accepted in 2011

1.2 Phasing of the Greater Cornubia Development

Due to the extent of the development, the Greater Cornubia Development is being developed in a phased manner (Figure 1-2) and Table 1-1.

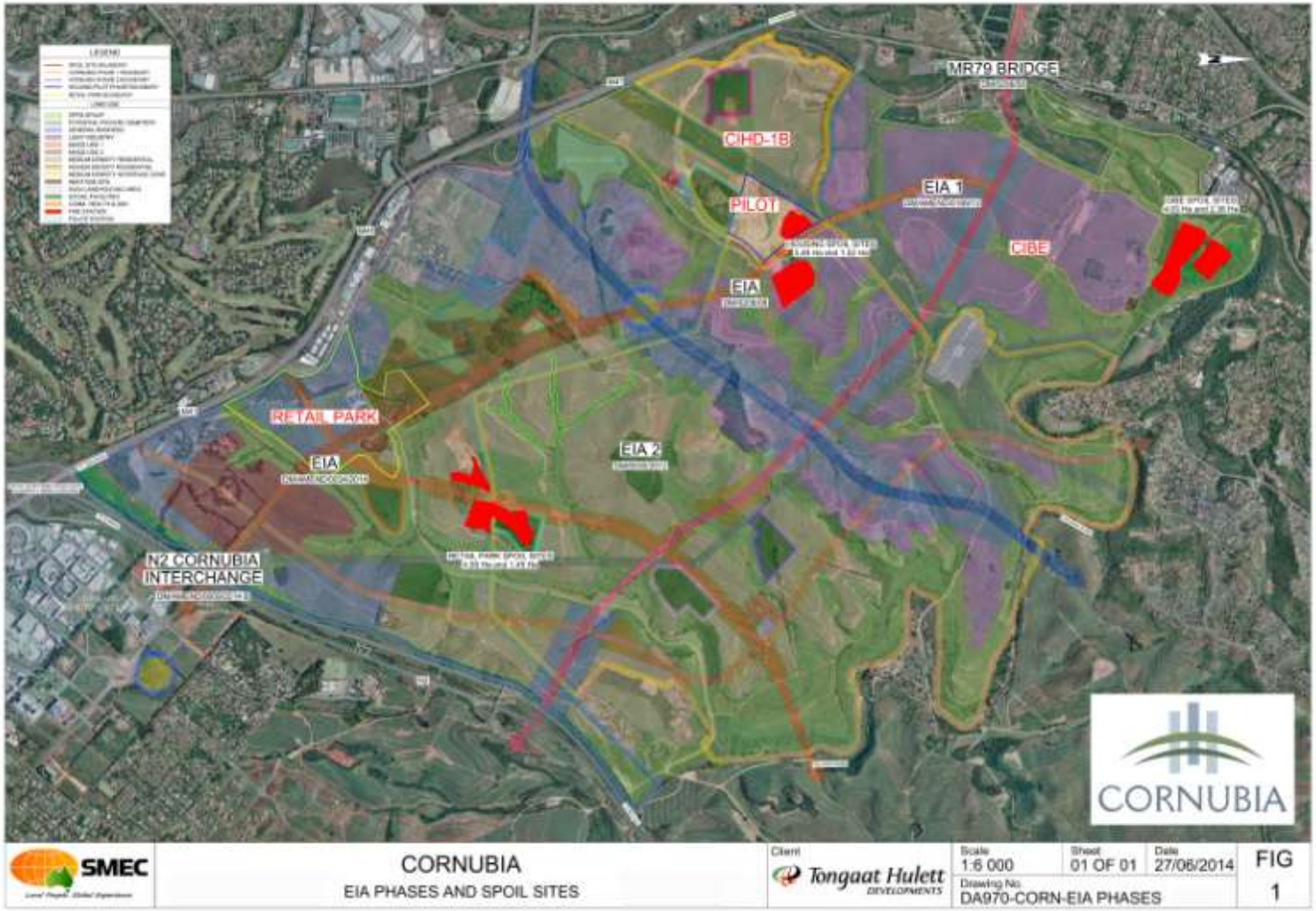


Figure 1-2: Location of the various phases within the Greater Cornubia Development

Table 1-1: Phasing of the Greater Cornubia Development

Project Name	Description	Reference No.	Responsible Party	Authorisation Status	Construction Programme
Cornubia Integrated Housing Development – Phase 1 *(a)* (Pilot Phase)  **Figure 1-3: Cornubia Phase 1 Plan (Phase 1a blue; Phase 1b yellow)**	Cornubia Phase 1 consists of the Cornubia Industrial and Business Estate (CIBE), north-west of the Cornubia Integrated Human Settlement Development (CIHD) Phase 1 *(a)* and *(b)* (Figure 1-3). The CIHD Phase 1 *(a)* precinct was targeted as a pilot phase for the establishment of subsidised units. 482 units have been delivered to date and residents have taken occupation. The CIHD Phase 1 *(a)* site was officially opened by State President Jacob Zuma on the 6th April 2014. The units are 50 m^2; double storey and signifies the starting of the first housing opportunity within Cornubia. The units are arranged around a common courtyard with the intention of landscaping the streets and local parks.  **Figure 1-4: Aerial photograph of houses at the CIHD Phase 1 *(a)* site**	DM/0208/08	eTM	Authorised	Complete
Cornubia Industrial and Business Estate – Phase 1	The CIBE is an initiative of THD and contains a business park with light industrial uses. An architect's plan of the ultimate development of the site is presented in Figure 1-5. Eighty percent of the area has already been sold and construction is well underway on-site. Some	DM/AMEND/0189/12	THD	Authorised	2012 - Current

Project Name	Description	Reference No.	Responsible Party	Authorisation Status	Construction Programme
 **Figure 1-5: Architect's plan of the CIBE**	sites have been handed over to end-users who have taken occupation.  **Figure1-6: Aerial photograph of construction activities at the CIBE**				
MR79 Bridge (Pilot Phase)	Approved as part of the Pilot Phase, the MR 79 Bridge provides access directly into Cornubia *via* Northern Drive from the R102 in Ottawa.	DM/0208/08	THD	Authorised	2013 – Current
CIHD – Phase 1 *(b)*	The CIHD Phase 1 *(b)* site follows on from Phase 1 *(a)* and it contains 2 468 sites approved *via* a Planning and Development Act (PDA) process in 2012. The layout is similar to the CIHD Phase 1 *(a)* and aims to target the subsidised housing market. Construction is presently underway at the CIHD Phase 1 *(b)* site with the first residence expected to be ready for occupation in May/June 2015.	DM/AMEND/0189/12	eTM	Authorised	2014 - Current
Cornubia Retail Park	The Cornubia Retail Park Environmental Impact Assessment (EIA) was expedited due to the significant investor interest to develop the sites for retail and business park developments due to its prime location and ability to serve as a potential major node when the Greater Cornubia Development is fully developed. Construction activities at the Cornubia Retail Park are presently underway.	DM/Amend/0034/2014	THD	Authorised	2014 – Current

Project Name	Description	Reference No.	Responsible Party	Authorisation Status	Construction Programme
 **Figure 1-7: Proposed urban form for the Cornubia Retail Park**					
N2 Cornubia Interchange  **Figure 1-8: Artists impression of the N2 Cornubia Bridge**	The N2 Cornubia Bridge and Interchange forms part of the C9 Integrated Rapid Public Transport Network (IRPTN) Corridor being implemented by the eTM. The bridge will provide an important link between the Greater Cornubia Development to the Umhlanga Ridge Town Centre (URTC) in the East. An Environmental Authorisation (EA) (Reference Number: DM/0009/06) was issued on the 30th July 2008 under the 2006 EIA Regulations. Subsequently this EA was amended, the most recent amended EA issued on the 1st August 2014 (Reference Number: DM/AMEND/0009/2014B). Construction at the N2 Cornubia Bridge and Interchange is expected to commence in 2015 following the receipt of a Water Use Licence (WUL) from the Department of Water and Sanitation (DWS).	DM/AMEND/0009/2014B	eTM	Authorised	Expected to commence in 2015
Phase 2 (including 3 interchanges)	**Subject of this EIA study**	**DM/0030/2012**	**eTM & THD**	**EIA underway**	**Expected - 2016**

1.3 Cornubia Mixed-Use Development Phase 2

The Cornubia Mixed-Use Development Phase 2 (referred to as Cornubia Phase 2) is the remainder of the Greater Cornubia Development (1 333 ha) located west of the N2 toll road and north of the Mount Edgecombe/M41 freeway in the eTM (Figure 1-9) that will be developed by the joint Developers – THD and the eTM and is the subject of this EIA study. Cornubia Phase 2 is approximately 895 ha in extent which equates to 70% of the Greater Cornubia Development. THD owns approximately 314 ha of land within Cornubia Phase 2 whilst the eTM owns 581 ha of land.

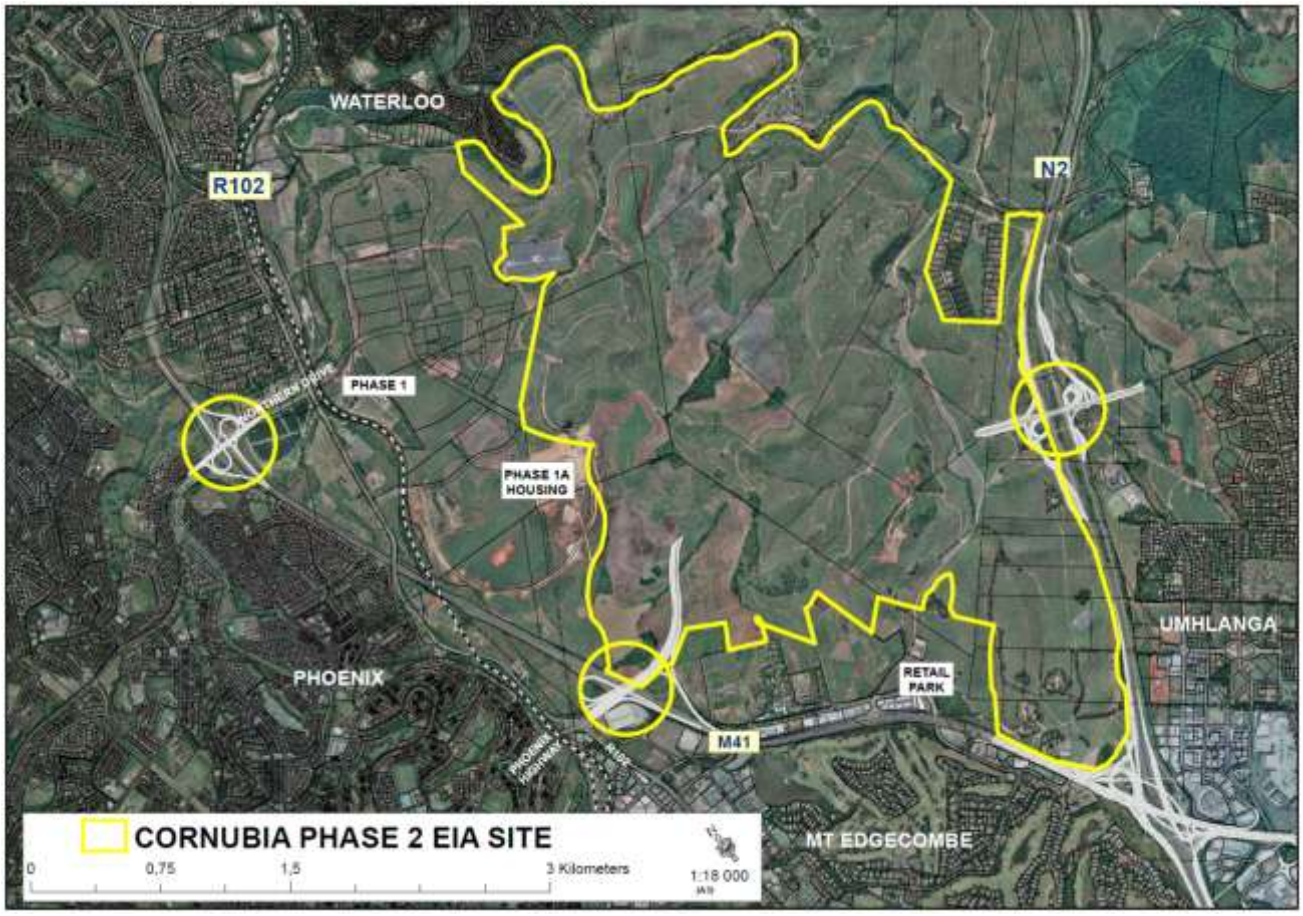


Figure 1-9: Cornubia Phase 2 EIA Boundary

A large proportion of Cornubia Phase 2 has been earmarked for residential development in accordance with the accepted Cornubia Development Framework Plan. However, it should be reiterated that whilst the Cornubia Development Framework Plan sets out the basic guiding framework for development of Cornubia, more detailed levels of planning is required for the refinement of the different set of proposals (i.e. Cornubia Phase 2). Such refinement will not alter the overall intent and philosophy of the Cornubia Development Framework Plan but rather optimise it based on detailed design.

As a result, the Cornubia Phase 2, Land Use Management (LUM) Precinct Plan layout was developed (Figure 1-10). According to this layout, 531 ha of the 895 ha is developable with 392 ha comprising of open space which includes wetlands, buffers, floodplains, steep slopes, servitudes, etc. Other features of the layout are as follows:

- Approximately 22 134 residential units of which approximately 12 000 units will be low cost subsidised housing and 10 000 affordable middle-income units;
- Provision for appropriate social facilities including fire station, police station, schools, clinics, halls;
- 60 ha of industrial platform;
- 800 000 m^2 for bulk services – commercial and mixed-use;
- Rehabilitated open space of approximately 392 ha;
- New road infrastructure including three interchanges as follows –

    - Blackburn Interchange;
    - Marshall Dam Interchange; and
    - R102 / Northern Drive Interchange.
- Construction of appropriate stormwater features;
- Construction of sewer reticulation and its associated bulk gravity trunks; and
- A number of road and service crossings of wetlands.

Key elements of the development include:

- Mix of land uses as above including specific components of low cost housing (referred to as BNG units) as well as affordable housing and market based housing opportunities;
- Community facilities such as schools, clinics, etc.;
- Use of wetlands and buffers for recreational and social sustainability purposes; and
- The installation of general engineering services and infrastructure which include:
    - Earth-worked platforms and banks;
    - Water supply including construction of the Blackburn Reservoir;
    - Sewage;
    - Electricity supply;
    - Stormwater management;
    - Roads and access; and
    - Telecommunications.

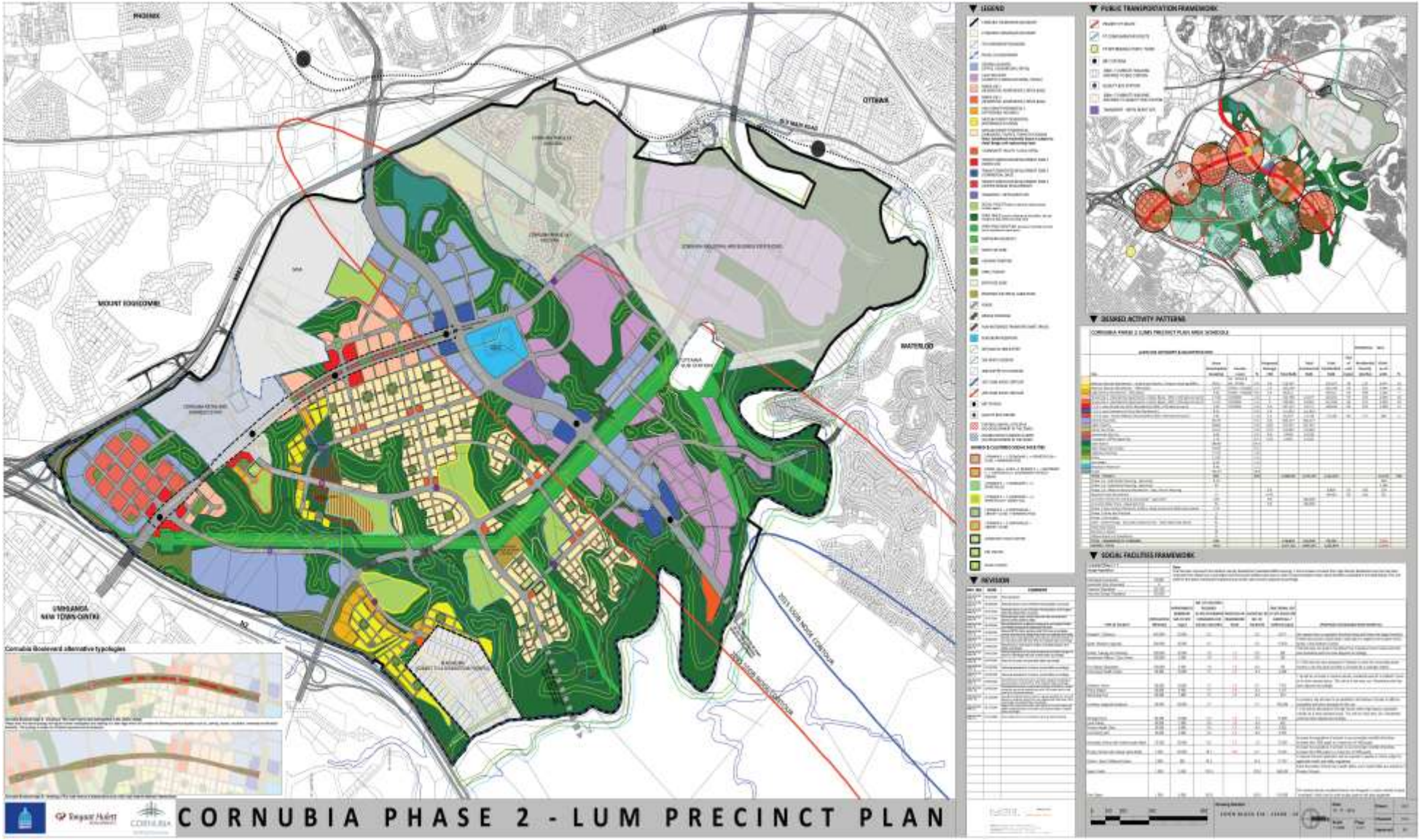


Figure 1-10: Cornubia Phase 2 LUM Precinct Plan layout

1.4 Approach to the EIA Studies

The required environmental studies for this project entail the undertaking of an EIA process. This process is being undertaken in two phases (Figure 1-11):

- Phase 1 – Compilation of an Environmental Scoping Report (ESR) including Plan of Study (PoS) for EIA - *complete*; and
- Phase 2 – Compilation of an Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr) – *currently underway.*

These reports must be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN EDTEA) and other relevant authorities for review, comment and authorisation – *current*.

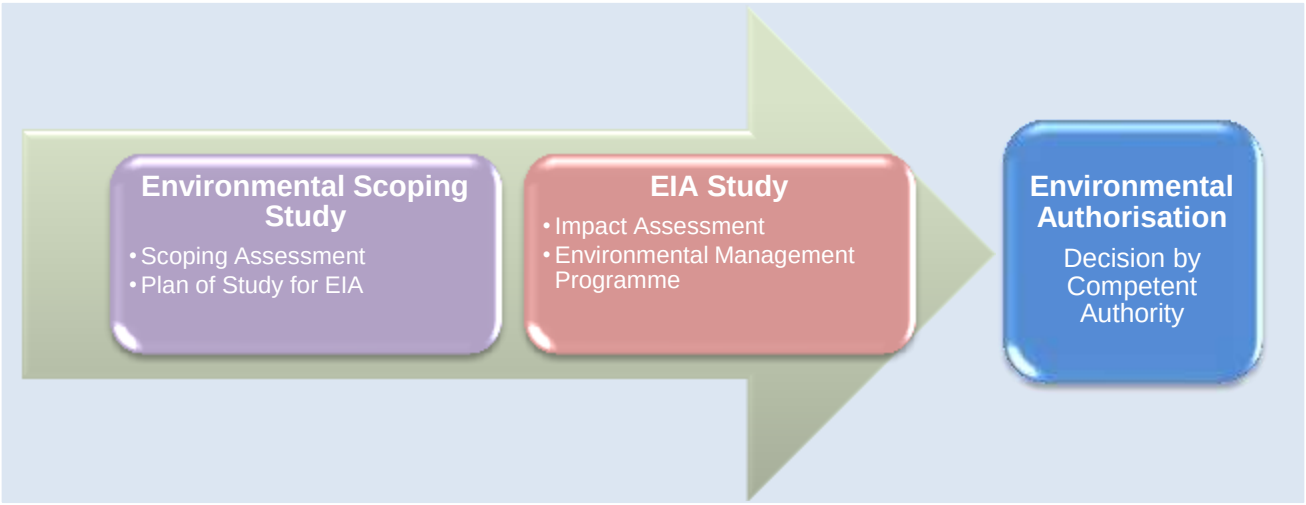


Figure 1-11: Environmental studies flow chart

1.4.1 Environmental Scoping Study

Scoping is the process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

The ESR provided a description of the receiving environment and how the environment may be affected by the existing development. Desktop studies involving the use of existing information, and ground-truthing through site visits, were used to highlight and assist in the identification of potential significant impacts (both social and biophysical) associated with the project. Additional issues for consideration were extracted from feedback from the public participation process (PPP), which commenced at the beginning of the Scoping phase, and will continue throughout the duration of the project.

All issues identified during this phase of the study have been documented within the final ESR which was submitted to the KZN EDTEA EIA Branch for decision-making. The KZN EDTEA EIA Branch accepted the final ESR on 15 January 2013 (Appendix A).

An extension for the submission of the EIAR was requested from the Department on 05 July 2013 and granted on 08 July 2013. A further extension was requested on 06 November 2013, which granted by the Department on 06 November 2013. A further extension was requested on 12 March 2014 which was granted by the Department on the same day. The most recent extension was requested on the 01 August 2014 which was acknowledged on the same day. The extensions related to the need to undertake specialist investigations, allow for negotiations between the joint Developers regarding the ultimate Cornubia Phase 2 LUM Precinct Plan layout and allow specialists time to generate specialist reports in response to changes.

1.4.2 Environmental Impact Study

This draft EIAR will aim to achieve the following:

- to provide an overall assessment of the social and biophysical environments of the affected area by the proposed project;
- to undertake a detailed assessment of the preferred site/alternatives in terms of environmental criteria including the rating of significant impacts;
- to identify and recommend appropriate mitigation measures (to be included in an EMPr) for potentially significant environmental impacts; and
- to undertake a fully inclusive PPP to ensure that interested and affected party (I&AP) issues and concerns are recorded and commented on and addressed in the EIA process.

1.4.3 Environmental Impact Assessment Report

This draft EIAR has been compiled in accordance with the accepted PoS for EIA and incorporates the findings and recommendations from the Scoping Study as well as specialist studies conducted for the project.

In addition, this draft EIAR has been compiled according to the guidelines provided in Government Notice R.543 of the EIA Regulations (2010) and contains the following:

Table 1-2: EIAR requirements according to Section 31 of GN. R.543

EIAR Requirements according to Section 31 of GN. R. 543	Section in report
31(2)(a) Details of - (i) the EAP who compiled the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment	**1.6**
31(2)(b) A detailed description of the proposed activity	**5**
31(2)(c) A description of the property on which the activity is to be undertaken and the location of the activity on the property	**3.1 & 3.2**
31(2)(d) A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	**4**
31(2)(e) Details of the public participation process conducted	**8**
31(2)(f) A description of the need and desirability of the proposed activity	**3.4**
31(2)(g) A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	**6 & 10**
31(2)(h) An indication of the methodology used in determining the significance of potential environmental impacts	**9**
31(2)(i) A description and comparative assessment of all alternatives identified during the environmental impact assessment process	**10**
31(2)(j) A summary of the findings and recommendations of any specialist report or report on a specialised process	**7**
31(2)(k) A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	**9**
31(2)(l) An assessment of each identified potentially significant impact, including - (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated	**9**

EIAR Requirements according to Section 31 of GN. R. 543	Section in report
31(2)(m) A description of any assumptions, uncertainties and gaps in knowledge	
31(2)(n) A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	**10**
31(2)(o) An environmental impact statement which contains - (i) a summary of the key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives	**10**
31(2)(p) A draft environmental management programme containing the aspects contemplated in regulation 33	**Appendix B**
31(2)(q) Copies of any specialist reports and reports on specialised processes complying with regulation 32	**Appendix C**
31(2)(s) Any other matters required in terms of sections 24(4)(a) and (b) of the Act	**Not applicable**

1.4.4 Environmental Management Programme

A draft EMPr (Appendix B) has been compiled for the construction and operational phases for the Cornubia Phase 2. The draft EMPr has been compiled as a stand-alone document from the EIA Report and will be submitted to the KZN EDTEA. The draft EMPr has been compiled in accordance with the EIA Regulations (2010). The draft EMPr provides the actions for the management of identified environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate the anticipated negative environmental impacts. The draft EMPr provides strategies to be used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

The EMPr includes the following:

- Details of the person who prepared the EMPr and the expertise of the person to prepare an EMPr;
- Information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in the EIAR, including environmental impacts or objectives in respect of operation or undertaking of the activities, rehabilitation of the environment and closure where relevant;
- A detailed description of the aspects of the activity that are covered by the draft EMPr;
- An identification of the persons who will be responsible for the implementation of the measures;
- Where appropriate, time periods within which the measures contemplated in the draft EMPr must be implemented;
- Proposed mechanisms for monitoring compliance with the EMPr and reporting thereon;
- An environmental awareness plan; and
- Procedures for managing incidents which have occurred as a result of undertaking the activity and rehabilitation measures.

The following plans have been prepared in support of the EMPr:

Table 1-3: List of supporting plans

Specialist Study	Organisation	Appendix
Wetland and Open Space Rehabilitation Plan	SiVEST	Appendix B 2
Stormwater Management Plan	SMEC South Africa	Appendix B 3
Soil Management Framework Strategy	Royal HaskoningDHV	Appendix B 4

1.4.5 Specialist Studies

To ensure the scientific vigour of the EIA process as well as a robust assessment of impacts, Royal HaskoningDHV (RHDHV) was assisted by various specialists in order to comprehensively identify both potentially positive and negative environmental impacts (social and biophysical) associated with the project and where possible mitigate the potentially negative impacts and enhance the positive impacts.

The specialist team have been involved in the project since the Cornubia Phase 1 EIA study when initial assessments commenced in 2006/2007. Some of these assessments presented in the Cornubia Phase 1 EIA are still relevant as they covered the Greater Cornubia Development area. The specialist team have since been involved in the subsequent phases of the Greater Cornubia Development (refer to Table 1-1) and have been key in integrating stakeholder as well as I&AP concerns into the Cornubia Phase 2 LUM Precinct Plan layout, identifying 'no-go' areas for development as well as recommending practical mitigation solutions for all phases of the development. In many respects, specialist studies have been on-going through the life-cycle of the development and have built on the initial lessons and incorporated many of the lessons learnt from earlier phases.

Where the status quo for the receiving environment has changed substantially since the previous phases of the project, this has culminated in updated and more detailed investigations which are presented in Section 7.

The following specialist studies have been conducted for the Greater Cornubia Development and/or Cornubia Phase 2 specifically:

Table 1-4: List of specialist studies

Specialist Study	Organisation	Appendix
Agricultural Potential Assessment	Mottram and Associates	Appendix C 1
Geotechnical Investigation	Drennan, Maud & Partners	Appendix C 2
Heritage Assessment	eThembeni Cultural Heritage	Appendix C 3
Vegetation Assessment	SiVEST	Appendix C 4
Wetland Assessment	SiVEST	Appendix C 5
River and Estuary	Marine and Estuarine Research	Appendix C 6
Social Impact Assessment	Real Consulting	Appendix C 7
Socio-economic Study	Jeff McCarthy	Appendix C 8
Traffic Impact Assessment	Hatch GOBA	Appendix C 9
Attenuation Facilities within Wetlands Report	SMEC South Africa	Appendix C 13

In addition to the above specialist studies, the following reports have been prepared in support of the EIA study:

Table 1-5: List of supporting reports

Specialist Study	Organisation	Appendix
Urban Planning Report	Iyer Urban Design Studio	Appendix C 10
Engineering Services Report	SMEC South Africa	Appendix C 11
Electrical Services Report	Bosch	Appendix C 12

1.5 Details of the Project Proponents

The Greater Cornubia Development is a Public-Private Partnership between the eTM and THD (details are provided in Table 1-6). Both eTM and THD as joint developers and applicants have signed a Memorandum of Agreement (Appendix D).

Table 1-6: Project applicants contact details

Applicant	Tongaat Hulett Developments	eThekwini Municipality
Representative	Karen Petersen	Beryl Mpakathi
Physical Address	305 Umhlanga Rocks Drive La Lucia	Shell House 221 Anton Lembede Street

Applicant	Tongaat Hulett Developments	eThekwini Municipality
	4015	4000
Postal Address	PO Box 22319 Glenashley 4022	PO Box 1014 Durban 4000
Telephone	031 5601900	031 311 3320
Facsimile	086 679 9243	031 311 3005
E-mail	Karen.Petersen@tongaat.com	Beryl.Khanyile@durban.gov.za

In addition to the two applicants listed in Table 1-6, it was previously noted in the ESR that THD were acting on behalf of the South African Sugar Association (SASA) who owned a portion of the land previously included in the Cornubia Phase 2 boundary. It should be noted that an agreement was not reached between the SASA and THD and SASA's land has subsequently been removed from the Cornubia Phase 2 EIA and does not form part of the project. However, a portion of SASA land is affected by the proposed interchanges as detailed in Section 3.2.

1.6 Details of the Environmental Assessment Practitioner

The environmental team of RHDHV has been appointed as an independent EAP by THD and the eTM to undertake the appropriate environmental studies for this proposed project. The professional team of RHDHV has considerable experience in the environmental management field.

RHDHV has been involved in and/or managed several of the largest EIAs undertaken in South Africa to date. A specialist area of focus is on the assessment of multi-faceted projects, including the establishment of linear developments (national and provincial roads, and power lines), bulk infrastructure and supply (e.g. wastewater treatment works, pipelines, landfills), electricity generation and transmission, the mining industry, urban, rural and township developments, environmental aspects of Local Integrated Development Plans (LIDPs), as well as general environmental planning, development and management.

In particular, RHDHV has been involved as the EAP for the Greater Cornubia Development, having secured the EAs for the Pilot Phase, Cornubia Phase 1 and Cornubia Retail Park applications.

It must be noted that as of 21 August 2012, SSI Engineers and Environmental Consultants (Pty) Ltd has adopted a new brand, changing its trading name from SSI to Royal HaskoningDHV.

Table 1-7: Details of the EAP

Consultant	RHDHV	RHDHV	RHDHV
Contact Persons	Humayrah Bassa	Prashika Reddy	Malcolm Roods
Postal Address	PO Box 55 Pinetown 3610	PO Box 55 Pinetown 3610	PO Box 55 Pinetown 3610
Telephone	031 719 5551	012 367 5973	011 798 6442
Facsimile	031 719 5505	031 719 5505	031 719 5505
E-mail	humayrah.bassa@rhdhv.com	prashika.reddy@rhdhv.com	malcolm.roods@rhdhv.com
Qualification	MSc Environmental Science	BSc (Hons) Geography	BA (Hons) Geography and Environmental Management
Expertise	Humayrah Bassa is a Senior Environmental Consultant with approximately 5 years of experience in various facets of environmental management. These include	Prashika Reddy is a Principal Associate at RHDHV with extensive experience in various environmental fields including: EIAs, EMPRs,	Malcolm Roods is the Service Line Head for the Environmental Management and Compliance Service Line within RHDHV and has approximately 12 years of

Consultant	RHDHV	RHDHV	RHDHV
	conducting environmental impact assessments and the public participation process; compiling environmental impact reports; developing environmental management programmes; compiling water use licence applications; conducting environmental control officer duties; and conducting legal compliance audits.	PPP and environmental monitoring and audits. She is/has been part of numerous multi-faceted large-scale projects, including the establishment of linear developments (roads and power lines), industrial plants, electricity generation plants, mixed-use developments and mining projects. She is a Professional Natural Scientist (400133/10) with the South African Council for Natural Science Professionals.	experience in environmental legislation and processes. He also has extensive experience in the compilation and review of environmental reports. He is certified as an Environmental Assessment Practitioner (EAP) with the Interim Certification Board (ICB) for EAPs of South Africa.

The Environmental Management and Compliance Service Line Profile for RHDHV and the Curriculum Vitae (CV) of the respective EAPs can be found in Appendix E.

2 ENVIRONMENTAL LEGAL REQUIREMENTS

The following key legislation is pertinent to the proposed Cornubia Phase 2 Development:

- National Environmental Management Act (No 107 of 1998)(as amended)
- National Environmental Management: Waste Act (No 59 of 2008)(as amended)
- National Water Act (No 36 of 1998)(as amended)
- National Forests Act (Act No 84 of 1998)
- Conservation of Agricultural Resources Act (Act No.43 of 1983)
- National Environmental Management Biodiversity Act (Act No. 10 of 2004)
- KZN Nature Conservation Ordinance (15 of 1974)
- National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
- National Heritage Resources Act (No 25 of 1999)
- National Environmental Management: Air Quality Act (No 39 of 2004)
- National Veld and Forest Act (Act 101 of 1998)
- Hazardous Substance Act (No 15 of 1973) and Regulations
- National Building Regulations and Building Standards Act (Act No. 103 of 1997)
- Occupational Health and Safety Act (No 85 of 1993)

In order to obtain authorisations from the relevant authorities, a number of regulatory processes need to be followed. A parallel approach to conducting these processes is currently being undertaken. The following regulatory processes are underway.

2.1 National Environmental Management Act (No 107 of 1998)(as amended)

The National Environmental Management Act (NEMA) provides environmental governance by providing principles for decision-making on matters that affect the environment and defines the principles that apply to the organs of state involved in that decision-making. The Act sets out the legal and procedural requirements for environmental compliance. Regulations under the Act define activities that may not commence without prior approval from the competent authority.

The KZN EDTEA is the competent authority for this EIA process and the development needs to be authorised by this Department in accordance with the NEMA (as amended).

The activities associated with this development, for which environmental authorisation is required are detailed in Table 2-1.

Table 2-1: Listed activities triggered according to Listing Notices 1 and 2 of the EIA Regulations (2010)

Listed Activities		
Listing Notice 1 (GNR. 544)		
Activity 9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or stormwater – i. with an internal diameter of 0,36 metres or more; or ii. with a peak throughput of 129 litres per second or more, excluding where: a) such facilities or infrastructure are for bulk transportation of water, sewage, or stormwater drainage inside a road reserve; or b) where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of a watercourse.	The proposed project includes the construction of water pipelines (linking to the surrounding reticulation), sewer line and stormwater attenuation. It is anticipated that the pipelines will exceed 1 000 metres in length and will be within 32 m of a watercourse (wetlands and/or the Ohlanga River). Furthermore, pipelines will need to be installed for the irrigation network.
Activity 10	The construction of facilities or infrastructure for the transmission and distribution of electricity – i. outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or ii. inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	The proposed project includes the construction of facilities and/or infrastructure for the transmission and distribution of electricity inside an urban area with a capacity of 275 kilovolts or more.
Activity 11	The construction of: i. canals; ii. channels; iii. bridges; iv. dams; v. weirs; vi. bulk stormwater outlet structures; vii. marinas; viii. jetties exceeding 50 square metres in size; ix. slipways exceeding 50 square metres in size; x. buildings exceeding 50 square metres in size; or xi. infrastructure or structures covering 50 square metres or more, where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The proposed project will see construction of service infrastructure such as sewer lines, pipelines, electrical cabling and/or road infrastructure within 32 m of a watercourse (wetlands and/or the Ohlanga River). Furthermore, the project will involve the construction of earth-worked platforms, portions of which will occur over watercourses (wetlands). It is also proposed that roads, bridges and interchanges within the Cornubia Phase 2 as well as for the three access interchanges (i.e. the Blackburn Interchange, Marshall Dam Interchange and the R102 / Northern Drive Interchange) will traverse wetland area. In addition, it is proposed that stormwater will be attenuated *via* attenuation ponds located within 32 m of wetlands. Therefore this activity is applicable for the following infrastructure located within a watercourse or within 32 m of a watercourse: - Earth-worked platforms; - Water pipelines;

Listed Activities		
		• Sewer lines; • Electrical cabling; • Stormwater attenuation facilities; • Reservoirs; • Roads, bridges and interchanges inside the Cornubia Phase 2 boundary; • Roads, bridges and stormwater attenuation structures at the Blackburn Interchange; • Roads, bridges and stormwater attenuation structures at the Marshall Dam Interchange; and • Roads, bridges and stormwater attenuation structures at the R102 / Northern Drive Interchange.
Activity 12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.	Applicable for the construction of the proposed Blackburn Reservoir.
Activity 13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.	The proposed project may involve the storage of dangerous goods above these thresholds during the construction and/or operational phase, particularly at Bus Depots.
Activity 18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from: i. a watercourse; excluding where such infilling, depositing , dredging, excavation, removal or moving; a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or b) occurs behind the development setback line.	The proposed project will require the infilling of wetlands and/or the removal of material from wetlands for the following: • Earth-worked platforms; • Water pipelines; • Sewer lines; • Electrical cabling; • Reservoirs; • Stormwater attenuation ponds inside the Cornubia Phase 2 boundary; • Roads, bridges and interchanges inside the Cornubia Phase 2 boundary; • Roads, bridges and stormwater attenuation structures at the Blackburn Interchange; • Roads, bridges and stormwater attenuation structures at the Marshall Dam Interchange; and • Roads, bridges and stormwater attenuation structures at the R102 / Northern Drive

Listed Activities		
		Interchange.
Activity 22	The construction of a road, outside urban areas, i. with a reserve wide than 13.5 m or; ii. where no reserve exists where the road is wider than 8 metres; or iii. for which an environmental authorisation was obtained for the route determination in terms of activity 18 in Notice 545 of 2010.	The proposed project includes the construction of new roads in regions where there is no road reserve. The road reserve is expected to be greater than 13.5 m.
Activity 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Applicable for the removal of protected trees which will require a DAFF Permit.
Activity 28	The expansion of or changes to existing facilities for any process or activity where such expansion or changes to will result in the need for a permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	Potentially applicable for the Water Use Licence.
Activity 37	The expansion of facilities or infrastructure for the bulk transportation of water, sewage or stormwater where: i. The facility or infrastructure is expanded by more than 1000 metres in length; or ii. Where the throughput capacity of the facility or infrastructure will be increased by 10% or more – excluding where such expansion: a) related to transportation of water, sewage or stormwater within a road reserve; or b) where such expansion will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	The proposed project may include the expansion of water pipelines (linking to the surrounding reticulation), sewer lines and stormwater attenuation already established within Cornubia. It is anticipated that the pipelines will exceed 1 000 metres in length and will be within 32 m of a watercourse (wetlands and/or the Ohlanga River).
Activity 39	The expansion of: i. canals; ii. channels; iii. bridges; iv. dams; v. weirs; vi. bulk stormwater outlet structures; vii. marinas; within a watercourse or within 32 metre of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.	The proposed project may involve the expansion of infrastructure located within a watercourse or within 32 m of a watercourse as follows: • Earth-worked platforms; • Water pipelines; • Sewer lines; • Electrical cabling; • Stormwater attenuation ponds inside the Cornubia Phase 2 boundary; • Roads, bridges and interchanges inside the Cornubia Phase 2 boundary; • Roads, bridges and stormwater attenuation structures at the Blackburn Interchange; • Roads, bridges and stormwater attenuation structures at the Marshall Dam Interchange;

Listed Activities		
		and • Roads, bridges and stormwater attenuation structures at the R102 / Northern Drive Interchange.
Activity 40	The expansion of i. jetties by more than 50 square metres; ii. slipways by more than 50 square metres; or iii. buildings by more than 50 square metres; iv. infrastructure by more than 50 square metres; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, but excluding where such expansion will occur behind the development setback line.	Applicable for the expansion of existing services authorised as part of Cornubia Phase 1 or Cornubia Retail Park which fall within 32 m of a watercourse.
Activity 47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – i. where the existing reserve is wider than 13,5 metres; or ii. where no reserve exists, where the existing road is wider than 8 metres - Excluding widening or lengthening occurring inside urban areas.	The proposed project includes upgrading to existing road networks.
Activity 56	Phased activities for all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where any one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; - Excluding the following activities listed in this Schedule: 2; 11(i)-(vii); 16(i)-(iv); 17; 19; 20; 22(i) & 22(iii); 25; 26; 27(iii) & (iv); 28; 39; 45(i)-(iv) & (vii)-(xv); 50; 51; 53; and 54.	The Greater Cornubia Development is being undertaken in a phased manner. Furthermore, once authorised, the construction of the Cornubia Phase 2 Development will be done in a phased manner over a number of years.
Listing Notice 2 (GNR. 545)		
Activity 3	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	The proposed project may involve the storage of dangerous goods above these thresholds during the construction and/or underground and/or aboveground storage tanks during the operational phase.
Activity 5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste competent authority is the Minister of I Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	Potentially applicable for the Water Use Licence.

Listed Activities		
Activity 15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; i. except where such physical alteration takes place for: ii. linear development activities; or iii. agriculture or afforestation where activity 16 in this Schedule will apply.	The project proposes to develop approximately 895 ha of land at Cornubia Phase 2 and the three access interchanges (i.e. Blackburn Interchange, Marshall Dam Interchange and the R102 / Northern Drive Interchange). The proposed site is currently a site under sugarcane cultivation. Proposed infrastructure within the Cornubia Phase 2 site includes, but is not limited to: • Earth-worked platforms for top-structures including, but not limited to houses, retail and commercial complexes, industrial buildings and warehouses, schools, clinics, police stations and other such social facilities, play grounds, sports fields, sites for surplus fill material, service infrastructure, and parking lots.
Activity 18	The route determination of roads and design of associated physical infrastructure, including roads that have not yet been built for which routes have been determined before 03 July 2006 and which have not been authorised by a competent authority in terms of Environmental Impact Assessment Regulations, 2006 or 2009, made under section 24(5) of the Act and published in Government Notice No. R. 385 of 2006- i. it is a national road as defined in section 40 of the South African Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); ii. it is a road administrated by a provincial authority; iii. the road reserve is wider than 30 metres; or iv. the road will cater for more than one lane of traffic in both directions.	The proposed project includes the construction of new roads and limited upgrading to existing road networks. The proposed project also includes the construction of three interchanges (i.e. Blackburn Interchange, Marshall Dam Interchange and the R102 / Northern Drive Interchange). The road and interchange infrastructure will be wider than 30 metres, may involve upgrades to roads administered by a national or provincial authority and will cater to more than one lane of traffic in both directions.

2.2 National Environmental Management: Waste Act (No 59 of 2008)(as amended)

The National Environmental Management: Waste Act (NEM:WA) has been considered, however, no activities have been identified for the proposed earth-works. It is noted that should an end-use Developer trigger any activities in terms of the NEM:WA, the end-use Developer will be required to apply for a Waste Management Licence (WML) in terms of the Act. This also applies to clinics and other health care facilities. Furthermore, the project team have engaged with the KZN EDTEA regarding the proposed surplus fill material sites. KZN EDTEA has affirmed that provided there is a beneficial end-use for the material and/or the site, a WML will not be required and has therefore, not been applied for.

2.3 National Water Act (No 36 of 1998)(as amended)

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

Water use in South Africa is managed through a water use authorisation process, which requires that every water use is authorised by the DWS or an established Catchment Management Agency (CMA), once the water requirements for the Reserve have been determined. A water use must be licensed unless it is listed in Schedule 1, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. The Minister may limit the amount of water which a responsible authority may allocate. In making regulations the Minister may differentiate between different water resources, classes of water resources and geographical areas.

As a result of the nature of the proposed development and the requirement for extensive platforming, portions of vegetation and degraded wetland are required to be in-filled. As such a Section 21 *(c)* and *(i)* WUL will be required for the infilling of these wetlands. Additionally, other water uses according to Section 21 of the Act have also been identified. The NWA defines the identified water uses under Section 21 as follows:

(a) *abstraction of water from a watercourse (applicable for the abstraction of water from the Ohlanga River and/or Marshall Dam for irrigation);*

(b) *storing of water (applicable for the construction of stormwater attenuation ponds and the Marshall Dam);*

(c) *impeding or diverting the flow of water in a watercourse (applicable for wetland crossings); and*

(i) *altering the bed, banks, course or characteristics of a watercourse (applicable for wetland crossings).*

The NWA defines a water resource to be a watercourse, surface water, estuary or groundwater (aquifer). Included under surface water are manmade water channels, estuaries and watercourses. Due to the large number of water uses applicable for this project, an integrated WUL Application (iWULA) for Cornubia Phase 2 is currently being conducted and will be submitted to the DWS in the coming months. The project team have been engaging with the DWS on the requirements of this submission.

2.4 National Forests Act (Act No. 84 of 1998)

According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that;

'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

In essence the National Forests Act (NFA) prohibits the destruction of indigenous trees in any natural forest without a licence.

In terms of the NFA and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No. 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a licence. In the case of the current assessment a Department of Agriculture, Forestry and Fisheries (DAFF) licence will be required for the proposed removal of forest area.

2.5 KZN Nature Conservation Ordinance (15 of 1974)

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KZN the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from Ezemvelo KZN Wildlife to remove or destroy any plants listed in the Ordinance. A permit is required to remove/relocate indigenous plants within the site.

SiVEST, the Vegetation specialists appointed for this project, are currently pursuing the necessary permit/licensing requirements from DAFF and Ezemvelo KZN Wildlife on behalf of the Applicants.

3 PROJECT PLANNING CONTEXT

3.1 Site locality

The Greater Cornubia Development is located within the North Urban Development Corridor (NUDP) as defined in the North Spatial Development Plan. It lies approximately 25 km north of the Durban Central Business District (CBD) and sits adjacent to Umhlanga in the east, Mount Edgecombe in the south, Ottawa in the west and Waterloo in the north. The site is strategically located along the axes of the M41 and N2 (Figure 3-1), forming the southern and eastern boundaries respectively. The Ohlanga River forms the site's northern boundary. The study area has prime visibility and potential connectivity to these major systems.

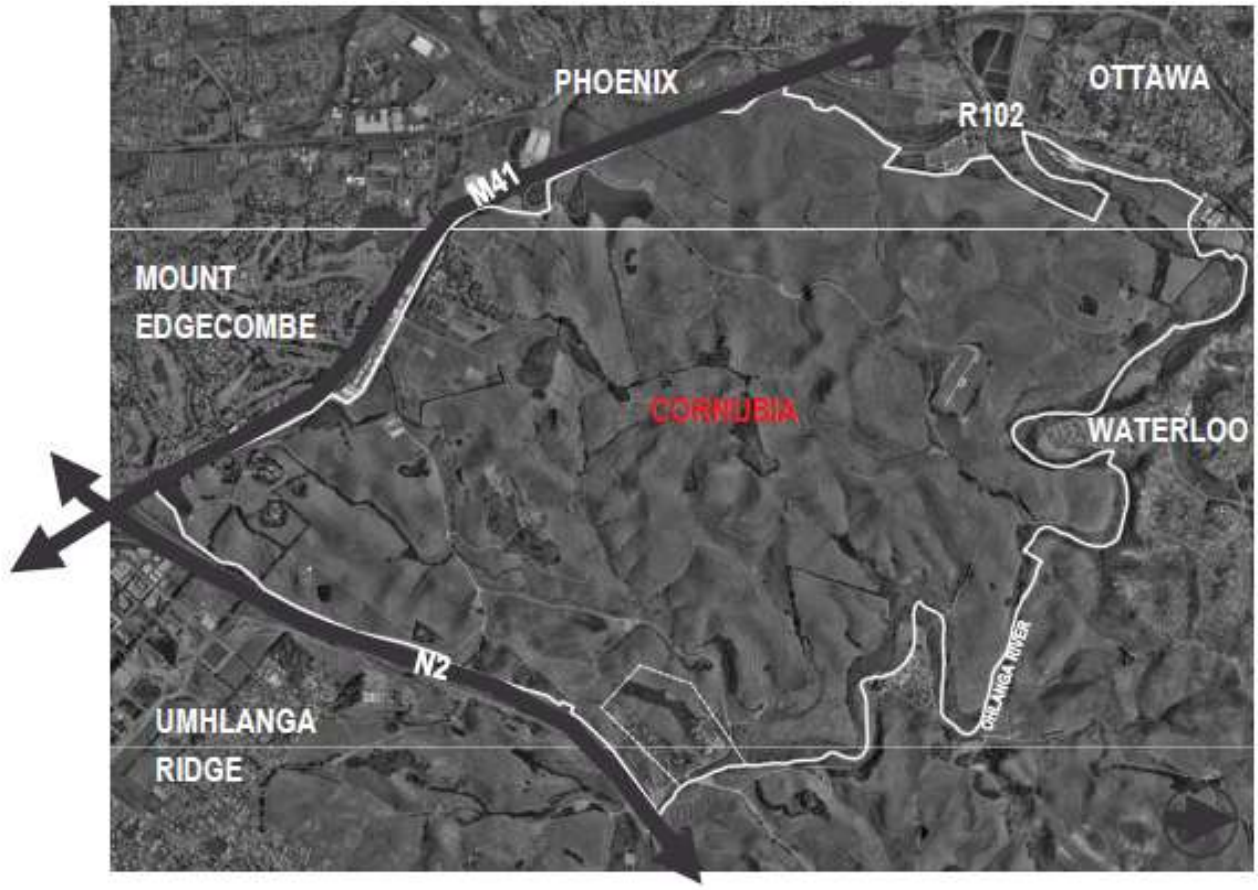


Figure 3-1: Greater Cornubia Development locality

3.2 Zoning and Ownership

The site is zoned as agriculture and is currently under sugarcane cultivation. The Greater Cornubia Development is located within the eThekwini Magisterial District and consists of numerous subdivisions or land parcels (Figure 3-2).

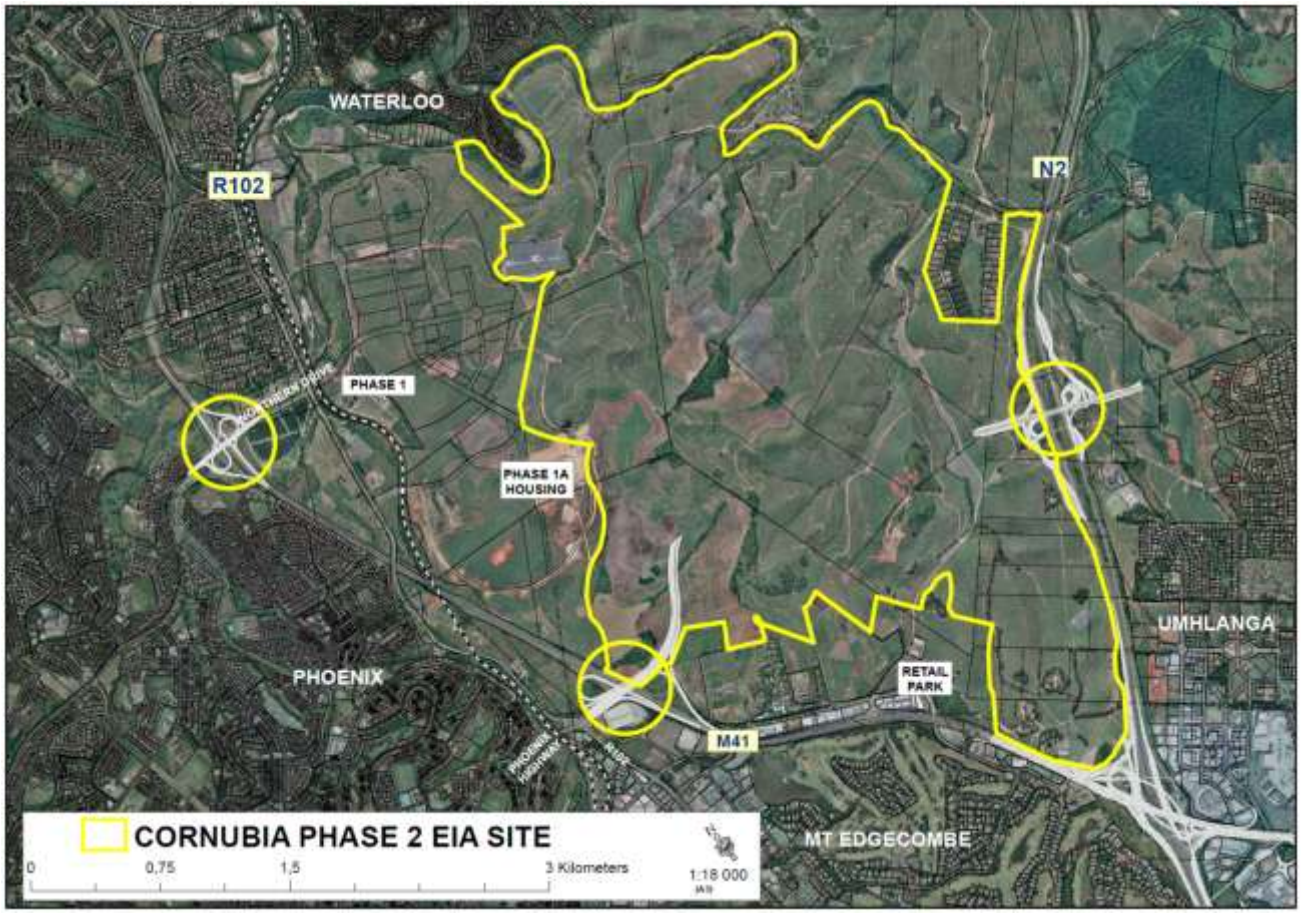


Figure 3-2: Site boundaries

As indicated in Section 1.3, the two major landowners of Cornubia Phase 2 (indicated in blue and mustard in Figure 3-3) are THD (314 ha) and the eTM (581 ha). A small portion of land outside the Cornubia Phase 2 boundary is owned by the SASA which measures approximately 62 ha and has been excluded from this EIA.

Figure 3-3 also includes Blackburn Village which has been excluded from this EIA. The eTM has started acquiring portions of land at Blackburn Village for future residential development. This will be subject to a separate environmental authorisation. The intention is for Blackburn Village to eventually be integrated into the Greater Cornubia Development.

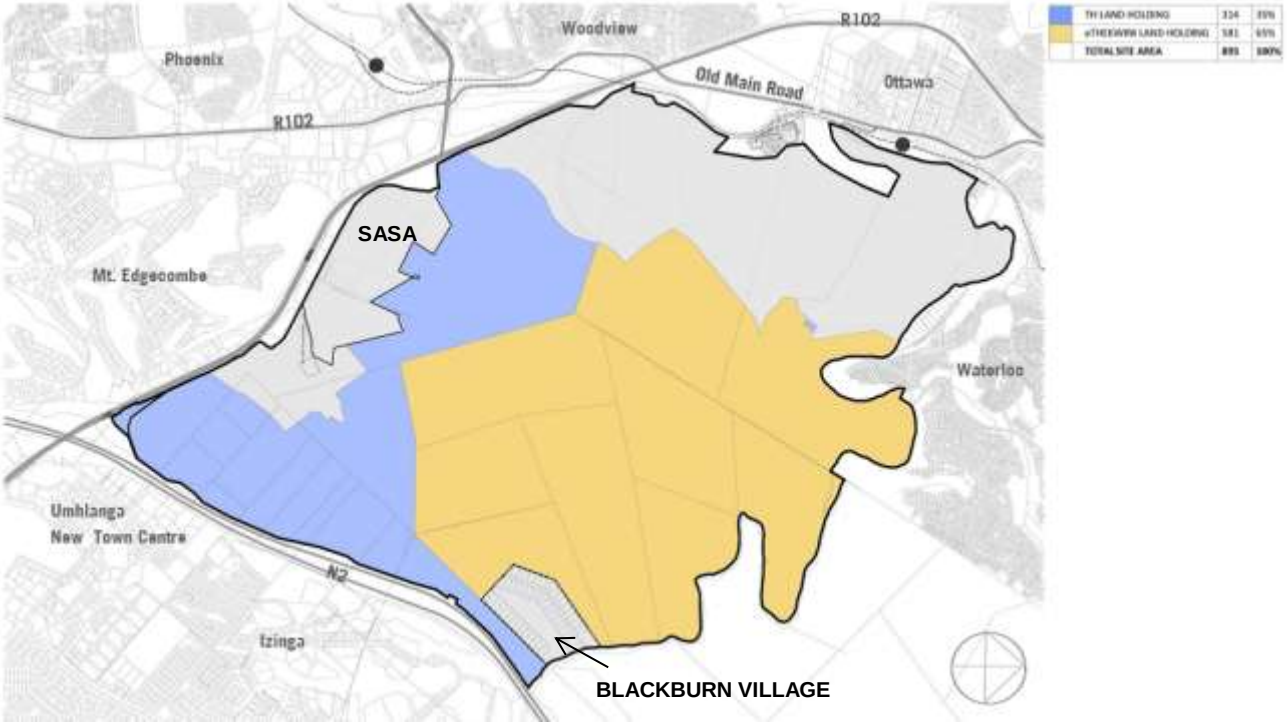


Figure 3-3: Ownership of land within Cornubia Phase 2

The three interchanges (i.e. Blackburn; Marshall Dam and R102 / Northern Drive) that are included within this EIA will be developed on land belonging to various landowners. The various landowners are working together to ensure that Cornubia is a sustainable 'Integrated Human Settlement' Development. Table 3-1 provides a list of properties affected by the Cornubia Phase 2 Development as well as the respective interchanges and further details the property owners for each property. All landowners and adjacent landowners have been notified of the development on their land.

Table 3-1: List of properties and landowners

Property Description	Ownership	SG 21 Digit Code
Cornubia Phase 2		
Ptn 50 (of 8) of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000050
Rem of Erf 142 Mount Edgecombe	Tongaat Hulett (Mt Edgecombe Estates)	N0FU02170000014200000
Rem of Ptn 4 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000004
Ptn 57 (of 21) of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000057
Rem of Ptn 16 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000016
Ptn 1 of the Farm Lot 21 No 1529	Tongaat Hulett	N0FU00000000152900001
Rem of Ptn 21 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000021
Ptn 5 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000005
Rem of Ptn 15 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000015
Rem of Ptn 6 (of 4) of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000006
Rem of Ptn 8 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000008
Rem of Ptn 14 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000014
Rem of Ptn 13 of the Farm Lot 31 No 1560	Tongaat Hulett	N0FU00000000156000013
Rem of the Farm Lot A 39 No 1532	Tongaat Hulett	N0FU00000000153200000
Ptn 2 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900002
Ptn 8 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900008
Ptn 9 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900009

Property Description	Ownership	SG 21 Digit Code
Ptn of Rem of the Farm Lot 20 No 1557	eThekwini Municipality	N0FU00000000155700000
Ptn of Rem of Ptn 1 of the Farm Lot 20 No 1557	eThekwini Municipality	N0FU00000000155700001
Ptn 7 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900007
Ptn 4 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900004
Ptn 3 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900003
Ptn 11 of the Farm Lot 21 No 1529	eThekwini Municipality	N0FU00000000152900011
Blackburn Interchange		
Rem of the Farm Lot A 39 No 1532	Tongaat Hulett	N0FU00000000153200000
Portion 471 of Lot 31 No. 1560	SANRAL	N0FU00000000156000471
Portion 4 of Lot A 39 No. 1532	SANRAL	N0FU00000000153200004
rem of Portion 21 of Lot 31 No. 1560	Tongaat Hulett	N0FU00000000156000021
Marshall Dam Interchange		
Erf 851 Mt Edgecombe	Mt Edgecombe Park Properties (Pty) LTD	N0FU02170000085100000
Erf 52 Mt Edgecombe	RSA	N0FU02170000005200000
Rem of Erf 17 Mt Edgecombe	SASA	N0FU02170000001700000
R102 / Northern Drive Interchange		
Rem of Lot Sykes No. 15658	eThekwini Municipality	N0FU00000001565800000
Rem of Erf 74 of Erf 89 Ottawa	Community Development Board	N0FU02440000008900074
Portion 45 of Erf 89 Ottawa	RSA	N0FU02440000008900045
Portion 505 of Riet Rivier No. 842	RSA	N0FU00000000084200505
Portion 69 of Lot Sykes No. 15658	RSA	N0FU00000001565800069
Portion 504 of Riet Rivier 842	RSA	N0FU00000000084200504
Portion 519 of Riet Rivier 842	eThekwini Municipality	N0FU00000000084200519

3.3 Planning Objectives and Principles

The Greater Cornubia Development has the potential to deliver on a range of current metropolitan development objectives given its scale and strategic location. The following are considered the core objectives:

- ***District Integration:*** the site represents a strategic opportunity to 'knit' together previously separated areas influenced largely through the imposition and apartheid heritage. Key in this is fostering improved linkage and integration between the surrounding communities of Phoenix, Mount Edgecombe, Umhlanga, Waterloo and Ottawa. A key development objective is therefore improved physical integration.
- ***Pursuing Integrated Human Settlement:*** given the relative unencumbered scale and greenfield opportunity, Cornubia represents a significant opportunity to 'get the basics right' in terms of achieving an integrated settlement. The core objective is ensuring that a 'complete and liveable' environment is created within which a range of economic and social opportunities are integrated with the provision of housing.
- ***Pursuing Sustainability:*** whereby the many facets of sustainability are considered carefully in the establishment of Cornubia. A key concern is moving the sustainability agenda further than the 'green agenda'. The core objectives are establishing a framework, management and delivery system that embraces all aspects of human settlement, the natural, social and economic environments. This will be elaborated on in Section 3.6.
- ***Building a Dynamic Region***: based on the strategic location of Cornubia within the northern development corridor, a key objective is responding to, drawing from and growing the energy within the larger urban and particularly economic logic of the region. New opportunities that contribute to the broader economic competitiveness needs to be considered within the planning for Cornubia.

- ***Strengthening the Regional Logic of Space:*** an important defining quality of the site is the natural environment. This includes at a regional scale the Ohlanga River which forms an important edge of the site, the unique landform of the site, as well as the local valley systems within the site. Therefore, a key is the potential to enhance the regional lattice of open space opportunity and connectivity.

Informed by the development objectives, the following are considered the key principles and development philosophy for Cornubia.

- ***Access and Structure:*** a key design principle at the level of the framework and at a local neighbourhood is the need to facilitate easy access, choice and convenience. At the larger framework scale, it is envisaged that a series of 'framework routes' would facilitate connectivity to the surrounding area and their respective opportunities. Equally, at a local scale, it is imperative that a robust structure is established which enables permeability and choice.
- ***Density and Compactness:*** encouraging density and compactness of settlement is a key design principle for Cornubia as these qualities provide the pre-conditions and threshold to support urban opportunity and choice.
- ***Diversity and Complexity:*** encouraging complexity through mixed-use and intensification is critical in delivering environments that offer choice and convenience. A key design objective within Cornubia is ensuring that a wide range of urban functions are catered for within the framework. This would ensure that future residents can access a 'fuller' set of urban opportunities within close proximity.
- ***High Quality Urbanism:*** the timeless qualities of high performance built environments must be sought within Cornubia. A clear departure from conventional housing provision premised on suburban models and patterns is a firm goal of the project. The critical interplay between form and space, between building and street, between the built and un-built are important concerns of the development approach.
- ***Meeting Local Needs Locally:*** the structure of Cornubia should facilitate easy access to local needs for future residents. A key design objective is ensuring walkability by locating facilities and convenience retail within local neighbourhoods. At the same time, these facilities should not be embedded within the urban fabric but should be externalised and contribute to a sense of local structure and legibility. Therefore, establishing local centres in places that are connected to the wider system is important.
- ***Public Transport and Non-motorised Transport Focus:*** given the thresholds targeted for the area, it is possible to achieve the required support for viable public transport. This would not only ensure that a longer term sustainability focus underpins development, but would maximise local convenience and accessibility. Non-motorised transport would be viable given the density and structure sought for Cornubia.
- ***Access to Open Space:*** creating a complete environment requires access to a range of landscapes including natural and recreational. Therefore, a key design objective for Cornubia is developing an integrated open space system as part of the overall urban fabric. The existing valley and wetland systems provide an important starting point in this regard. Through additional 'green' linkages a lattice of open space opportunity can be created within Cornubia. It is imperative that the establishment of the open space is undertaken in a manner that contributes positively to the overall environment in terms of natural resources and residential amenity.
- ***Public Space and Facilities:*** a primary goal is ensuring that a complete and liveable environment is created. A key ingredient to achieve this is ensuring that adequate provision is made for public facilities and developed public space.

3.4 Need and Desirability

Cornubia is a bold undertaking by both THD and the eTM and sets out the commitment to the national ideals, as well as defining and creating benchmarks for similar initiatives. The project aims to apply, leverage, assemble, and systematically align multiple institutional, financial, human and managerial resources, in a creative and innovative manner, covering aspects such as - informal settlement eradication, inter-and intra-settlement integration, urban restructuring and renewal, densification, tenure diversification, improved settlement design, better quality shelter, poverty eradication, and greater responsiveness to livelihood strategies. These are key components of Cornubia and relate directly to the strategic mandate of Government, its constitutional obligations and the priorities of creating a better life for all. The very nature of the Cornubia project is of a highly integrated and collective effort.

The development of Cornubia is strategically important for the reasons set out below:

- It presents an important opportunity to address the integration of the City and the imbalances of apartheid planning, consolidating and integrating the currently dispersed and dislocated points of urban development in the region. It does so by contributing significantly towards the development of the Northern Corridor, enhancing the development opportunities along the R 102, and through the potential to create connections and links to Umhlanga, Phoenix, Waterloo, Verulam and the Dube TradePort as well as to the broader urban system that extends to areas such as Pinetown, Bridge City, Inanda and KwaMashu.
- The area in which Cornubia is located is identified in the Integrated Development Plan (IDP) as part of a major economic investment node. The proposed development of Cornubia presents a significant opportunity to attract new investment to this area by releasing land to meet the significant demand for well-located light industrial and commercial land being generated as a result of the increased economic growth rate of the metropolitan economy.
- The development will create substantial new job and employment opportunities, particularly for residents of areas such as Phoenix, Verulam and Waterloo where work opportunities close to places of residence, as a consequence of apartheid planning, are currently lacking.
- It represents an important opportunity for substantial new residential development, significantly addressing demand for affordable housing and integrated residential developments that are well located in terms of access to employment opportunities, urban amenities and social facilities.
- The development will provide a benchmark for mixed-income, mixed-use development in line with the policy objectives of National Government's new housing policy, BNG. As a result, the development can make an important contribution to the realisation of the City's vision of being Africa's most liveable city.

The location of the Greater Cornubia Development is ideally positioned for THD together with the eTM to ensure that the following key objectives can be achieved:

- Make a key contribution to building, consolidating and integrating the social and economic base of the northern portion of the eTM;
- Ensure a sustainable mixed-use, inclusionary mixed-income development that maximises economic opportunities for future residents and investment;
- Create value by maximising the potential of the land through public-private partnerships so that the development of the land delivers a positive and a balanced economic, environmental and social return that is both financially sustainable and contributes to redressing inequalities;
- Position both THD and the eTM as leaders, innovators and promoters of integrated visionary planning and development; and
- To use the opportunity for creating substantial Black Economic Empowerment (BEE) opportunities in property development ownership and urban management.

Aside from the above mentioned key objectives of the proposed project there are three other motivating factors that rationalises the need for the Greater Cornubia Development. These are:

- ***Location***
  The location of Cornubia provides an opportunity to strengthen and consolidate the northern sub-region of eThekwini as well as providing marginalised communities access to the benefits of a growing urban node. Furthermore, Cornubia can compliment and enhance the value of public sector investment in new developments such as the Dube TradePort. Lastly, the projects can assist to address the legacy of apartheid planning;
- ***Economic Growth***
  The Cornubia Project intends to address the City and Province's competitiveness through its significant potential to deal with the scale and rated of the release of land for much needed industrial, commercial and residential development. Furthermore, the project offers significant opportunities to create new, well located employment opportunities close to new and existing housing and to focus on demand in the subsidised, gap and middle income housing markets; and
- ***Scale***
  The scale of the Greater Cornubia Development allows for the development of environmentally and financially sustainable innovations in service and housing delivery models. In addition, the project will

facilitate new forms of urban development, choices and lifestyle options previously not available to these markets.

3.5 Policy Informants

The Cornubia land is strategically situated within a number of development corridors or growth areas identified in provincial and local government plans and strategies in recent years.

3.5.1 Economic Development and Job Creation Strategy

The Provincial Spatial Economic Development and Job Creation Strategy identifies the eThekwini/Umhlatuze corridor as one of three Primary Corridors in the Province. A Primary Corridor is defined as a corridor with very high economic growth potential which serves areas of high poverty densities. The N2 national route acts as the spine of the eThekwini/Umhlatuze corridor connecting the port of Durban in the south to the port of Richards Bay to the north, which together function as the primary logistics gateway into South Africa. One of the main aims of this corridor is to take advantage of the development opportunities presented by the King Shaka Airport/Dube TradePort initiative.

The Economic Development and Job Creation Strategy (2012-2017) was compiled for the eThekwini Municipal area and will be executed *via* a comprehensive Implementation Plan by the Economic Development and Investment Promotion Unit, in partnership with all other relevant units in the Municipality, as per the local government mandate with the intention of providing for the core principles, mechanisms and processing necessary to enable municipalities to move progressively towards social and economic upliftment of local communities. In this plan, Cornubia is identified as a major catalytic construction project over the next 10-15 years which will create a significant number of jobs.

The Strategy seeks alignment and ensures it is homologous with the relevant Strategies amongst the three spheres of government – most notably the New Growth Path, National Development Plan and the Industrial Policy Action Plan from National government, all of which have identified specific sections of the economy with job-creation potential. The KwaZulu-Natal Provincial Industrial Development Framework and the Growth and Development Strategy also guide the local government initiatives. In compiling the regional Integrated Development Strategy, the Spatial Development Framework and others, the eThekwini Municipality has ensured that the essential principles and focus areas resonate with these reports.

3.5.2 Integrated Development Plan and Spatial Development Framework

Durban's Spatial Development Framework (SDF), as established through the IDP process, firmly seeks to reinforce the development intensification and improved functioning of the existing "T" shaped development areas. The SDF depicts the thrust of the IDP indicating the eTM investment intentions and development management approach.

It is suggested that the SDF will respond to key spatial drivers that will determine investment within Durban. Umhlanga is considered as an urban investment opportunity and is located strategically along the existing "T" axes. The SDF acknowledges a northward investment thrust to accommodate the Dube TradePort as a key spatial driver in the Northern Region. The SDF identifies Cornubia as an investment opportunity area and is located within the defined Urban Development Corridor.

In terms of eThekwini's IDP, the Greater Cornubia Development site it is situated within the urban edge/boundary of the City, in one of the three "zones of planning", the "urban core", which is intended to be characterised by well-resourced development, with high density urban form and high value infrastructural investment. The project will be grounded in the principles of the City's IDP, and will specifically articulate the following programmes identified in the plan:

- New subsidised housing;
- Integrated neighbourhood interventions;
- Community empowerment and development;
- Job creation;

- Enterprise development;
- Good governance; and
- Environmental management.

3.5.3 Northern Spatial Spine

One of the key objectives of the Northern Spatial Development Plan is to redress past imbalances and build for the future by responding appropriately to future needs and anticipated growth patterns and trends. To this end, the R102 and the M41 have been identified as a Metropolitan spine and Sub-Metropolitan spine respectively. The purposes of these spines are to promote the efficient and effective linkage between rural and urban areas across the metropolitan areas as well as the provision of high density housing/business opportunities in close proximity to the public transportation routes.

The Northern Spatial Development Plan identifies Cornubia as one of 6 LAPs (Figure 3-4) and suggests the following for Cornubia:

- The establishment of Cornubia as a new local node;
- The creation of new mixed-use with housing densities along the R102 development spine in the region of a minimum of 40-60 du/ha;
- Establish new mixed medium and high density residential in undeveloped zones;
- Create industrial opportunity in Ottawa Flats; and
- Protect open space assets.

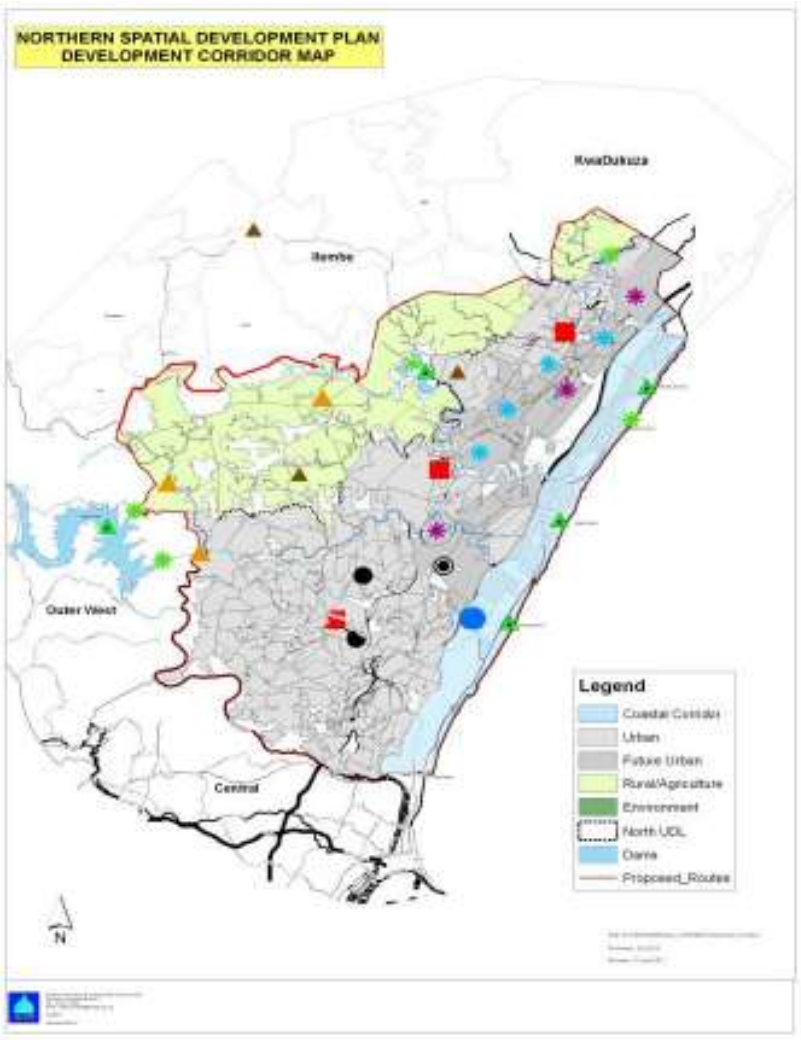


Figure 3-4: Northern Spatial Development Plan

3.5.4 Northern Urban Development Corridor and Verulam/Cornubia Local Area Plan

As part of the innovative package of plans approach adopted by the Municipality, LAPs have been developed for the NUDC – the subregion between KwaMashu and Tongaat to the west of the N2.

The NUDC "…*is to be developed as a mixed-used development corridor that will consolidate existing and anticipated future population and economic growth in the northern metropolitan area in a spatial pattern that reinforces the new airport node as an internationally competitive Aerotropolis whilst simultaneously establishing and/or enhancing the roles and characteristics of established and/or new development nodes, spines and neighbourhoods*".

In terms of the Verulam/Cornubia LAP, the primary roles envisaged for Cornubia include:

- New Town to accommodate local mixed use, mixed density and mixed-income urban living areas – with densities of between 80 and 150 dwelling units per hectare;
- New local light industrial node;
- Establishment of part of the new north-south multi modal transit oriented development spine connecting Phoenix-INK and the metro HPPTN to the Airport and Dube TradePort; and
- Protection of the environmental roles of the Ohlanga River systems.

In summary, the location of the development is in line with the planning intent as the study area is in a prime location for the nature of uses proposed. The development could serve as a catalyst to induce future private sector investment within this area and will generate much needed employment opportunities for people of Cornubia and surrounds. Since the Medium Density residential development is already under construction with approximately 2 500 units envisaged in the short-term, the development of the study area may contribute in creating much needed employment opportunities in the area. Initial feasibility studies indicated that the precinct would be able to provide a number of temporary and permanent jobs as well as contribute significantly to the rates base.

3.6 Application to Cornubia Phase 2

The development objectives and principles for the Greater Cornubia Development have been applied to Cornubia Phase 2 through the following key elements (Figure 3-4):

- Integration of the surrounding context through a clear hierarchy of roads as well as ensuring permeability of the internal network;
- Design and plan for future uses that are driven around public transportation;
- The allocation of high intensity mixed used development around Bus Rapid Transport (BRT) stations;
- The inclusion of non-motorised transport and the promotion of 'walkability' to urban and social opportunity;
- Land uses are to be arranged on its most appropriate location in order to capitalise and promote economic opportunity;
- Pursuing higher densities in order to achieve a more sustainable development;
- A mix of residential types with an understanding of their relationship with one another;
- Using the green spaces more efficiently that retains their ecological benefit but also adds value and opportunity to the land uses that it surrounds;
- Promoting clustered social facilities that are part of the neighbourhood structure.

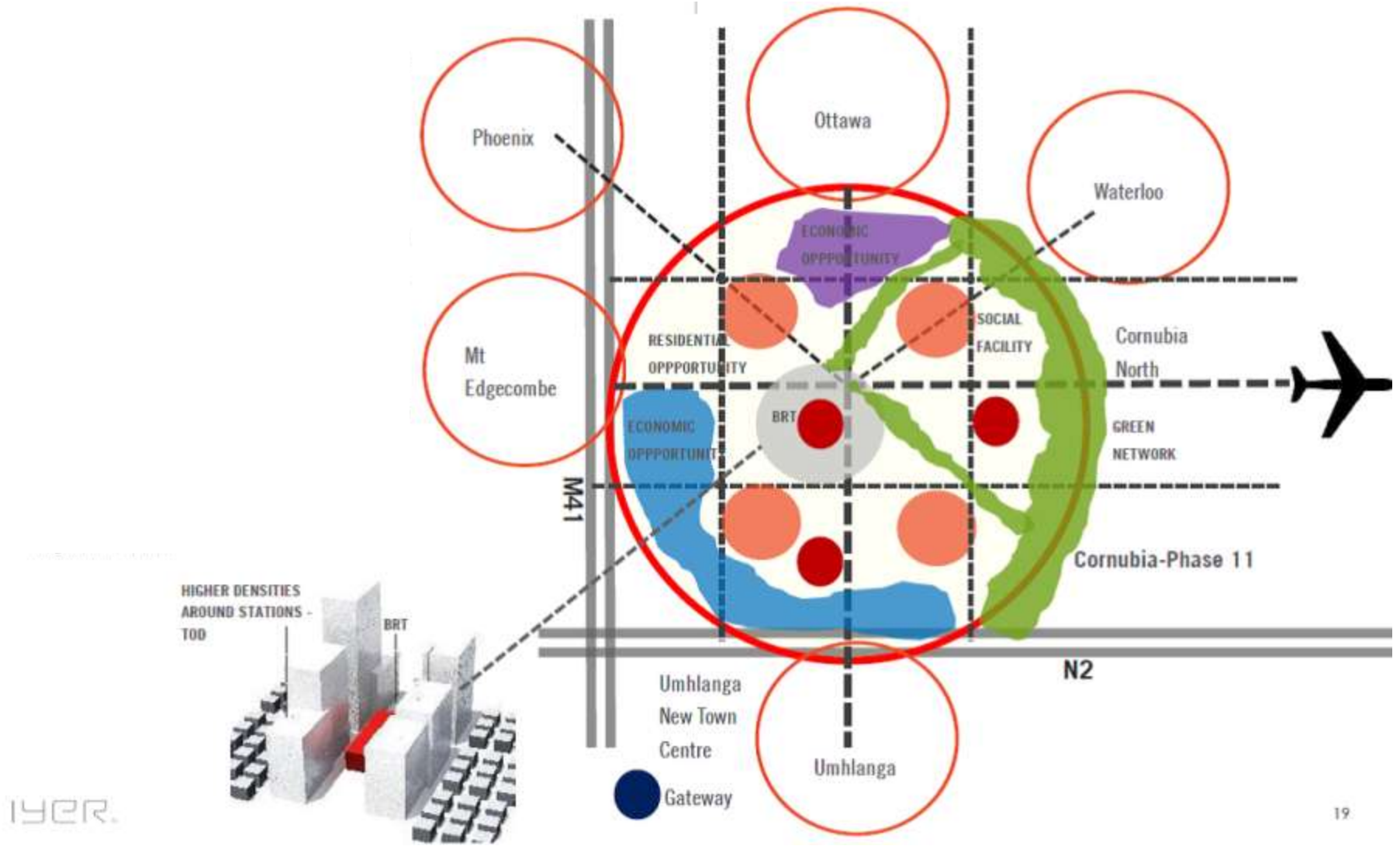


Figure 3-5: Application of development objectives and principles to Cornubia Phase 2

3.7 Cornubia Social Sustainability and Innovation Programme

In keeping with the promise of an Integrated Human Settlement Development, the Developers have committed to the Cornubia Social Sustainability and Innovation Programme (SSIP) which seeks to position Cornubia as a zero unemployment Development where the community plays a pivotal role in driving economic growth and social development in the Greater Umhlanga area. The Cornubia SSIP identifies three pillars to drive an all-inclusive sustainable stakeholder value creation Development as follows: Open Space Management; Social Development Programme; and Economic Participation Programme.

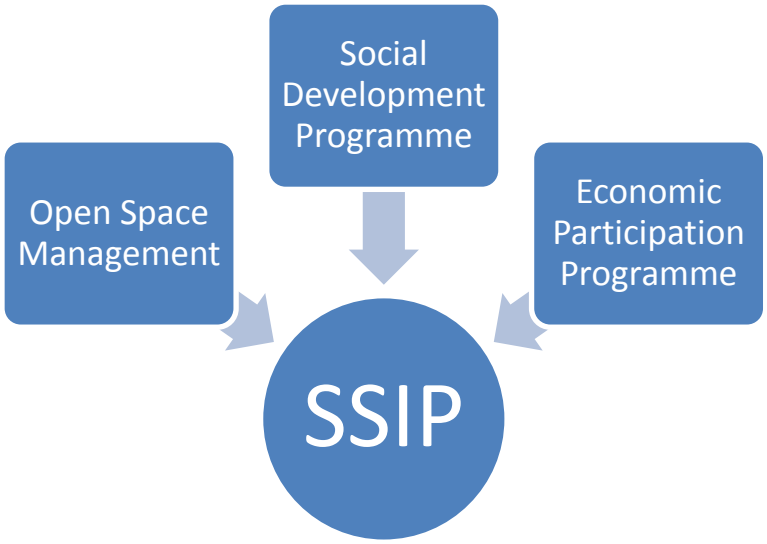


Figure 3-6: Cornubia SSIP

3.7.1 Open Space Management

The programme seeks to explore the entire extent of the approximately 400 ha of public open space at the Greater Cornubia Development to identify initiatives aimed at ensuring sustainable, value creating use of this space. To this end there are four programmes that are currently in progress:

- ***Ohlanga River Catchment Management*** – The Cornubia SSIP team has engaged the Wildlands Conservation Trust in a three-year partnership to eradicate alien invasives along a 10 km stretch of the Ohlanga River Catchment. The project is co-funded by Department of Water and Sanitation under the Working for Water Programme along with THD together with their Cornubia Value Chain partners (Contractors, Lot Owners and Land Purchasers). There are 16 workers recruited from the local community (Cornubia Phase 1(a) and Blackburn Village).
- ***Cornubia Nursery*** - More than 3 ha have been earmarked to establish a nursery that will hold at least 20 000 trees sourced from surrounding rural and peri-urban communities. This is part of Wildlands Conservation Treepreneurs Programme aimed at educating the community on biodiversity conservation. The trees will be used in the restoration and landscaping initiatives at Cornubia.
- ***Urban Agriculture*** - as part of piloting urban agriculture in Cornubia, a 2 ha site has been made available at Blackburn and Hillhead Estates where two cooperatives recruited from the community established at Cornubia have been trained by the eTM's Urban Agriculture Unit to prepare community gardens. There are presently eight cooperatives that are part of the Cornubia Incubation Programme where two graduate interns have been assigned to the cooperatives to impart the theoretical and practical knowledge in Urban Agriculture. Furthermore, in partnership with the local school, the Cornubia SSIP revived a 225 m^2 school garden project where one of the cooperatives was involved in cultivating vegetables. The first harvest has been achieved; and this was sold to employees at THD's office with proceeds reserved for the School Repairs and Maintenance Project.

3.7.2 Social Development Programme

3.7.2.1 Social Desk Coordination

The Cornubia SSIP established a social desk manned by a co-ordinator recruited from the community to deal with community complaints and queries. This initiative played a key role in bringing about social cohesion amongst beneficiary families who were allocated houses at the CIHD, Phase 1 *(a)*.

3.7.2.2 Development Committee

The Cornubia SSIP facilitated the establishment of a Community Development Committee aimed at addressing committee socio-economic issues. This committee, together with the local councillor, has played an important role in forging unity and organisation in the community.

3.7.2.3 Youth Development Programme

There are several youth development programmes underway at Cornubia. These are as follows:

- ***Abet classes*** - 70 students, mostly young people from the community are attending ABET classes in the evening since April this year. This is funded by eThekwini Skills Development, Business Support and Department of Education.
- ***University/College Registration facilitation*** - 50 would-be students attended the information sharing session hosted by the University of KwaZulu-Natal, Durban University of Technology and Coastal FET colleges. This was aimed at raising awareness to matriculants wanting to further their studies. Twenty students qualified for entrance and the Cornubia SSIP facilitated the registration of these students *via* the Central Application Office.
- ***Matric Re-writing Programme*** - the Cornubia SSIP team is busy engaging with the Department of Education to activate the above programme that would allow those students wanting to improve their matric results. The Department of Education would provide resources if the community manages to have 50 students registered for the programme.

3.7.3 Economic Participation Programme

3.7.3.1 Jobs Links

The process of registering job seekers has been successfully concluded. This shows a low level of skills base in the community with the majority (60%) of the job seekers under the age of 24 years. A process of prioritising Cornubia residents for job opportunities was agreed with the development committee. Most of the opportunities require semi-skilled construction related skills. The sustainability of these jobs beyond construction has put the project under risk. The Cornubia SSIP team is currently reviewing the job catchment to include the Greater Umhlanga Area (Phoenix, Mount Edgecombe, Gateway, Umhlanga Ridge Town Centre, Izinga, Prestondale and Ridgeside) in order to accommodate Cornubia job seekers.

3.7.3.2 Skills Development and Workforce Preparation

Seventy people have undergone a workforce preparation programme with Harambee (a youth employment accelerator programme), a programme co-funded by the Jobs Fund and Private Sector. The process to engage employers in the Greater Umhlanga Area is underway to facilitate employment opportunities for the job seekers.

3.7.3.3 Enterprise Incubation and Business Support

Two cooperatives involved in Urban Agriculture are part of the incubation programme to transfer knowledge of farming in the urban context. Four interns with agricultural qualifications have been recruited to be part of the incubation centre; assisting with imparting knowledge to cooperatives.

3.7.3.4 Food Kiosks

As part of socio-economic development, three food kiosks have been bought and allocated to the vendors who are selling food to workers at the construction sites. They each employ two people with each kiosk generating an income of between R350- R700 per day.

4 DESCRIPTION OF THE RECEIVING ENVIRONMENT

BIOPHYSICAL

4.1 Climate

The Cornubia area is coastal with a summer rainfall and a warm humid climate throughout the year. No frost occurs within the project area and is thus ideal for most crops including sub-tropical crops. Mean annual precipitation is 989 mm and mean annual potential evaporation is 1659 mm.

Table 4-1: Climate data from SASA Experiment Station, Mount Edgecombe

	TMX	TMN	DBA	WBA	RHA	DBP	WBP	RHP	SUN	RAIN	EVP	WND
	ºC	ºC	ºC	ºC	%	ºC	ºC	%	h	mm	mm/d	km/d
Jan	27.3	19.7	23.8	21.0	77.3	26.2	22.2	69.9	6.0	126.7	5.6	**163.9**
Feb	27.5	19.9	23.7	21.2	79.5	26.6	22.6	69.9	6.4	122.0	5.4	**152**
Mar	27.0	19.3	22.7	20.5	80.9	26.0	22.0	69.4	6.6	105.1	4.6	**136.9**
Apr	25.6	16.7	20.3	18.2	80.8	24.6	20.3	66.2	7.0	67.1	3.7	**114.7**
May	24.2	13.7	17.3	14.9	75.9	23.2	18.2	60.6	7.3	50.7	2.9	**94.9**
Jun	22.7	11.4	14.4	11.6	69.8	21.7	16.0	53.6	7.4	30.9	2.5	**90.7**
Jul	22.4	11.1	14.2	11.4	70.6	21.4	15.7	53.8	7.5	31.5	2.7	**101.4**
Aug	22.8	12.3	16.0	13.4	74.1	21.7	16.6	58.6	7.0	40.2	3.2	**128.9**
Sept	23.3	14.4	18.4	15.7	74.8	22.0	17.7	64.4	6.0	65.8	3.8	**156.7**
Oct	24.1	16.2	20.2	17.3	74.1	22.6	18.6	67.7	5.6	93.5	4.4	**178.0**
Nov	25.2	17.7	21.9	18.8	74.0	23.7	19.9	69.8	5.6	107.6	4.9	**177.6**
Dec	26.6	19.1	23.3	20.3	75.1	25.2	21.3	70.0	5.9	115.0	5.5	**170.3**
Mean	**24.9**	**16.0**	**19.7**	**17.0**	**75.6**	**23.7**	**19.3**	**64.5**	**6.5**	**79.7**	**4.1**	**138.8**

Legend:

TMX	Maximum temp	**WBP**	Wet bulk 14:00
TMN	Minimum temp	**RHP**	Relative humidity 14:00
DBA	Dry bulb 8:00	**SUN**	Sunshine hours
WBA	Wet bulk 8:00	**RAIN**	Rainfall
RHA	Relative humidity 8:00	**EVAP**	A-pan evaporation
DBP	Dry bulk 14:00	**WND**	Wind run

4.2 Geology and Soils[2]

The site is predominantly underlain by the miscaceous sandstones and siltstones of the Permian Vryheid Formation, containing Jurassic dolerite intrusions. The major valley lines and the floodplains of the Ohlanga River to the north and the dam in the south western area are underlain by Quaternary alluvial sediments. The south eastern corner of the area is underlain by the clays and sands of the Berea Formation, capped by recent Aeolian dune sands.

4.2.1 Topsoils and Colluviam

The slopes are in general covered by brown, colluvial sandy clays and clayey sands, extending to depths of up to 0.70 m below present ground level.

[2] *The following information has been extracted from the Geotechnical Assessment undertaken for the remainder of the Cornubia Development undertaken by Drennan, Maud and Partners (2009) and can be found in Appendix C 2.*

4.2.2 Alluvium

The major valley lines and low plain areas towards the southern embankment of the Ohlanga River is built up by the alluvial sediments both from the drainage lines and from deposits from flood events of the river itself, which comprise alluvial sands in various areas, as well as alluvial clays.

4.2.3 Aeolian Dune Sands

The far south eastern corner, north of the Mount Edgecombe Highway, comprises of recent Aeolian dune sands capping the underlying clayey sands and sandy clays of the Berea Formation. The dune sands are in general brown loose fine grained sands, which may contain clayey parts of Berea Formation clay, picked up during the sedimentary process, near the contact with the underlying Berea Formation sediments.

4.2.4 Berea Formation

The south eastern elevated areas are underlain by the typical Berea Formation sandy clays and clayey sands of the KwaZulu-Natal coastline. The Berea Formation can be expected to reach depth up to 40 m below present as shown in the boreholes previously drilled for the proposed Cornubia Interchange.

4.2.5 Dolerite

The dolerite intrusions appear in the entire scale of reddish colours from violet over red to orange. The dolerite is locally moderate to completely weathered and covered by residual clays or clayey sandy soils of depths varying from less than 1.0 m to in excess of the 3.0 m depending on the mineral composition of the intrusive rock and the exposure to the weathering processes. However, on the steeper slopes in the area, the residual soils are not present and the weathered bedrock is exposed or covered by shallow colluvial soils.

4.2.6 Vryheid Formation

The micaceous fine grained sandstones, siltstones and shales of the Vryheid Formation are in general grey, laminated to thinly interbedded and highly to medium wide fractured by multiple joint sets. Whereas the medium to coarse sandstones sequences in general are medium to widely bedded, the soils derived from the weathered Vryheid Formation generally comprise yellow brown, grey and orange, sandy silty residual clays and extend in areas to depths beyond the reach of the TLB below the existing ground level. Ferricrete may occur locally in areas where sandstone is the predominant bedrock. However, on the steepest slopes in the area, the residual soils are not present and the weathered bedrock is exposed or covered by clayey colluvial soils.

4.2.7 Structural Features

The predominant dip direction of the usually moderate to highly jointed sedimentary beds of the Vryheid Formation in the northern and eastern area is in a southerly to south westerly direction, at low angles of 5^{o} – 10^{o}, whereas this changes to general dip direction of north to northeast towards the area reported on for Cornubia Phase 1. The change in predominant dip directions indicates a major tectonic alignment running in a north-south direction throughout the area and correlates with the predominant north-south alignment of most major dolerite intrusions in the area. However, sedimentary beds might locally dip in a southern or western direction as observed on the Blackburn Estate outside of the Phase 1 area.

4.2.8 Mining Reserves

The Cornubia Phase 2 development area includes a small portion of clay (Corobrik) reserves which are located primarily in the noise contours. The Flanders Quarry is located within the Cornubia Phase 2 development area. The extent of the Flanders Quarry is illustrated in Figure 4-1. The black line illustrates the

site boundary of the quarry; however, the yellow line indicates the extent of the existing quarry. The red hatched area represents historical stockpiles and is deemed undevelopable as this area is underlain by an assortment of materials such as discarded concrete, piles, large tree trunks to an unknown depth and covered by a thin layer of topsoil. The recommendation by the project engineers SMEC, is that that it is unadvisable to use this site for housing or structures. This site has since been approved as a spoil site for the Cornubia Retail Park. All waste has/is being removed from this site prior to spoiling. The intention is to rehabilitate the site once spoiling is complete to be used for open space, parks, and sports fields.

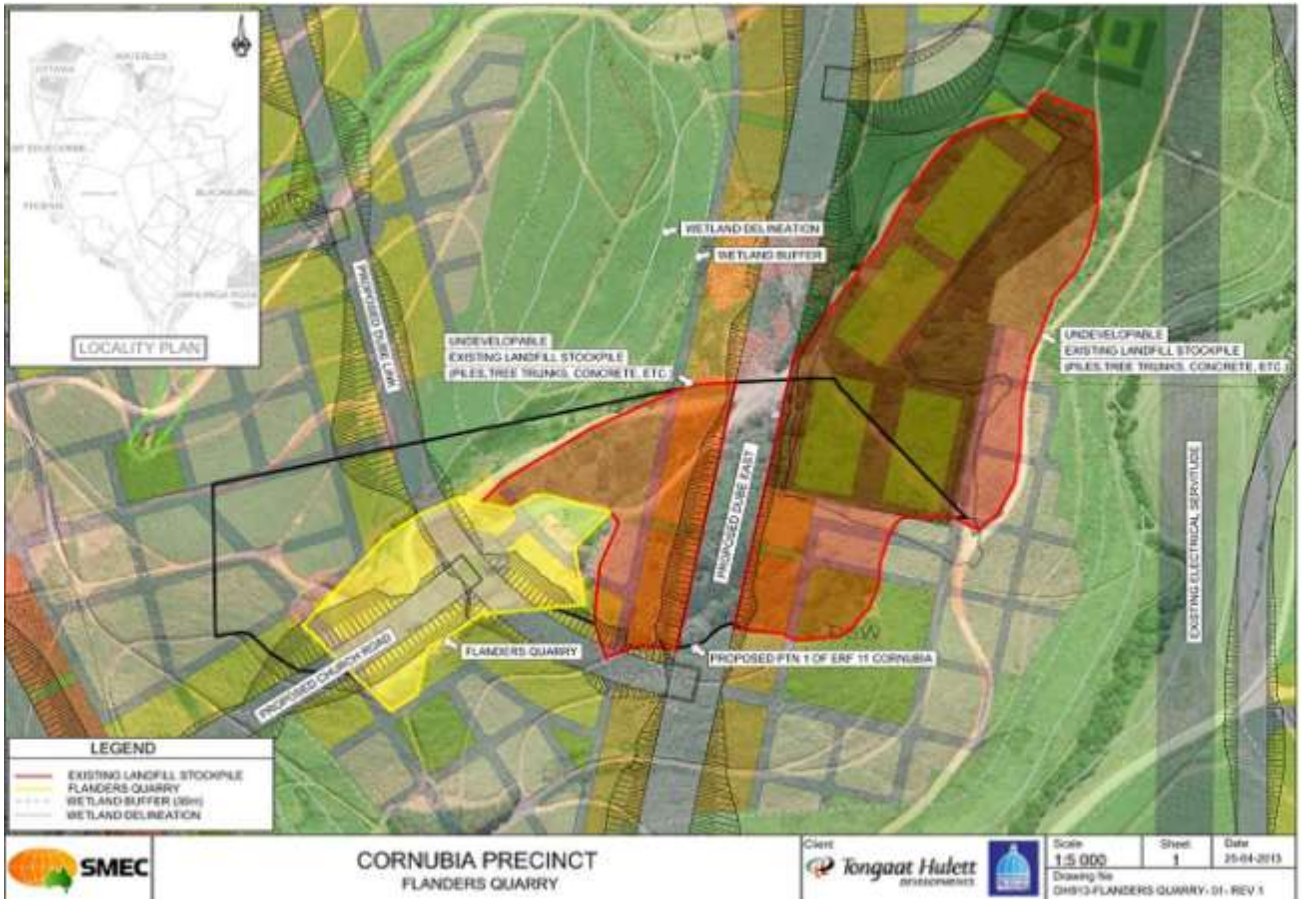


Figure 4-1: Extent of the Flanders Quarry

Figure 4-2: Photograph of the existing surplus fill material sites at the Flanders Quarry

4.2.9 Cornubia Phase 2 Site Summary[3]

The Environmental Protection Atlas (ENPAT) Geographic Information Systems (GIS) Database indicates that the Cornubia site is predominantly underlain by Pietermaritzburg Shale with the northern parts underlain by alluvium associated with the Ohlanga River floodplain. Small areas of tillite of the Dwyka Formation, sandstone of the Vryheid Formation, dolerite and dune cordon sand are also expected. It is expected that the soils overlying the shales and dolerites comprise silty clay and the alluvial soils within the Ohlanga River floodplain comprise loamy sand to well sorted sand. The soils across most of the estate have been highly disturbed for as long as it has been utilised as a commercial sugarcane farm. Regular ploughing along with the sugarcane production cycle has resulted in extensive disruption to the wetland soils. Some compaction of soils has occurred in those wetland areas with roads or tracks traversing them.

4.3 Agricultural Potential[4]

Cornubia was formerly part of Blackburn Estate, which in turn was part of the Natal Sugar Estates and has been producing sugarcane for decades. The land is predominantly under sugarcane production. Most production is under dryland (rainfed) conditions. Three sugarcane varieties are being cultivated namely, 376, N27 and N12. There exists very good infrastructure with respect to buildings, roads, equipment and staff. All equipment to be appeared in well maintained condition, which is indicative of a good and motivated management team.

4.4 Topography and Land Use

The site is characterised by steep and undulating topography with broad and rounded hilltops and ridge lines separated by broad, moderately sloping valleys and valley heads. Elevation ranges from around 150 m down to 8 masl. Mean average slope within Phase 2, is approximately 13% and a maximum slope of 77%. Figure 4-3 suggests that more than 50% (458 ha) of the Cornubia Phase 2 area is flatter than 1 in 6.

The site comprises of a gentle hill and valley system draining northwards into the Ohlanga River. Furthermore, a manmade dam (the Marshall Dam) is established in the south-western part of the site, fed by valley lines from the north. The area is predominantly under sugarcane cultivation. Very steep slopes and main valley lines are covered by indigenous bush interspersed with alien invasive species. Furthermore, various parts of the site offer alternate land uses such as the resting borrow pit at Flanders Quarry, approved spoil sites for the earlier Phases of Cornubia, private farming, informal settlements, etc.

[3] *Information obtained from the Cornubia Phase 2 Wetland Assessment (2014) prepared by SiVEST and provided in Appendix C 5.*

[4] *Information extracted from the Agricultural Potential Study of Cornubia undertaken by Mottram and Associates cc. and provided in Appendix C 1.*

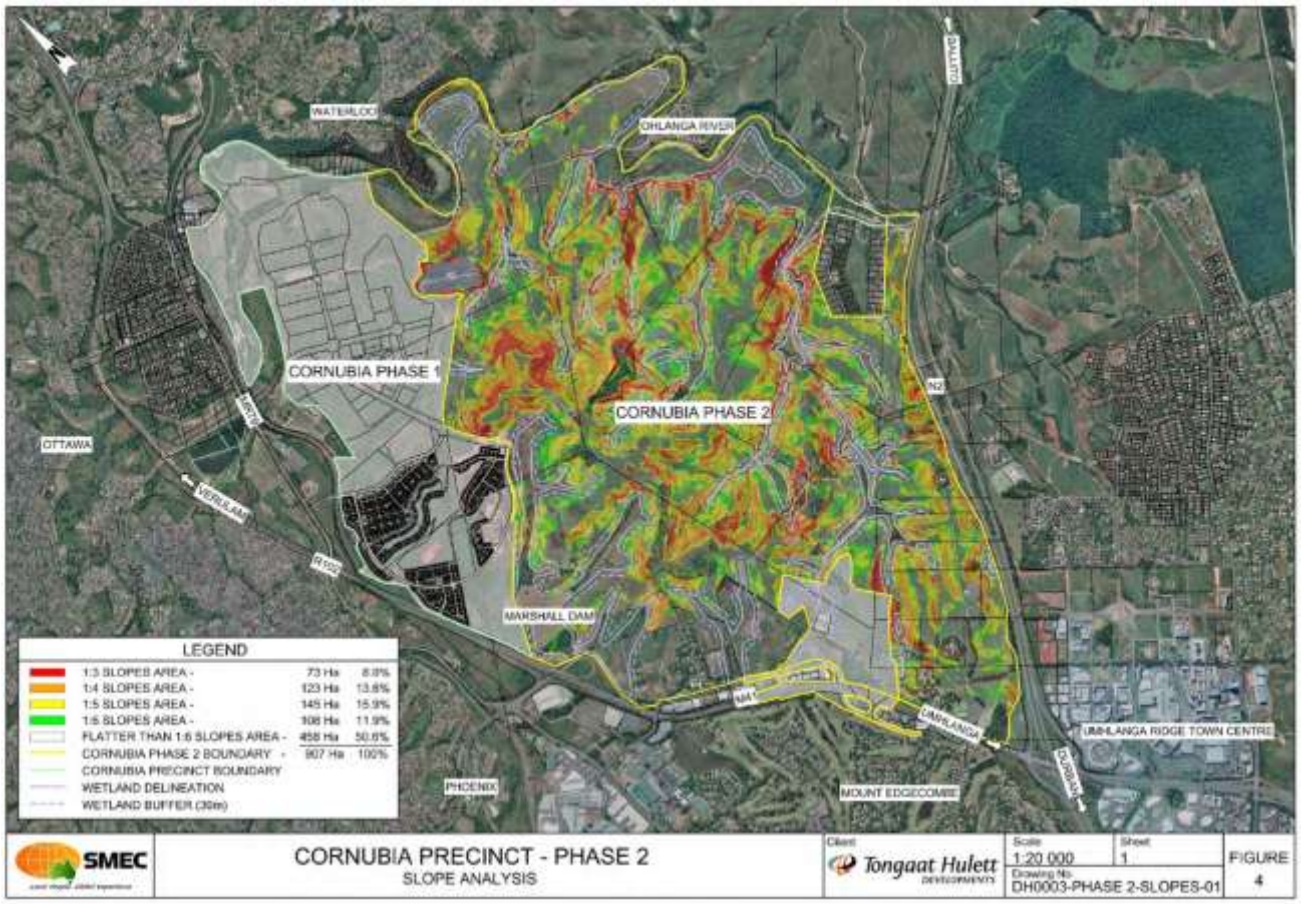


Figure 4-3: Slope analysis of the Cornubia Phase 2 site

4.5 Vegetation and Fauna[5]

At a broad-scale, the site is situated within the KwaZulu-Natal Coastal Belt vegetation unit, as defined by Mucina and Rutherford (2006). This vegetation unit predominantly comprises subtropical coastal forest with patches of primary grassland prevailing in hilly, high rainfall areas where pressure from natural fire and grazing regimes prevailed (Mucina and Rutherford, 2006).

This vegetation unit is considered endangered by Mucina and Rutherford (2006) with only a very small part formally conserved in Ngoye, Mbumbazi and Vernon Crookes Nature Reserves. About 50% of this veld type has already been transformed for cultivation and by urban sprawl. It is for this reason that the vegetation unit is considered endangered. In these areas much of the remaining vegetation has been severely encroached upon by alien invasive species that include *Chromolaena odorata*, *Lantana camara*, *Melia azedarach* and *Solanum mauritianum*. Erosion within this veld type is low to moderate.

At present, the majority of the site has been cleared for sugarcane cultivation. Remnants of invaded and highly disturbed coastal and riparian bush remain where sugarcane cultivation was not feasible. These areas include the riparian area adjacent to the Ohlanga River, fragments along some of the existing streams and on hilltops characterised by shallow soils. Natural communities that still exist appear to be maintained annually, as part of the estates maintenance. With the exception of the floodplain wetland immediately bordering the Ohlanga River, the wetlands to be rehabilitated have been cleared for sugarcane cultivation. Typical wetland species such as of *Typha capensis*, *Phragmites australis* and *Cyperus textilis* are confined to the beds and banks of the artificial drainage channels dug along these in-land wetlands units.

[5] *Information obtained from the Cornubia Phase 2 Wetland Assessment (2014) prepared by SiVEST and provided in Appendix C 5.*

4.6 Water Resources[6]

4.6.1 Catchment Details

The Greater Cornubia Development falls within the Mvoti to Mzimkulu Water Management Area and specifically within the Mgeni Key area and Mdloti and Tongati Key area. The responsible water authority for the catchment and sub-catchment of the project area is the DWS, KwaZulu-Natal Region.

The proposed Phase 2 development is located within the western edge of Quaternary Catchment U30B and within the upper reaches of a right-bank tributary of the Ohlanga River referred to as catchment A in the original wetland study.

4.6.2 Site Drainage

The majority of the site drains towards the Ohlanga River, to the north with a small catchment area that contributes to Marshall Dam, being the most notable exception. Artificial drainage channels have been established within all of the valley thalwegs (lowest elevation of a valley bottom) to lower the local water table and drain the wetlands within the valley bottom areas for use as sugarcane cultivation areas.

At present, the drainage within Cornubia Phase 2 has been severely modified in order to maximise the cultivated area. This modification stems from the diversion and canalisation of flow into central channels through the formation of artificial drainage channels, gully formation or channel incision. Unnatural channels are identified as straight or angular lines following the courses of valleys, as opposed to the usually sinuous, irregular lines made by natural channels.

For ease of assessment and discussion Cornubia Phase 2 has been delineated into smaller sub-catchments and for consistency have been labelled, as far as possible, based on the original Wetland Delineation Report (NMH, 2005) (Figure 4-4).

[6] *Information obtained from the Cornubia Phase 2 Wetland Assessment (2014) prepared by SiVEST and provided in Appendix C 5.*

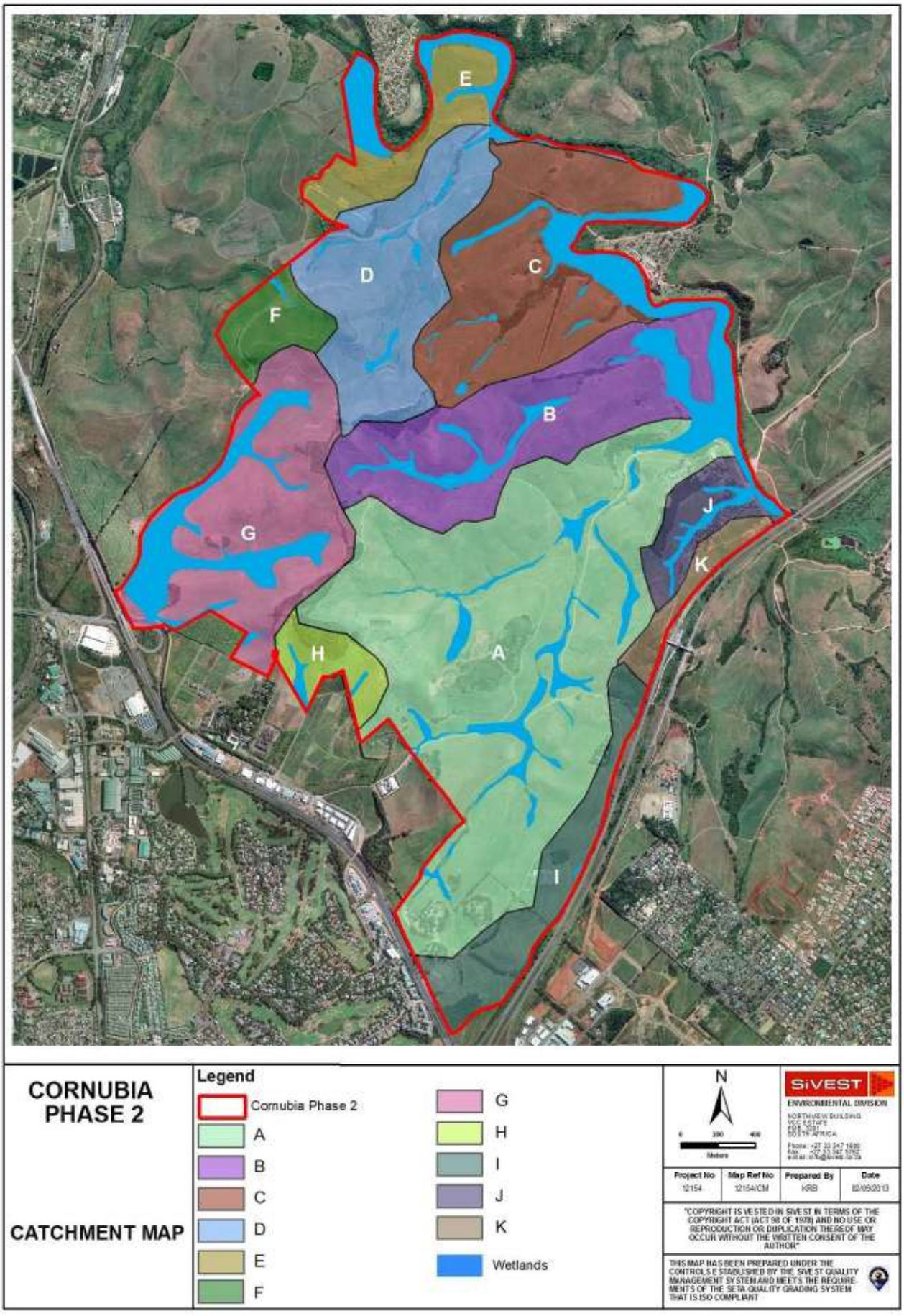


Figure 4-4: Cornubia catchment map

4.6.3 Wetlands

Of the 895 ha which constitute Cornubia Phase 2, 128 ha (14%) is defined as wetland (Figure 4-5). Hydro-geomorphic (HGM) units within this land use class include floodplains, channelled and un-channelled valley bottoms and hillside seeps. To ensure consistency, these units have been labelled based on their contributing catchment as well as on names used in previous assessments.

Figure 4-5: Wetlands within the Cornubia Phase 2 site

The following wetland HGM units were identified in the study area:

- Forty channelled valley bottom wetlands;
- Two un-channelled valley bottom wetlands;
- Eight valley head seep wetlands;
- Five floodplain wetlands; and
- Two wetland units that have already been lost.

A wetland catchment and area analysis was undertaken to delineate each wetland catchment area as well as to determine the extent of the wetlands. The results are presented in Table 4-2.

Table 4-2: Wetland unit, HGM classification, area and wetland catchment areas

Wetland Unit	HGM	Wetland Area (ha)	Catchment Area (ha)
A1	Channelled Valley Bottom	2.1596	302.7632
A10	Channelled Valley Bottom	0.1834	21.2285
A11	Channelled Valley Bottom	0.5733	16.9100
A11a	Valley Head Seep	0.1761	0.9294
A12	Channelled Valley Bottom	2.4248	13.7789
A2	Channelled Valley Bottom	05085	289.9740
A3	Channelled Valley Bottom	1.4955	274.9045
A3a	Valley Head Seep	0.2434	9.7627
A3b	Channelled Valley Bottom	0.4510	87.3637
A3c	Channelled Valley Bottom	1.2448	84.8979
A3d	Channelled Valley Bottom	2.0630	11.2081
A4	Channelled Valley Bottom	1.3469	137.9892
A4a	Valley Head Seep	0.2902	3.1584
A4b	Channelled Valley Bottom	0.9578	16.3355
A4c	Valley Head Seep	0.8719	4.7244
A5	Channelled Valley Bottom	2.6723	105.0835
A6	Channelled Valley Bottom	0.5452	20.4428
A6a	Channelled Valley Bottom	0.6342	5.4153
A8	Channelled Valley Bottom	1.7855	67.6303
A8a	Channelled Valley Bottom	0.3082	6.6897
A8b	Channelled Valley Bottom	0.5317	18.9751
A9	Channelled Valley Bottom	0.3889	30.8563
B1	Channelled Valley Bottom	7.8767	69.8513
B2	Channelled Valley Bottom	7.4613	120.5234
B3	Flood Plain	5.0604	10812.2588
C1	Channelled Valley Bottom	0.3124	2.2563
C2	Channelled Valley Bottom	0.1686	8.5088
C3	Un-Channelled Valley Bottom	0.5102	7.7885
C4	Channelled Valley Bottom	0.3498	11.6586
C5	Channelled Valley Bottom	0.0313	2.2030
C7	Un-Channelled Valley Bottom	0.1947	6.7072
C8	Flood Plain	25.4607	10812.2588
C8b	Channelled Valley Bottom	0.2629	38.9995
C9a	Channelled Valley Bottom	1.9253	14.3146
C9c	Channelled Valley Bottom	0.0725	4.7274
D1	Channelled Valley Bottom	0.9351	24.4167
D2	Channelled Valley Bottom	0.0466	33.7666
D3	Channelled Valley Bottom	1.2293	80.4226
D4	Channelled Valley Bottom	0.2606	6.3077
D5	Channelled Valley Bottom	0.3258	89.9940
E1	Flood Plain	8.1129	10812.2588
E1	Flood Plain	8.2685	10812.2588
E2	Channelled Valley Bottom	0.9728	6.9304
F1	Channelled Valley Bottom	0.4089	8.0909
G1	Channelled Valley Bottom	19.9040	68.0796

Wetland Unit	HGM	Wetland Area (ha)	Catchment Area (ha)
G2	Channelled Valley Bottom	7.4263	30.9176
G3	Lost*	1.2395	
G4	Lost*	0.4942	
H2	Channelled Valley Bottom	1.4163	9.2620
H3	Channelled Valley Bottom	0.3882	9.6230
I1	Channelled Valley Bottom	0.1195	3.6046
J1	Flood Plain	1.1332	10812.2588
J2	Channelled Valley Bottom	2.8715	23.4422
J3	Valley Head Seep	0.2157	2.8294
J4	Valley Head Seep	0.1449	1.2337
J5	Valley Head Seep	0.1013	1.0524
J6	Valley Head Seep	0.4058	4.2498

**Wetland Catchment Area could not be calculated due to existing wetland loss that has occurred*

The channelled valley bottom wetlands ranged in size from 0.0313 ha to 19.90 ha. Wetland catchment size for the channelled valley bottom wetlands varied greatly from a minimum of 2.203 ha to a maximum of 302.7632 ha. The un-channelled valley bottom wetlands were more limited in extent ranging from a minimum of 0.1947 ha to 0.5102 ha. Wetland catchment size were similarly limited in extent and ranged from 6.7172 ha to 7.7885 ha. The valley head seep wetlands were very limited in extent by comparison to the other two wetland types with the smallest valley head seep wetland measuring 0.1013 ha whilst the biggest valley head seep wetland measured 0.8719 ha. Corresponding wetland catchment areas were equally limited by comparison to the other wetland types ranging from a minimum of 0.9294 ha to a maximum of 9.7627 ha. The floodplain wetlands, however, are relatively extensive by comparison to the other wetland types measuring from a minimum of 1.1332 ha to a maximum of 25.4067 ha. The wetland catchment is likewise quite large by comparison encompassing an area of approximately 10 812.26 ha.

Overall, it can be stated that the wetlands located within the study area are generally not extensive systems with the exception of the floodplain wetlands. Most are quite small (<5 ha) in size, and have localised and limited catchment areas that are contained within the study area. The topography is a strong factor dictating the wetland type and characteristics. Relatively steep hills and sandy/loamy substrate provide a suitable template for the development of seasonal valley head seep wetlands on the mid slopes. Drainage into the valley bottom areas gives rise to the occurrence of the channelled and un-channelled valley bottom wetlands. The valley bottom wetlands are generally narrow and constrained by hilly topography. The wetlands are seasonal to permanently inundated.

The Ohlanga River is the primary water input to the Ohlanga floodplain wetlands. Progressive development of the floodplain wetland as a result of yearly inland flows and flood events has resulted in scouring out a wide valley bottom area, susceptible to the deposition of sediments in the valley bottom. The substrate of the floodplain wetland contained mainly unconsolidated sandy sediments along with fine grained clay particles giving rise to permanent, seasonal and temporarily inundated areas.

4.6.4 River and Estuary[7]

The Ohlanga river and estuary is situated immediately north of the coastal resort town of Umhlanga approximately 20 km north of Durban. The lower part of the estuary was proclaimed as an additional part of the Umhlanga Lagoon Nature Reserve in 1986 and includes the surface area of the lagoon up to the high water mark of the river, seaward of the provincial main road and up to the high water mark of the Indian Ocean.

Estimates of the Ohlanga catchment area range from 85 to 196 km^2 Begg (1978) but Perry (1989) and Cooper (1989) gave a figure of 118 and Perissinotto *et al.* (2004) 80 km^2. River length (Perry 1989) is 28 km. The estuarine boundaries based on the position of the 5 masl contour are depicted in Figure 4-6. The river

[7] *Information obtained from the Ohlanga River and Estuary Assessment (2009) prepared by Marine & Estuarine Research and provided in Appendix C 6.*

boundaries for the river section within the limits of the proposed development are demarcated as the 1:100 year floodline (Figure 4-7).

Figure 4-6: Ohlanga estuary with core estuarine area (blue shading) and key features

Figure 4-7: Section of the Ohlanga river adjacent to the Cornubia Development within the 100 yr. floodline and riverine area indicated

Mean annual run-off estimates range from 19.7 to 29.5 x 10^6 m^3 with an intermediate of 26 x 10^6 m^3 and a low of 12.6 x 10^6 m^3. There does not appear to be a good record of flood events but in January 1953, following 45 cm of rain overnight, water levels allegedly rose to 2.4 m higher than the normal high water mark. A small localised flood observed during February 2008 partly due to the bottleneck effect of the N2 bridge design resulted in flooding of sugarcane fields, roads and remaining wetland areas inland of the N2. The water was extremely turbid indicating a high silt content.

The earliest aerial photographs (1937) show an estuarine floodplain virtually entirely under sugarcane. There was some subsequent withdrawal of cane from the water's edge in the area downstream of the N2 but above the freeway, the entire valley and the adjoining slopes as far upstream as the bridge on the R102 are under sugarcane. Upstream of the R102 virtually the entire catchment is urban.

Earliest reported depths in the estuary ranged from "1.5 to 2 m" "in most places" with a maximum of 3.5 m below the M4 road bridge (at the mouth) and "depths of 3 m at several points in the lagoon". Whitfield (1980) referred to a maximum depth of 3.2 m in 1978. Depths of 2.2 – 2.4 m were recorded in the mouth, mid and upper reaches during closed phases in 2007/2008.

Detail with regard to water chemistry is presented in the specialist report included as Appendix C 6.

SOCIAL

In addition to a number of physical informants detailed above, such as (i) the topography which provides constraints but also numerous vantage points and ridge's which serve as an opportunity for the development; (ii) the 1:100 year floodline; (iii) wetlands; and (iv) drainage lines, there are a number of other informants which need to be considered as a basis for the detailed planning of the Cornubia Phase 2 site. These are presented in Figure 4-8 and detailed in the following sections.

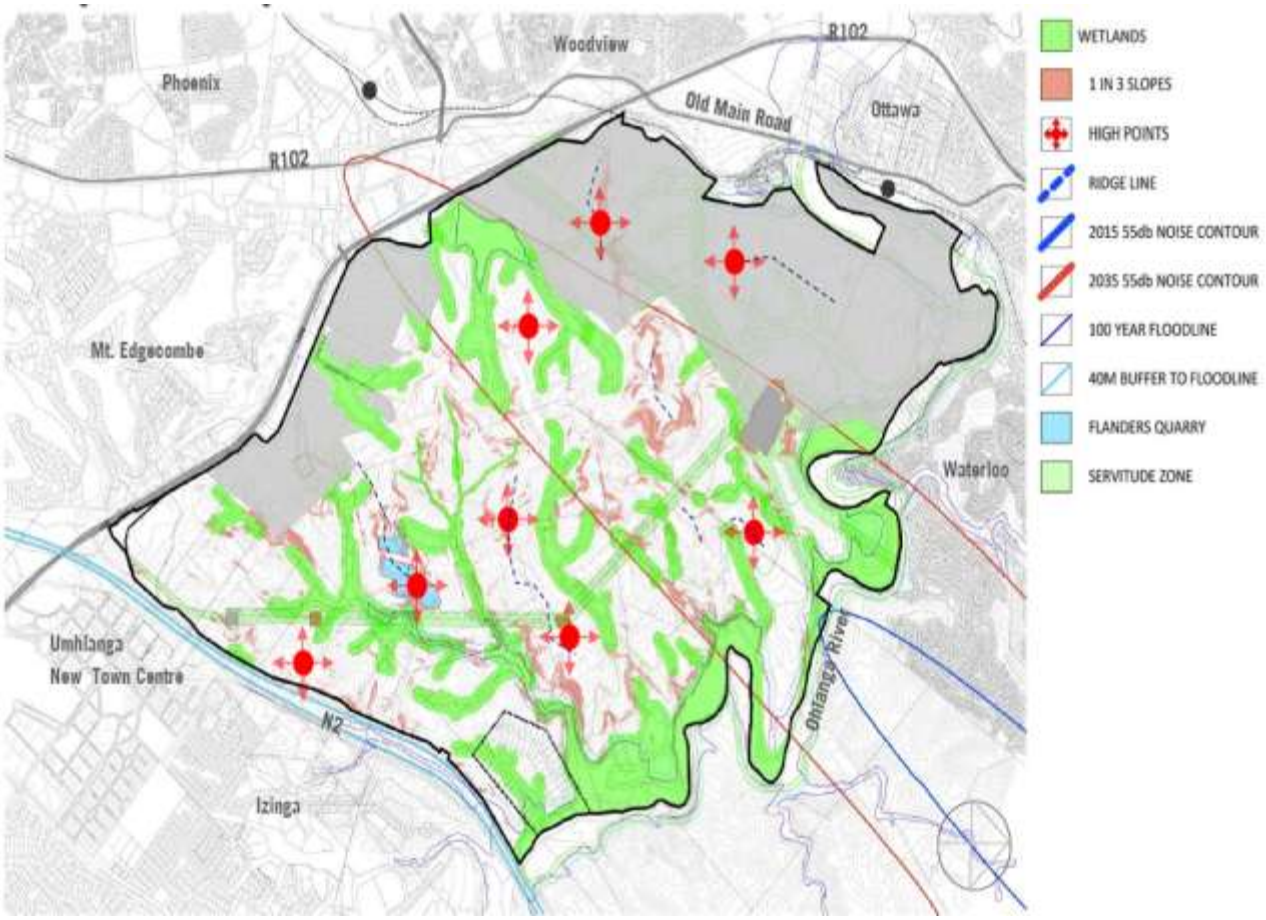


Figure 4-8: Existing conditions and informants

4.7 Noise Considerations

Cognisance of noise contours has been taken into account in the development of the Cornubia Development Framework Plan for which the Phase 2 Development falls within. Whilst it is not envisaged that there will be significant increases in noise during the operational phase of the proposed development, increases in noise levels during the construction phase have been considered and assessed. Additionally, cognisance of existing noise contours has been taken in the development of the Cornubia Development Framework Plan.

The 2035, 55 dB noise contours are illustrated in Figure 4-8. No residential development is permitted within this zone unless in the future there is a policy change that permits residential development within this zone. A significant portion of the eTM-owned land fall within the 2035 55 db noise contour.

4.8 Servitudes

There are numerous servitudes within the Cornubia Phase 2 site. An overhead 35 m transmission line servitude runs along the eastern portion of the site and into the major sub-substation. Other sub-stations have been identified within the open space areas. Other services in particular, a 9 m water pipeline servitude, runs parallel to the transmission line servitude. A 10 m sewer servitude runs from east to west along the site and connects with the Phoenix Waste Water Treatment Works (WWTW). All servitudes are presented in Figure 4-8 above.

4.9 Visual Considerations

The site is located within an agricultural landscape, with some residential and retail land uses adjacent to the site boundaries. The visual changes that will occur with the development of the site are envisaged to be in accordance with the current land use of that region and should not stand out or be of any concern.

4.10 Heritage Considerations[8]

There are no sites of cultural heritage significance identified with the Cornubia Phase 2 Development site.

4.11 Socio-Economic Profile of the Receiving Environment[9]

Cornubia is immediately surrounded by nine quite distinct “suburbs”, reflecting an extremely diverse range of socio-cultural views, economic baselines and consequently, expectations. There is also a new area, namely the small area within Cornubia known presently as the CIHD Phase 1 *(a)*.

The Cornubia Phase 2 site is located in Ward 102 and is situated in close proximity to Wards 35, 50, 51 and 58, and given the size of the proposed development, and its proximity to the new development of the Dube TradePort and King Shaka International Airport, the impacts of the development will ripple out to the secondary areas surrounding the site. Following the 2011 local government elections, new wards were demarcated in the eTM. One of these was Ward 102, which encompasses the Greater Cornubia Development as well as Mount Edgecombe and a part of Phoenix known as Mount Moriah. It is also important to note that Wards, especially Wards 102 and 58, are not homogenous. Ward 102, for example, includes both the poorest and the most affluent areas, consequently the ward-based statistics provided here are somewhat skewed.

A detailed socio-economic profile of the CIHD Phase 1 (a) and the surrounding areas to Cornubia can be found in the Social Impact Assessment (SIA) presented in Appendix C 7.

[8] *Information obtained from the Cornubia Heritage Assessment (2006) prepared by eThembeni Cultural Heritage and provided in Appendix C 3.*

[9] *Information obtained from the Cornubia Phase 2 SIA (2014) prepared by Real Consulting and provided in Appendix C 7.*

5 PROJECT DESCRIPTION

5.1 Development of the Cornubia Phase 2 LUM Precinct Plan[10]

In developing the Cornubia Phase 2 LUM Precinct Plan (Appendix F and Figure 1-10), the Cornubia Development Framework Plan was used as a guiding framework. As a point of departure, the existing constraints as presented in the Section 4 were used to guide the formulation of the open space network that is presented in the Cornubia Development Framework Plan.

5.1.1 Structure of the Open Space Network

The open space network was established through the creation of additional new 'green' linkages adopting the existing valley systems, wetlands and their buffers and steep topography as a basis (Figure 5-1). As the Precinct Plan is a more refined plan, changes had to be made to the open space network. Most notably are the changes due to roads master planning within the Greater Cornubia Development. This includes the realignment of Blackburn Road as well as other networks related to the IRPTN project. In addition, the eTM's Environmental Planning and Climate Protection Department have also identified additional areas to be included as open space within the overall open space network.

The above has changed the extent of the open space previously defined. More detailed design processes have resulted in additional open spaces being created within certain portions of the layout. The total extent of open space has been broken down as follows:

- Open Space (wetlands and floodplains, including their buffers): 309 ha
- Open Space(servitudes that can be considered as open space): 55 ha
- Highway Planting: 17 ha
- Park/Play lot: 11.5 ha

In total these open space components constitute approximately 44% of the total study area for Cornubia Phase 2.

[10] *The information provided in this section has been obtained from the Cornubia Phase 2 Planning Report (2014) prepared by Iyer Urban Design Studio and provided in Appendix C 10. This section must be read in conjunction with this report.*

Figure 5-1: Structure of the open space network

5.1.2 Structure of the Mobility Network

At a regional scale, the Cornubia Development Framework Plan roads play an important role in integration of the northern areas. It is proposed that the M41 / R102 will eventually become the Western Bypass. The other significant regional connector is Dube West which starts at Cornubia and continues to eventually become the Eastern arterial. This route crosses the Western Bypass in the vicinity of the King Shaka International Airport and will eventually join the R102. This route will serve as a Public Transportation Priority Route.

At a local level however, some refinements have been made to some of the roads that were identified on the Cornubia Development Framework Plan due to detailed engineering design. Whilst the Cornubia Development Framework Plan indicated only the main framework roads, the primary, secondary and tertiary routes have been defined within Cornubia Phase 2 through this initial detailed design process (Figure 5-2).

Figure 5-2: Structure of the mobility network

The affected roads which have been realigned from the Cornubia Development Framework Plan are:

- Blackburn Link - The eastern portion of Blackburn Link changed significantly due to the location of the Blackburn interchange on the N2 freeway.
- Cornubia Boulevard - Cornubia Boulevard's alignment is marginally changed at the intersection of Dube East and Dube West. These changes were necessary to correct road alignments of crossing roads and to more economically facilitate the design of the adjacent platforms at the Cornubia Retail Park.
- Dube East - The straightening up of the intersection with Cornubia Boulevard was required to maintain the connection into the Marshall Dam interchange upgrade. The original alignment of Dube West traversed the middle of the proposed Blackburn reservoir site which also contributed to the required alignment change. The northern portion of Dube West was realigned to avoid very steep terrain that would incur huge costs and generate large quantities of surplus fill material due to the earth-works required. The road has to cross the two existing live trunk sewers mains effectively and realignment is required to achieve this.
- Dube West - The original skew alignment of the intersection of Blackburn Link and Dube East was not ideal and geometrically incorrect. In order to rectify this, a horizontal curve was introduced south of the intersection. The road has to cross the two existing live trunk sewers mains effectively and realignment is required to achieve this.

The technical detail as to the reasons for the change in road alignments from the Cornubia Development Framework Plan is provided in Section 6.2.1.

As detailed above, one of the significant changes has focused on the proposed Blackburn interchange. Previously the interchange was situated closer to Blackburn Village. It has been repositioned further south from the position indicated on the Cornubia Development Framework Plan as per the latest engineering design. Due to the IRPTN project, a number of intersection and reserve widths have had to be increased due to the Traffic Impact Assessment (TIA) dictating the number of lanes to be accommodated for through- and turning movements. Cornubia Boulevard for instance was identified as a 60 m reserve in the Cornubia Development Framework Plan, however, a 74 m reserve is now proposed. A typical cross-section of main routes is presented in Figure 5-3.

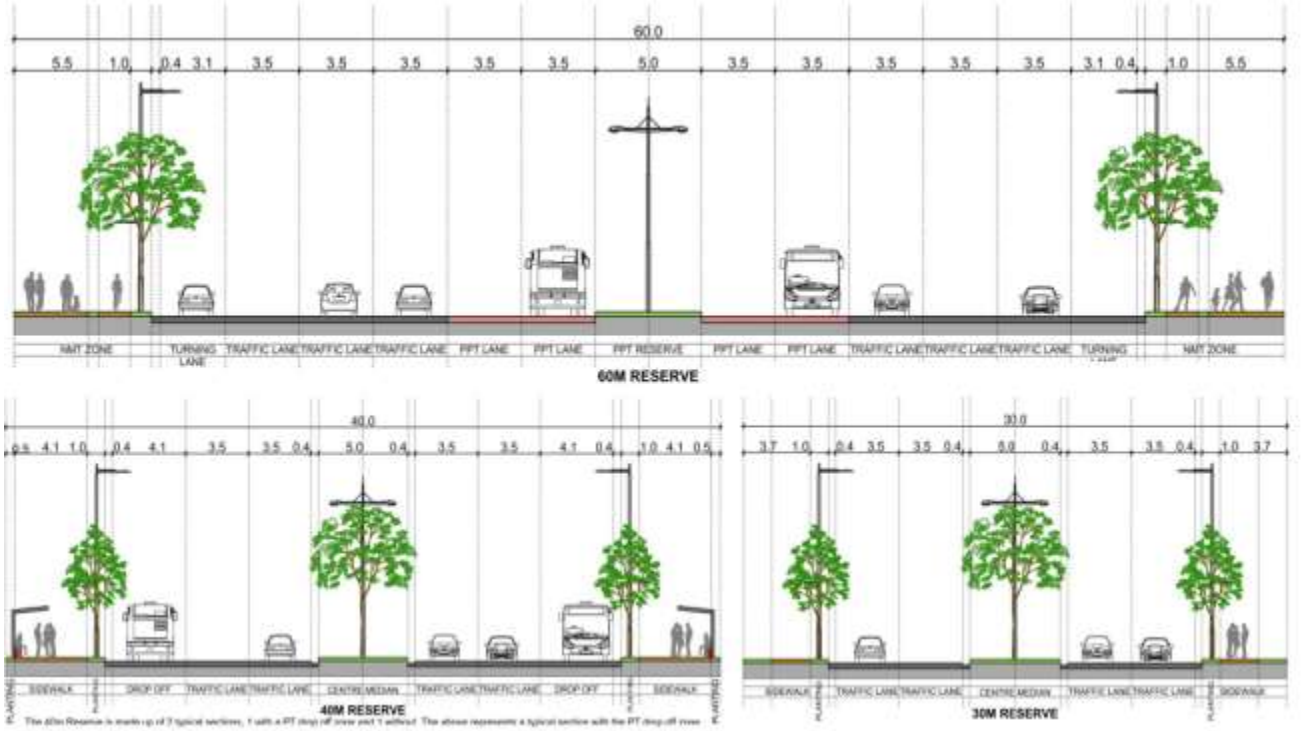


Figure 5-3: Typical cross-section of main routes

Both Cornubia Boulevard (east) and Dube West are public transportation routes. These routes will have stations that are approximately 400 m apart and a 5 minute walking distance from each other as illustrated in Figure 5-4. These routes will contain generous sidewalks and turning lanes. Spatially, the station positions are located at important junctions and connected to main framework roads and supporting road networks. This improves the coverage of stations throughout the layout.

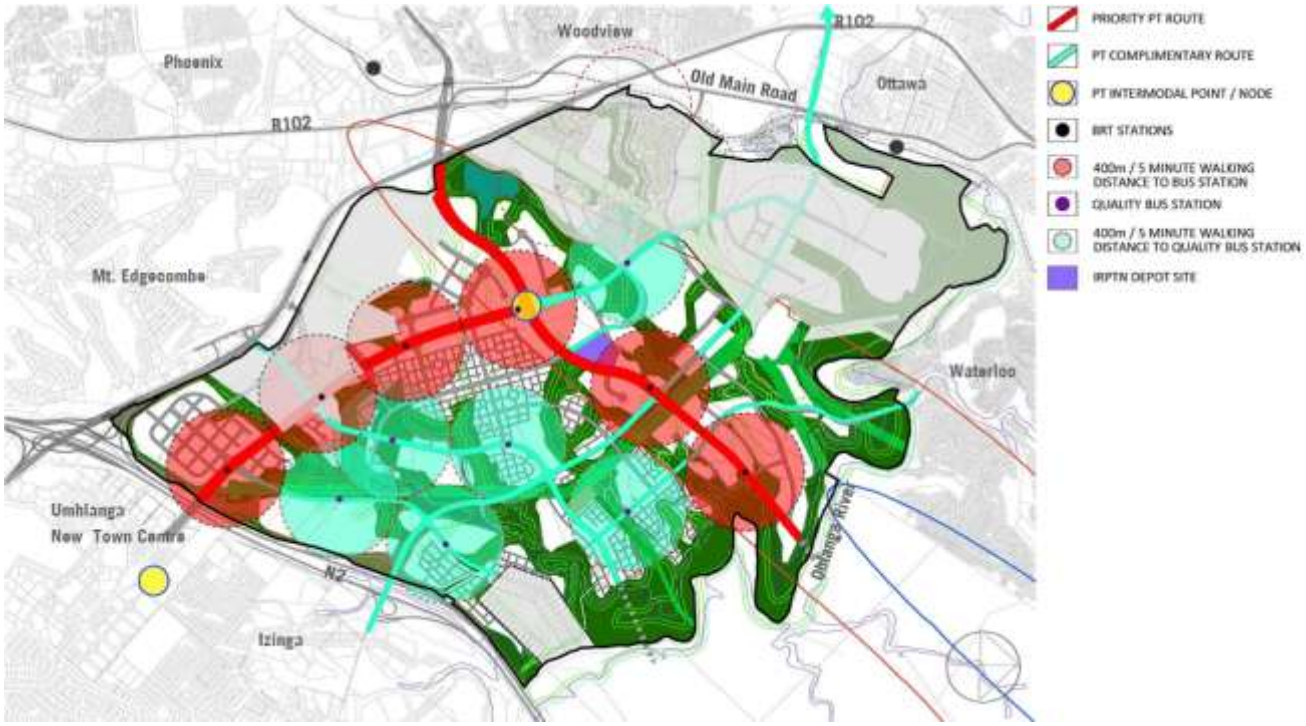


Figure 5-4: Structure of the public transport mobility network

Around each station, Various Transit Orientated Development (TOD) sites are proposed. The TOD sites will contain high density retail and residential development in the case of the development outside the noise contour and only commercial for the TOD sites within the noise contour.

Along the complimentary routes, Quality Bus stations have been located based on the same logic and approach as the TOD. At certain stations, community facility sites such as opportunities for vending have been proposed. Furthermore, an IRPTN depot site has been identified along Dube West.

As mentioned previously, the Cornubia Boulevard reserve has increased to 74 m especially along the corridor which has the highest concentration of bulks. Based on the above, two typologies for Cornubia Boulevard have been proposed which are summarised as follows:

- ***Cornubia Boulevard Typology A:***
  Typology A contains a continuous reserve of 74 m where development is located in the centre median. The development proposed is suited for TOD - office/retail - which may or may not contain residential. The TOD is predicated on public transport with less reliance on parking. The objective of this option is to break down the scale of the 74 m road by having development contained within the centre median. The median could be designed in a manner to contain structured green spaces framed by retail opportunities. This allows the site and visual connections to be retained. The scale of buildings could also be considered to ensure no unsafe spaces are created on either side of Cornubia Boulevard. Openings or recesses within the built form could assist in avoiding continuous building facades within the median and create a street interface which is modulated and interesting. It should be noted that the proposed typology will require further investigation and detailing at a later stage which will consider technical aspects such as, parking, access, circulation, ownership and financial feasibility. The typology is subject to the eThekwini Transport Authorities (eTA's) approval and endorsement.

Figure 5-5: Cornubia Boulevard mobility structure – Typology A

- ***Cornubia Boulevard Typology B:***
  Typology B has a reserve of 74 m at intersections and a reserve of 45 m between the intersections. In order to ensure a more pedestrian scale or feel of road is created, the reserve was reduced to 45 m where there are no stations or intersections. In this way the development along either side of the road gives the sense of a reduced width which in turn improves the pedestrian comfort and feel along the road.
  Both the typologies have to be tested at a later stage in regards to their feasibility for parking, access etc. however based on the principles of good urbanism, Typology A is the preferred option.

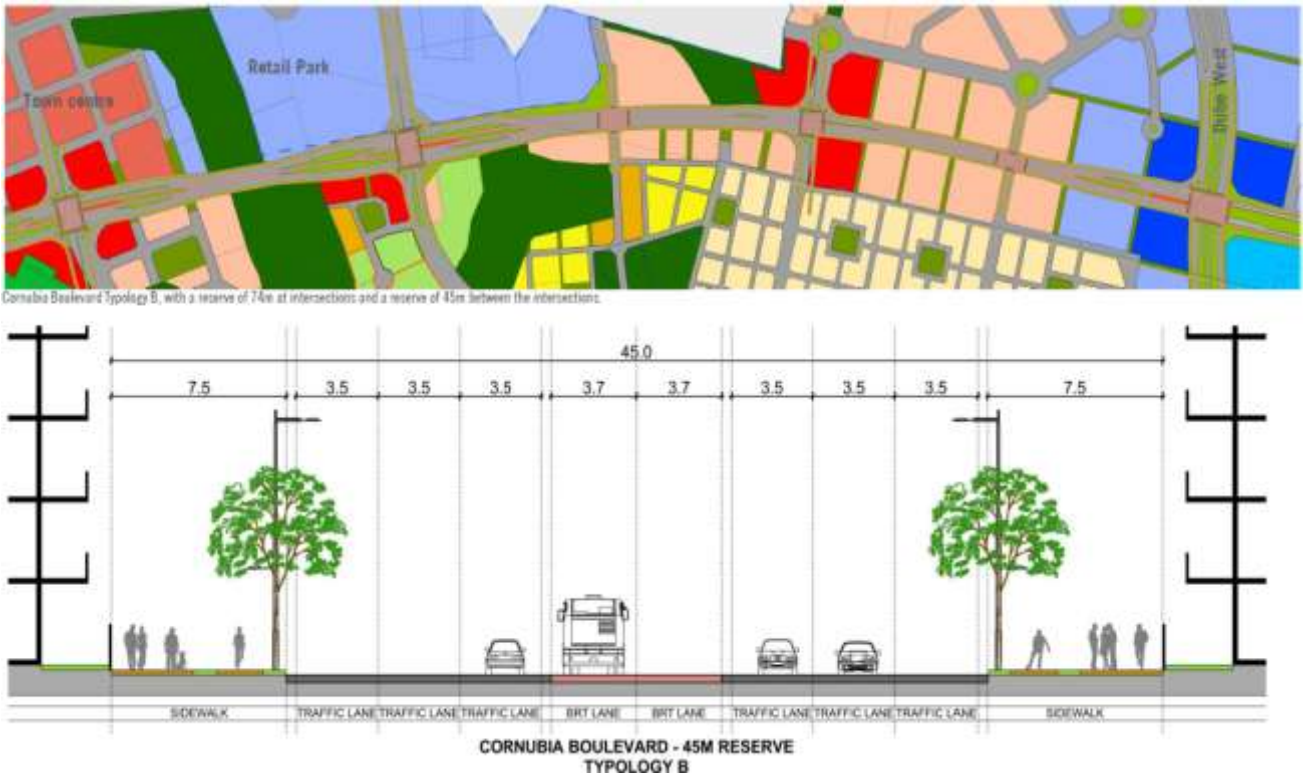


Figure 5-6: Cornubia Boulevard mobility structure – Typology B

The remainder of the roads presented in the Cornubia Development Framework Plan remain the same, in principle. The description of the road networks are as follows:

- Blackburn link is a 40 m route and represents the main arterial framework road;
- Cornubia Boulevard and Dube West (Priority Public Transport Routes) are between 40 to 74 m dependent on which typology is favoured. These routes will serve as a mobility route with limited access;
- Cornubia Boulevard (west) has been identified as a 40 m Collector Access Road;
- Dube East is a Collector with a 40 m reserve which will function as an accessibility route;
- The remainder of the LUM Precinct Plan layout will consist of 30 m and 20 m roads respectively within the town centre area;
- 24 m roads are proposed within the residential districts but also within the industrial/business park zones. These routes will contain non-motorised transport in the form of cycle and pedestrian paths;
- The 18 m roads proposed will occur within the industrial and business park zones; and
- The 16 m bus route, 10,5 m taxi collector and 8 m access roads will service the residential districts.

An interchange upgrade is required at the junction between the M41 and Dube West, M41 and Flanders Drive intersection which will serve the retail part of development and has been authorised as part of the Cornubia Retail Park EIA. Furthermore, a planned overpass at the N2 is proposed to connect Cornubia with the Umhlanga Ridge Town Centre in the east. This interchange is referred to as the N2 Cornubia Bridge and Interchange and has already been authorised. An interchange upgrade is planned at the junction of the N2 and M41 where construction has commenced by the South African National Roads Authority Limited (SANRAL).

In addition to the authorised interchanges mentioned above, the following interchanges are proposed as part of the Cornubia Phase 2 EIA:

- Blackburn Interchange;
- Marshall Dam Interchange; and
- R102 / Northern Drive Interchange.

Specific non-motorised transport lanes such as walking and bike trails are proposed within the open space network. These are proposed between the wetland and buffer zones and will service the Greater Cornubia Development.

5.1.3 Desired Activity Patterns

Figure 5-7 reflects the desired activity patterns for Cornubia Phase 2. The brief summary below will describe each activity use independently. As described, the activity uses are '*desired*'. As the layout presented in this EIA as a LUM Precinct Plan, another, more detailed level of planning will be required to determine the zoning which will encompass as many desired activity uses as possible to ensure the development of Cornubia Phase 2 has no rigid uses imposed and that the Precinct Plan remains as flexible to keep up with market trends and demands. This approach ensures that the development is continuously evolving and never remains static to various development scenarios and challenges provided that the overall ethos of the Greater Cornubia Development and the Cornubia Phase 2 LUM Precinct Plan is never compromised.

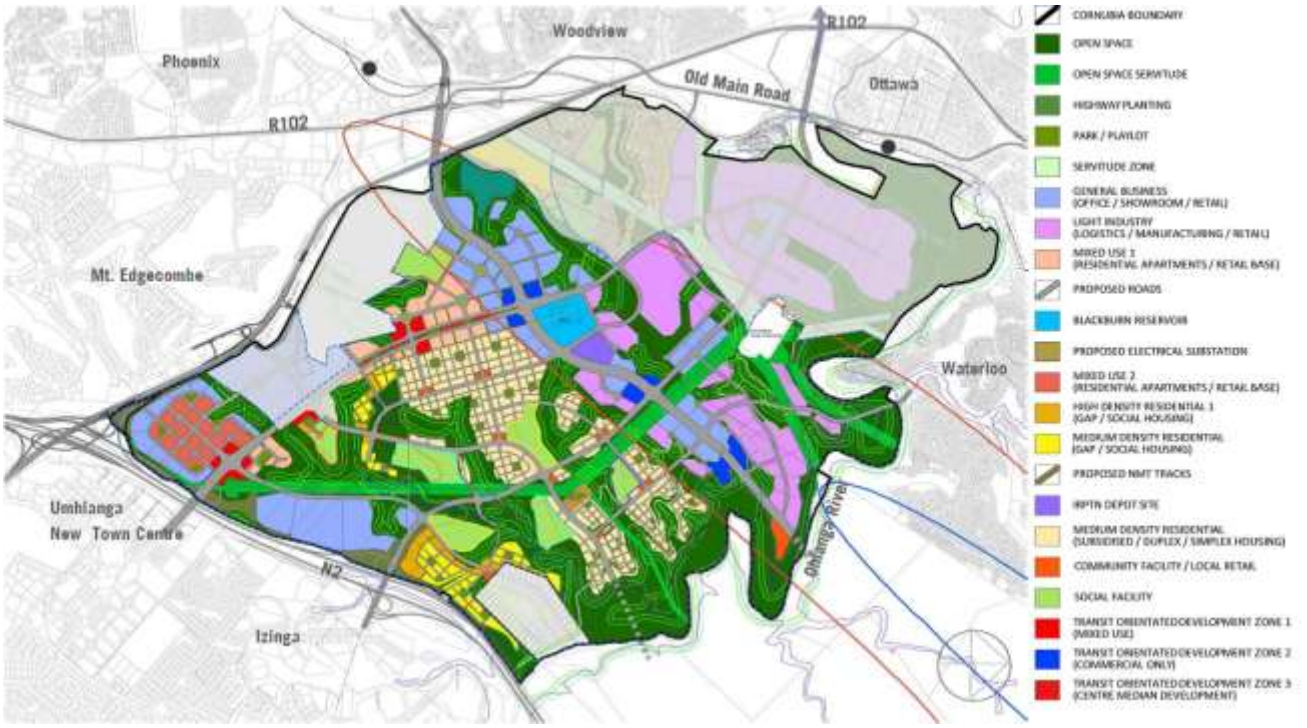


Figure 5-7: Desired activity patterns

The desired activity uses are as follows:

5.1.3.1 General Business

The General Business land use consists of offices, showrooms, retail complexes and the like. This land use is indicated in blue in Figure 5-7. These types of land uses are normally attracted to areas of high visibility and good exposure and therefore this use has been proposed along the M41 and the N2 respectively. A business corridor is also proposed within the 2035, 55 dB noise contour along Dube West which will consist predominantly of office and retail types of land uses. The total extent of this zone within Cornubia Phase 2, is 84 ha which is 9.4% of the total area of Cornubia Phase 2. A relatively low Floor Area Ratio (FAR) of 0.8 on average with a maximum height of 6 storeys is proposed. The total bulk of approximately of 603 277 m² is proposed for the General Business land use.

5.1.3.2 Light Industry

The Light Industry land use consists of logistics, manufacturing, retail and the like. The light industrial land use is indicated in purple in Figure 5-7. This use is located within the 2035, 55 dB noise contour and is the natural extension of the CIBE which forms part of Cornubia Phase 1. It is envisaged that the types of businesses located within this land use zone would include a range of logistics, light industry in line with current trends. This land use accounts for 6.6% of the total area and is 59 ha in extent. An average FAR of 0.65 which yields approximately 317 527m² of bulk is proposed. This zone will generate economic opportunities for the people

within Cornubia and surrounds and is well located in relation to Waterloo and Ottawa. The type of light industry envisaged is 'clean and green' industry similar to the River Horse Business Valley Estate area and the CIBE.

5.1.3.3 Mixed-Use 1 and 2

There are two Mixed-Use categories proposed for Cornubia Phase 2. Both these categories have a proposed split of 10% retail and 90% residential, however, these percentages are indicative. The intention is for these land use areas to remain as flexible as possible to ensure the continuity of development based on market demand. 10% would be a maximum allocation of retail permissible within these land use areas to ensure that the bulk of the mixed-use sites are residential.

Consideration may be given to a more horizontal form of mixed-use within these land use areas. A horizontal form of mixed-use means that a building could be entirely residential and the next building could be office/retail but collectively this would be considered as a mixed-use precinct or neighbourhood.

The area denoted in dark orange in Figure 5-7 is the Mixed-Use 2 area where the intention is to create a higher intensity, Town Centre environment. The intensity of development is not meant to replicate the activities around the Umhlanga Ridge Town Centre but to serve the growing catchment within Cornubia and immediate areas. The FAR within this zone will be in the region of 3.

The areas along Cornubia Boulevard denoted in the light orange hatch in Figure 5-7 are Mixed-Use 1 and will have a residential bias, however, it is envisaged that the ground floor may contain retail development over time. The intensity of mixed-uses i.e. retail, residential and business uses along Cornubia Boulevard will compliment the future BRT system proposed along Cornubia Boulevard. The Mixed-Use 1 activity has a FAR of 2.

The following is a brief summary for the Mixed-Use 1 and 2 uses:

- ***The Mixed-Use 1:***
  - 17.48 ha in extent
  - Total bulk of 244 768 m²
  - Yield approximately 4 005 units at 229 du/ha
  - Height - 4 storeys
  - Apartment sizes will vary from 55 m² to 60 m²
- ***The Mixed-Use 2:***
  - 11.23 ha in extent
  - Total bulk of 235 920 m²
  - Yield approximately 3 539 units at a residential density of 315 du/ha
  - Height - 6 storeys.
  - Apartment sizes will vary from 55 m² to 60 m²

5.1.3.4 Medium and High Density Residential

Three residential land use categories are proposed within Cornubia Phase 2. A detailed residential study commissioned as part of Cornubia Phase 2 has been undertaken which indicates examples for each type of residential offering, illustrates unit types per category, densification of the various clusters, typical cross-sections and block layout options. These typologies are presented as an Annexure to the Urban Planning Report which is included as Appendix C 10.

5.1.3.4.1 High Density Residential - Affordable

High Density Residential has been located along Blackburn Road, in the vicinity of Blackburn Village. The rationale behind the separate location is the relationship between the subsidised housing and rental and therefore it was necessary to identify a more distinct location for rental housing to avoid rental boycotts due to competition for subsidised housing at no cost. Some High Density Residential pockets are located within proximity of Dube East. It is envisaged that these uses would primarily permit residential development for the affordable market. A brief summary for the High Density Residential is provided:

- Income grouping targeted - R7 001 to R15 000 per month
- Height - 4 storey's
- Accounts for 0.6% of the area with a total of 5 ha
- Approximate yield of 1 555 units

5.1.3.4.2 Medium Density Residential - Affordable

Specific clusters along Dube East, directly behind the High Density Residential area as well as at the Blackburn Village vicinity have been allocated for affordable housing in a Medium Density format. These land use areas could also accommodate Community Residential Units (CRUs) but will be determined once further studies or research has been finalised. A brief summary for the Medium Density Residential Use is provided:

- Income grouping targeted – R 7001 to R15 000 per month (falls in the bracket of partially subsidised housing)
- Height - 2 to 3 storeys
- Accounts for 1.7% of the total study area and 16% of the total residential area for Cornubia Phase 2
- Approximate yield of 3 494 units

5.1.3.4.3 Medium Density Residential Subsidised /Duplex /Simplex Housing:

A large portion of the Greater Cornubia Development has been allocated for residential development particularly Medium Density Residential. This is indicated as light yellow in Figure 5-7. The Medium Density is similar in format to that which is currently being established for the CIHD Phase 1 *(a)* and *(b)* respectively which involves attached double storey units around a central courtyard. The Cornubia Phase 2 LUM Precinct Plan indicates the layout form and pattern; however, this will be detailed in further studies as the specific phases are released. A brief summary for the Medium Density Residential Use is provided:

- Income grouping targeted - R0 to R3 500 and/or R0 to R7 000 (subsidised housing)
- Density – 110 du/ha
- Height - 2 storeys row or duplex housing typologies
- Accounts for 6.6% of the total study area
- Approximate yield of 6 447 units

Together all the residential land uses for Cornubia Phase 2, excluding the mixed-use activities and TOD sites, yields approximately 11 497 units. This equates to 52% of all residential land uses allocated in Cornubia Phase 2 apart from the exclusions indicated above.

5.1.3.5 Transport Orientated Development

At key intersections, and where BRT stations have been proposed, TOD sites have been identified which are approximately 400 m from one another. The TOD sites have been located so all key local access roads connect with them. This ensures that there is adequate coverage across the entire development and they are easily accessible. The TOD sites have a high intensity of uses focused around a station. These sites would consist of either commercial/retail or residential uses that capitalises on the high levels of foot traffic and activities generated at the stations. This use is split into 3 parts,

- ***TOD 1***: mixed-use which allows residential as well as a commercial land use. TOD 1 has a FAR of 5. TOD 1 is denoted as red on the Cornubia Phase 2 LUM Precinct Plan (Figure 1-10) and yields 2 808 units;
- ***TOD 2:*** strictly commercial and limited to TOD sites that fall within the 2035, 55 dB noise contour. TOD 2 has a FAR of 3. TOD 2 is denoted as blue on the Cornubia Phase 2 LUM Precinct Plan (Figure 1-10); and
- ***TOD 3:*** this is the centre median. Should this typology be approved, it permits commercial and residential development. TOD 3 has a FAR of 2.5. TOD 3 is denoted as red/grey on the Cornubia Phase 2 LUM Precinct Plan (Figure 1-10) and yields 285 units.

The TOD sites will provide the public transport network with adequate densities/thresholds i.e. residential or retail required to sustain and support the operations of the BRT. In the same token, reduced parking standards are proposed for the TOD sites due to its location along a BRT network.

In total, 22 134 units are proposed for Cornubia Phase 2. Combined with Cornubia Phase 1, a total residential yield of 25 695 units are envisaged for the Greater Cornubia Development.

5.1.3.6 Social Facilities

This section provides a brief summary of the social facilities provided for Cornubia Phase 2. An in-depth assessment with the provision of each type of facility/cluster is provided as an annexure to the Urban Planning Report included as Appendix C 10. Also contained in the annexure are conceptual layouts for each social facility cluster within Cornubia Phase 2.

The approach taken in developing the Cornubia Development Framework Plan was to promote a more compact urban form of development and, therefore, the traditional standards for facilities were reviewed. This approach has continued in developing the social facilities for Cornubia Phase 2. There has been very little change from the Cornubia Development Framework Plan apart for the locations of some of the clusters based on a refinement of the plan. Social Facility clusters have been located generally within the flatter portions of the site and at key interceptory points. However, given that Cornubia has steep and undulating topography, many of these locations will require detailed engineering design when developed.

These clusters have been located at key intersections and prominent positions within Cornubia Phase 2 so that there is adequate coverage to all residential areas. Some of the uses that are contained within the clusters which vary between each other are libraries, community halls, clinics and sports fields. The locations of the facilities are based on the concept of walkability aimed at distributing schools and other facilities within a 5 minute walk.

A ratio of two primary schools for every high school has been utilised. The total number of schools and other facilities required for Cornubia Phase 2 has been determined by estimating the total number of units for the Greater Cornubia Development which was in the region of 25 695. Applying a household size of 4 yields a total design population of 103 000. The eTM standards for social facility provision were then applied.

Sites for standalone facilities such as police stations, fire stations and community health centres have been identified primarily along main routes and at prominent intersections. Areas have been allocated within specific uses to accommodate facilities such as children's home, tertiary training facilities and old age homes as these will occur as and when the need arises.

A site was identified in the earlier planning of Cornubia Phase 2 for a cemetery, however, it was deemed unsuitable due to geotechnical studies, therefore, a suitable cemetery site must be identified within the Northern Corridor (Umhlanga, Mount Edgecombe, Waterloo, Blackburn, Sibaya, Tongaat, etc.).

Local retail or commercial community facility sites are proposed at key intersections across the layout for Cornubia Phase 2. These are denoted as a dark orange fill within the layout (Appendix F). These sites occur along prominent local access roads at key intersections to serve the residential areas and are within a comfortable walking distance. These will provide local level community services and can range from local shops/takeaways to smaller community centres.

Apart from the sportfields within each social facility cluster, local parks have been created through the design. These occur at strategic areas within the residential clusters and are designed in a manner so that they can be accessed by all residents by connecting them to key local access roads. Other local courtyards will be created through the detailed design phase and are not reflected on the Cornubia Phase 2 LUM Precinct Plan.

5.1.3.7 Informal Trading

It is most likely that these activities will occur where there is a constant flow of foot traffic. It is most likely these activities will occur around public transport areas (BRT stations, depots, drop/off pick up points) and/or at retail or employment areas such as industrial areas. The identification of areas for trading and depots must be through a managed process.

5.1.4 Bulk and Density Controls

Table 5-1 reflects the total bulk and yield for Cornubia Phase 2.

Table 5-1: Cornubia Phase 2 LUM Precinct Plan bulk and density area schedule

Land Use Category & Quantification									Residential Yield		
Use	**Gross Developable Area (Ha)**	**Income Level**	**%**	**Proposed Average FAR**	**Total Bulk**	**Total Commercial Bulk**	**Total Residential Bulk**	**Size of unit (m^2)**	**Residential Density (du/ha)**	**Yield: no of units**	**%**
Medium Density Residential - Subsidised Duplex / Simplex Housing (BNG)	58.61	R0 - R3500 & R0 - R7000	6.6	0.6	316 508		316 507	50	110	6 447	29
Medium Density Residential - Affordable	15.07	R7001 - R15000	1.7	1.5	192 196		192 196	55	232	3 494	16
High Density Residential - Affordable	5.03	R7001 - R15000	0.6	2.0	85 511		85 511	55	309	1 555	7
Mixed Use 1 (Residential Apartments + Retail Base) - 90% / 10% desired split)	17.48	>R15000	2.0	2	244 768	24 477	220 291	55	229	4 005	18
Mixed Use 2 (Residential Apartments + Retail Base) - 90% / 10% desired split)	11.23	>R15000	1.3	3	235 920	23 592	212 328	60	315	3 539	16
T.O.D 1 zone Mixed Use (With Residential) (90% / 10% desired split)	5.35	>R15000	0.6	5.0	187 215	18 721	168 493	60	525	2 808	13
T.O.D 2 zone Commercial Only (No Residential)	8.31		0.9	3.0	211 823	211 823					
T.O.D 3 zone - Centre Median Development (50% / 50% desired split)	1.61		1.0	2.5	34 257	17 128	17 128	60	177	285	1
General Business	83.79		9.4	0.8	603 277	603 277					
Light Industry	58.86		6.6	0.65	317 527	317 527					
Social Facilities	44.24		4.9	0.25	110 601	110 601					
Community Facility	4.04		0.5	0.6	24 259	24 259					
Transport: IRPTN Depot Site	3.75		0.4	0.65	24 392	24 392					
Open Space	308.83		34.5								
Open Space Servitudes	55.38		6.2								
Highway Planting	17.29		1.9								
Parks	11.50		1.3								
Servitudes	9.20		1.0								
Blackburn Reservoir	9.45		1.1								
Roads	165.67		18.5								
TOTAL - PHASE 2	**895**		**100**		**2 588 252**	**1 375 797**	**1 212 455**			**22 134**	**100**

Land Use Category & Quantification									Residential Yield		
Use	**Gross Developable Area (Ha)**	**Income Level**	**%**	**Proposed Average FAR**	**Total Bulk**	**Total Commercial Bulk**	**Total Residential Bulk**	**Size of unit (m^2)**	**Residential Density (du/ha)**	**Yield: no of units**	**%**
Phase 1 A - Subsidised Housing - Approved	6.10									486	
Phase 1 B - Subsidised Housing - Approved	33									2 186	
Phase 1 B - Medium density Residential - Gap / Social Housing	1			0.9			8 899	55	160	158	
Marshall Dam Residential	9			0.45			40 500	55	100	731	
Cornubia Industrial and Business Estate - Approved	106			0.6		460 000					
Cornubia Retail Park - (Separate EIA)	34			0.6		169 500					
Phase 1 Open Space (Wetlands, buffers, steep areas and additional space)	113										
Phase 1 Parks and Play Areas	3										
Phase 1 Servitudes	32										
SASA - Landholdings - (Excludes wetland area - Total SASA area 62Ha)	51										
SASA Open Space	11										
Blackburn Extent	28										
Ottawa Electrical Substation	9										
TOTAL - REMAINDER OF CORNUBIA	436					629 500	49 399			3 561	
OVERALL TOTAL	1331									25 686	

A brief summary of the bulk and density controls is provided:

- The General Business land use has a total bulk of 603 277 m² at an average FAR of 0.8;
- The Light Industry land use has a total bulk of 317 527 m² with an FAR of 0.65;
- The Mixed-Use 1 category yields a mixed use split with a commercial bulk of 24 477 m² and a residential bulk of 220 921 m². Mixed-Use 1 yields 4 005 units;
- The Mixed-Use 2 category has a commercial bulk of 23 592 m² and a residential bulk of 212 328 m². Mixed-Use 2 yields 3 539 units;
- The total residential bulk for both Mixed-Use 1 and 2 in the region of 432 619 m².The Mixed-Use 1 and 2 category caters for the over R15 000 income category designated for sectional title units. Together over ±7 500 units are proposed;
- The High Density Residential use has an average apartment size of 55 m² and yields approximately 1 555 units with a residential density of 309 du/ha. The High Density Residential is targeting the R7 001 - R15 000 income category;
- The Medium Density (affordable housing) will yield approximately 3 494 units at a residential density of 232 du/ha with an average unit size of 55 m². This use will target the R7 001 - R15 000 income category and will largely encompass partial subsidised units;
- The Medium Density (subsidised/duplex/ simplex housing) accommodates the R0 - R3 500 and R0 to R7 000 income categories. This will encompass fully subsidised units of approximately 6 447 units at 110 du/ha with an average unit size of 50 m²;
- The TOD 1 and TOD 3 yield 2 808 and 285 units respectively. TOD 1 does not contain residential units.

The total number of units proposed for Cornubia Phase 2 is approximately 22 134 units. An additional 3 561 units were created in Cornubia Phase 1 which brings the total to 25 695 units for the Greater Cornubia Development. Applying a ratio of four people per unit, this generates a population estimate of 102 780 people over the full development of 1 333 ha of land. In establishing the social facility requirements, a design population of 103 000 people has been used. The remaining uses within Cornubia Phase 2 are as follows;

- Social Facilities: 44.24 ha;
- Servitudes: 9.20 ha;
- Open Space: 308.83 ha;
- Open Space Servitudes: 55.38 ha;
- Highway Planting: 17.29 ha;
- Parks: 11.50 ha;
- Community Facilities: 4.04 ha;
- Reservoir: 9.45 ha, and
- Roads: 165.67 ha.

In summary, the total development yield for Cornubia Phase 2 is approximately 2,588,000 m^2 with the split of 1,376,000 m^2 of commercial which includes the industrial use and 1,213,000 m^2 for residential.

5.1.5 Cornubia Phase 2 LUM Precinct Plan Summary

The Cornubia Phase 2 LUM Precinct Plan presented in Figure 1-10 is aligned with the Cornubia Development Framework Plan and the overall intent and philosophy has remained intact. However, the Cornubia Phase 2 LUM Precinct Plan has, out of necessity, provided a greater level of detail to test and develop in particular the housing options further in order to provide the detail necessary for environmental licencing.

It is evident from the plan that there is a very clear hierarchy of routes that have been created and a permeable movement network that offers a myriad of choice to its users.

As the ultimate vision for the Greater Cornubia Development is to create an Integrated Human Settlement, this has been reinforced by creating economic opportunity by proposing General Business and Mixed-Uses along interfaces of high exposure, such as the M41 and N2 and Industrial and Business within the 2035, 55 dB noise contour. This enables the creation of a live, work and play environment. Residential land uses are in the form of High, Medium Density and affordable housing occupies the majority of the Cornubia Phase 2 LUM Precinct Plan. The separation of the affordable housing from the subsidised units was considered an

important locating factor to prevent rental boycotts resulting from the proximity of rental housing to fully subsidised housing, in other words, housing at no cost.

Therefore, the Cornubia Phase 2 LUM Precinct Plan provides for the establishment of an Integrated Human Settlement based on the principles and objectives espoused in the Cornubia Development Framework Plan. The Cornubia Phase 2 LUM Precinct Plan sets out a clear structure for development which maximises choice, urban amenity and lays a foundation for a sustainable future for Cornubia. The interactive process undertaken as part of preparing the precinct layout has contributed positively in shaping the plan. New bold ideas have emanated from the interactions between the professional team and the various line departments, such as the higher intensity /density TOD zone within Cornubia.

5.1.6 Sub-Phases within Cornubia Phase 2

It is noted that due to the magnitude of the Cornubia Phase 2 site, construction of Cornubia Phase 2 will be phased over a 10-20 year period. Therefore, Cornubia Phase 2 will consist of sub-phases as follows:

- Cornubia Town Centre;
- Umhlanga Hills;
- N2 Commercial;
- SASA Commercial;
- Marshall Dam Commercial Precinct;
- Blackburn Village;
- Cornubia Central;
- Ohlanga Valley;
- Dube West Industrial Spine North;
- Dube West Industrial Spine South;
- Blackburn Interchange;
- Marshall Dam Interchange; and
- R102 / Northern Drive Interchange.

It should be noted that all sub-phases form part of this EIA Application and therefore, the EIA presents the Cornubia Phase 2 Precinct Plan at a high-level indicating the planning intent for Cornubia Phase 2. It is further noted that detailed engineering design will be required for each specific phase as and when the Developer's choose to pursue that specific phase. Therefore, the EIA study for Cornubia Phase 2 is at a high-level and assesses land use pockets within the Cornubia Phase 2 boundary (Figure 1-9). The Environmental Authorisation should allow for flexibility with regards to specific infrastructure within the approved pockets.

The release of phases of land for development in Cornubia Phase 2 will be in accordance with an infrastructure programme and feasibility model. Each phase or phases will involve more detailed planning, design, specialist input as well as statutory approval through the relevant departments within the eTM.

5.1.7 3D Model

The following 3 dimensional images of the Cornubia Phase 2 LUM Precinct Plan have been prepared by Iyer Urban Design Studio and overlaid over aerial photography using Google Earth software.

Figure 5-8 provides a view showing the surrounding context in relation with the Greater Cornubia Development and Cornubia Phase 2 specifically; in particular the General Business Uses along the N2 and M41 has been located along these routes for achieving maximum exposure.

Figure 5-9 provides a bird's eye view of the study area in context of greater Durban. In the background the KwaMashu and Phoenix areas are clearly visible and the scale of the Greater Cornubia Development is clearly evident from this image.

Figure 5-10 provides a view of the proposed development along the M41 which becomes the R102. The areas in white overlay are Cornubia Phase 1, which is currently under construction. The image also reflects the undulating topography of the study area as well as the proximity of the development to the coast and surrounding neighbourhoods and connections to these areas.

Figure 5-8: Aerial view from south to north over site

Figure 5-9: Aerial view from north to south

Figure 5-10: Aerial view from south-west to north-east

5.1.8 Artist Impressions

The following images are a series of artist impressions of the development along Cornubia Boulevard. These images graphically illustrate the ultimate vision for Cornubia Phase 2.

Figure 5-11: Location of the artist impression

Figure 5-12: View 1 – Mount Edgecombe Interchange looking towards Cornubia Town Centre

Figure 5-13: View 2 – Cornubia Boulevard illustrating development in the Central Median

Figure 5-14: View 3 – Cornubia Boulevard illustrating the IRPTN route and indicating park spaces

Figure 5-15: View 4 – Cornubia Boulevard illustrating activity within the Central Median

Figure 5-16: View 5 – the intersection of Cornubia Boulevard and Dube East illustrating the positioning of the BRT stations in relation to the shopping centre and TOD zone

5.2 Engineering Services[11]

Currently major portions of the site are under sugarcane cultivation which requires the existing myriad network of gravel haul roads which generally follow the contours. There are several notable features on the Cornubia Phase 2 site as follows (Figure 5-17):

- Marshall Dam;
- Ottawa Major Substation;
- Pockets of natural forest;
- Electrical Switching Station;
- 35,0 m wide electrical servitude from the existing switching station in the south east of the site running north and then west towards the Ottawa Substation;
- 5,0 m wide sewer servitude running from the north east corner of the site in a westerly direction towards the Waterloo pump station;
- An existing 600 mm diameter raw water supply pipeline which is not in a servitude; and
- NAA Water pipeline in existing 12 m servitude.

[11] *The information provided in this section has been obtained from the Cornubia Phase 2 Engineering Services Report (2014) prepared by SMEC South Africa and provided in Appendix C 11. This section must be read in conjunction with this report.*

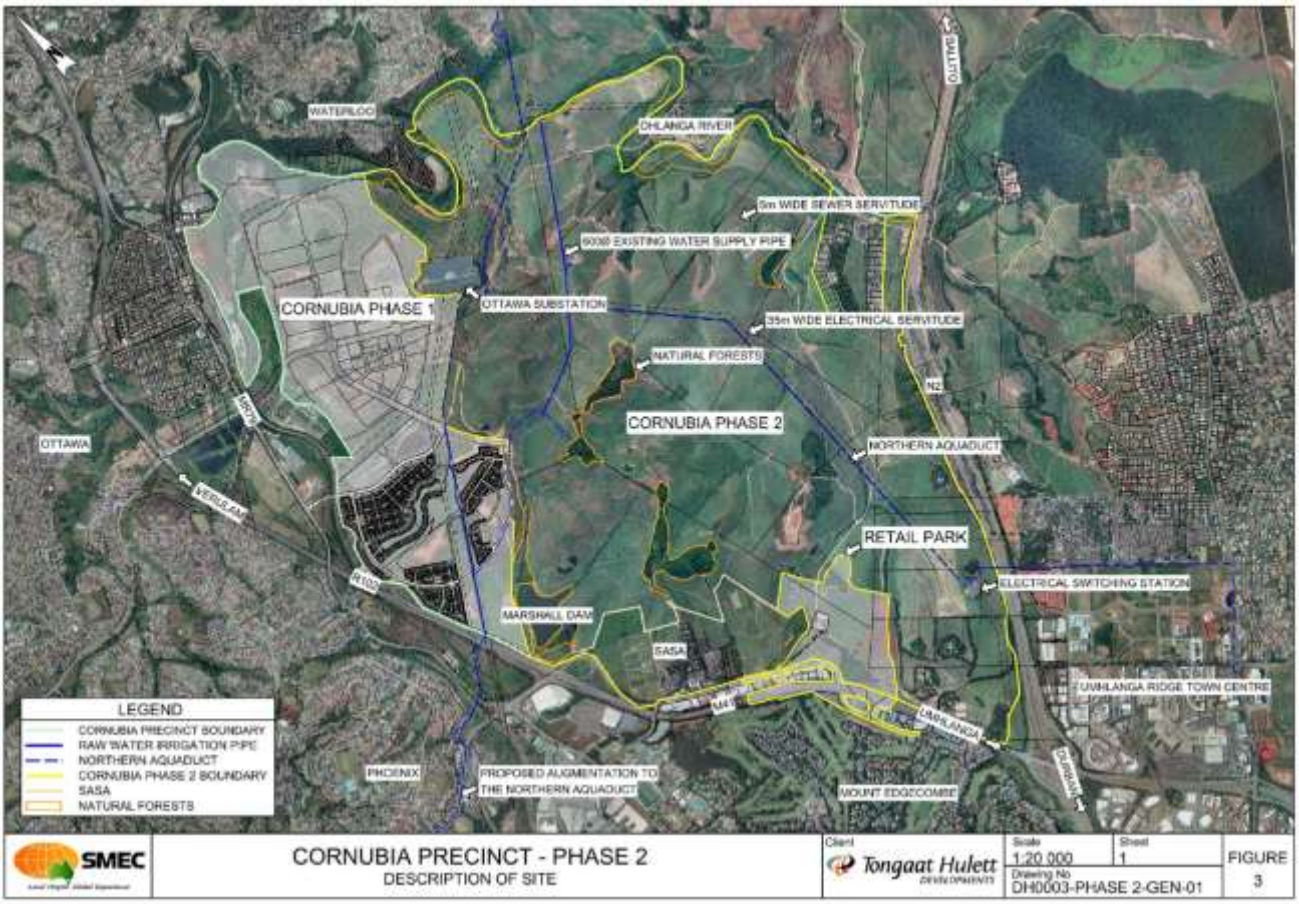


Figure 5-17: Description of existing features on site

5.2.1 Water

5.2.1.1 Proposed Water Demand

The total Average Daily Demand (ADD) for Cornubia Phase 2 as well as the required reservoir storage capacity is detailed in the Engineering Services Report (Appendix C 11). The ADD for Cornubia Phase 2 is approximately 30.12 Mℓ/day and the required reservoir storage capacity is approximately 61 Mℓ. This includes allowance for 3.56 Mℓ fire flow in the additional 24 hour storage capacity.

5.2.1.2 Proposed Ultimate Bulk Water Infrastructure

The proposed bulk water infrastructure for Cornubia Phase 2 is presented in Figure 5-18.

Currently there is no existing water infrastructure to serve Cornubia Phase 2. The ultimate water supply for the Greater Cornubia Development will be provided by the proposed Blackburn Reservoir[12].

The supply to the Blackburn Reservoir will be provided by the Northern Aqueduct. According to the Blackburn Reservoir Modelling Report Revision 2, Project No. D294/01 prepared by Naidu Consulting, the first phase of the Northern Aqueduct augmentation will increase capacity of the system to supply water from Durban Heights to Phoenix 2, Blackburn, Waterloo and Umhlanga 2 Reservoirs. This augmentation will result in additional capacity of 44 Mℓ/day into the current system. This is expected to be complete by 2016.

Ultimately in the second phase, the Northern Aqueduct will be supplied by the Western Aqueduct once complete. According to the Bulk Services Planning Report for future developments in the Northern Region

[12] *Reference must be made to the Bulk Services Planning Report for future developments in the Northern Region Report No. DR2014/07 compiled by SMEC South Africa.*

Report No. DR2014/07 compiled by SMEC South Africa, this is scheduled for completion towards the end of 2021.

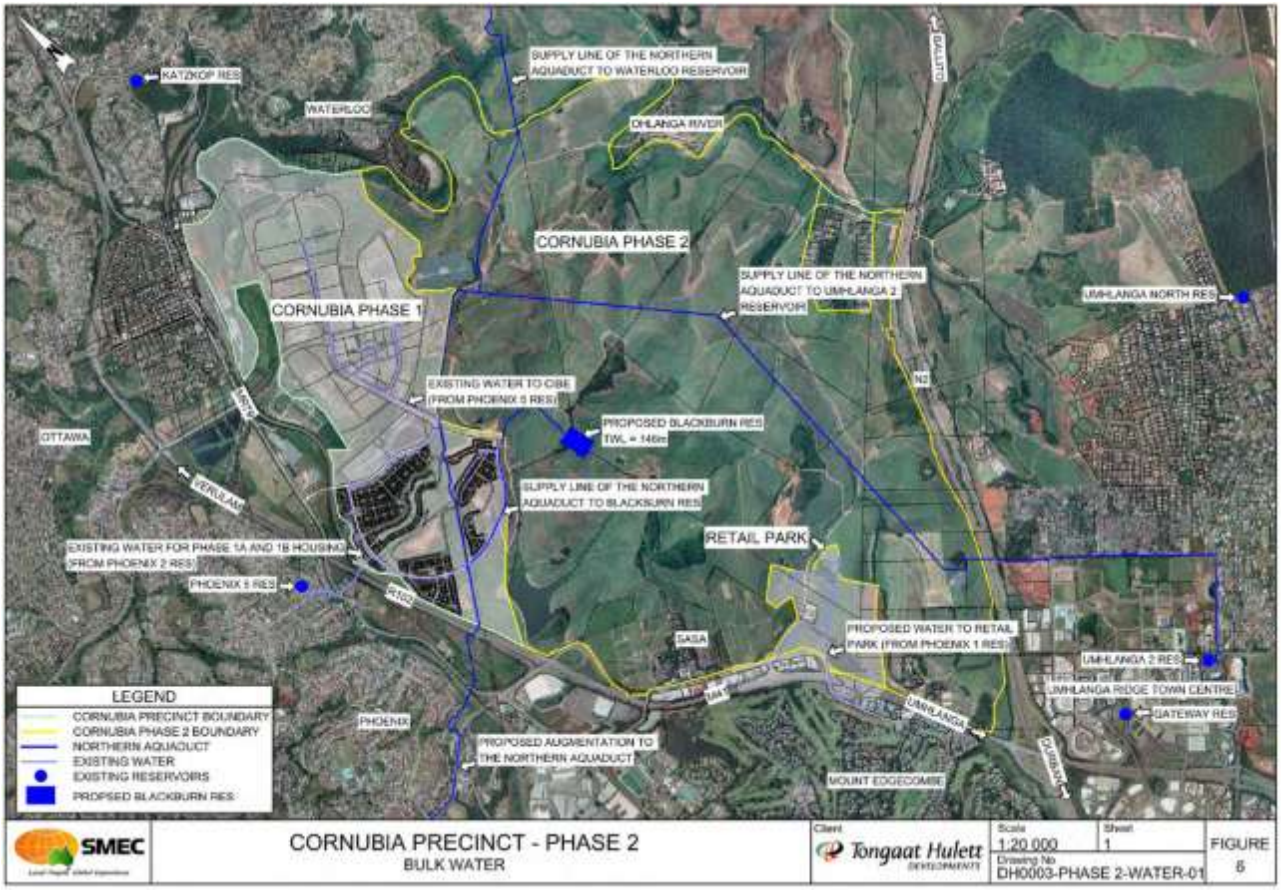


Figure 5-18: Proposed bulk water infrastructure

5.2.1.3 Proposed Blackburn Reservoir

The proposed Blackburn Reservoir will be constructed in phases in order to meet future demand. The first phase of construction is planned to commence in 2015. This initial reservoir storage needs to cater for the existing Cornubia Phase 1 which includes the CIHD Phase 1 *(a)* houses and CIHD Phase 1 *(b)* houses (currently supplied by the Phoenix 2 Reservoir) as well as the Cornubia Retail Park. According to the Blackburn Reservoir Modelling Report, Project No. D294 compiled by Naidu Consulting, there is also a portion of Mount Edgecombe/Phoenix demand that will be transferred from the Phoenix 1 Reservoir zone to the Blackburn Reservoir zone in order to free up storage capacity at Phoenix 1 Reservoir. This demand also needs to be catered for in the initial storage.

The initial reservoir storage required is approximately 24 Mℓ. This includes an allowance of 1.45 Mℓ for fire flow in the additional 24 hour storage capacity.

Confirmation of water supply will be obtained from the eThekwini Municipality and included as Appendix G.

5.2.2 Sewerage

5.2.2.1 Existing Bulk Sewer Infrastructure

The Greater Cornubia Development is divided by a main ridgeline running west to east. The northern catchments gravitate to the Phoenix WWTW. The southern catchment gravitates to the KwaMashu WWTW (Figure 5-19).

Aurecon has recently completed the upgrade of the Ohlanga Pump Station, the new rising main and the Ohlanga gravity trunk sewer. This gravity trunk sewer runs east to west across Cornubia and discharges

directly into the Phoenix WWTW. This gravity trunk sewer will deal adequately with the overall sewer from the northern catchments.

Sewer from the southern catchment will discharge into the Eastbury Trunk Sewer which gravitates to the KwaMashu WWTW. It is noted that the Eastbury Trunk Sewerline requires an upgrade at Eastbury Drive to accommodate the increased capacity from Cornubia. A Basic Assessment Study (Reference: DM/0045/2014) and Water Use Licence Application are presently underway for the proposed upgrade.

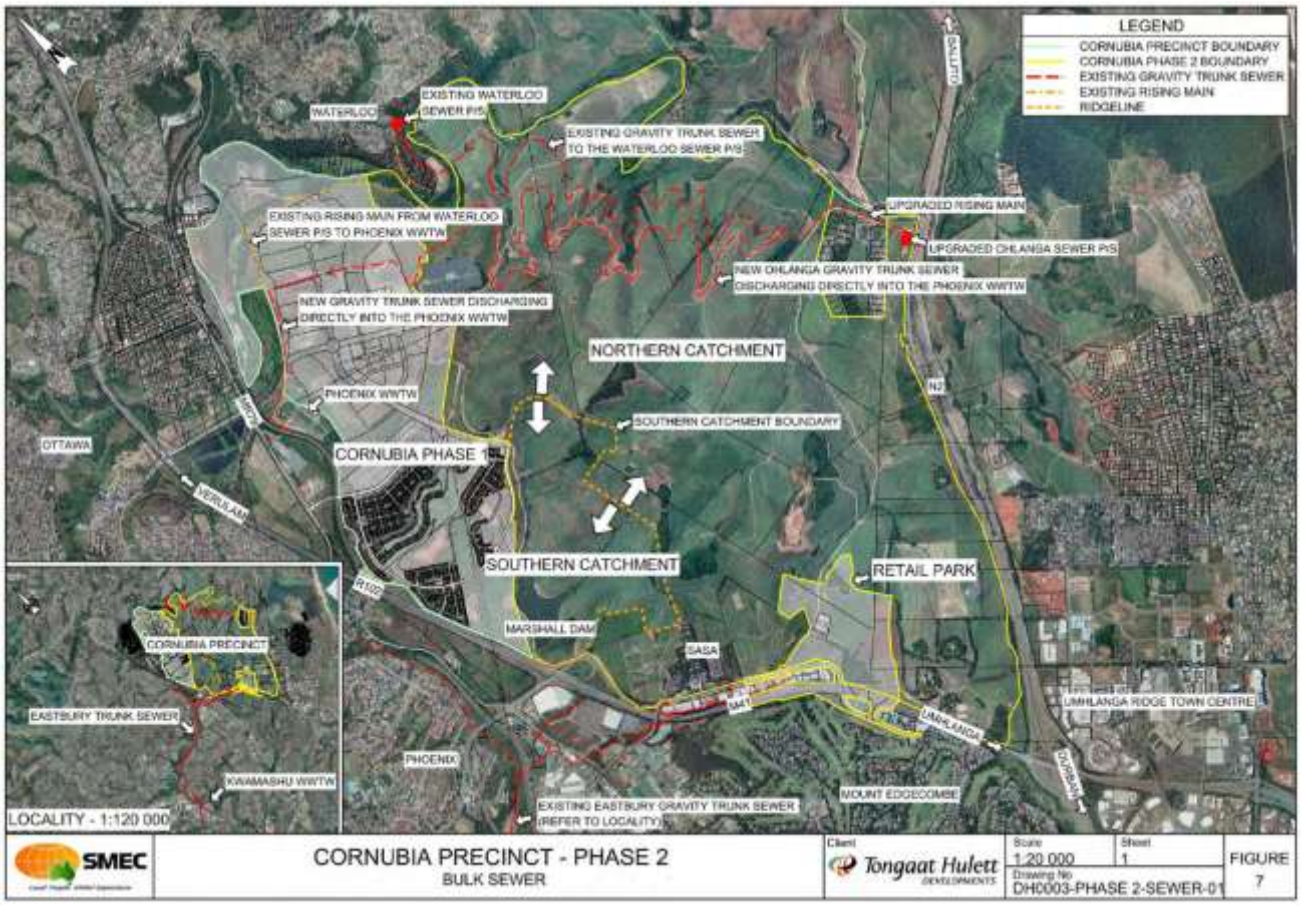


Figure 5-19: Bulk sewer infrastructure at Cornubia

5.2.2.2 Waste Water Treatment Works

The following information regarding the Phoenix and KwaMashu WWTW has been confirmed by SMEC South Africa with officials from the EWS. Refer to Appendix C1.

5.2.2.2.1 Phoenix WWTW

The Phoenix WWTW's existing thresholds are as follows:

- Operating (design) capacity - 25 Mℓ/day
- Current yearly average operating load - 18 Mℓ/day
- Spare capacity - 0 Mℓ/day

Sludge handling capacity has restricted the works to 18 Mℓ/day as opposed to 25 Mℓ/day. EWS have stated they are currently increasing sludge dewatering and digestion facilities to meet the 7 Mℓ/day shortfall. This is anticipated to be complete by mid-2015. EWS is also planning to upgrade the works on the current site to a capacity of 50 Mℓ/day. This is anticipated to be complete by 2016. Ultimately EWS plans to upgrade the works to a capacity of 100 Mℓ/day.

5.2.2.2.2 KwaMashu WWTW

The KwaMashu WWTW's existing thresholds are as follows:

- Operating (design) capacity - 65 Mℓ/day

- Current yearly average operating load - 60 Mℓ/day
- Spare capacity - 5 Mℓ/day

EWS has proposed an upgrade to a capacity of 75 Mℓ/day which is due for completion by 2015. It should be noted that the additional capacities will be utilised as and when the need arises within the Ohlanga and Umgeni River Catchments and is not specifically reserved for the Greater Cornubia Development.

5.2.2.3 Sewer Catchments

The total sewer Average Daily Flow (ADF) for Cornubia Phase 2 is approximately 29.50 Mℓ/day. The topography of the site is such that the watershed lines determine that the sewer effluent needs to be dealt with in five different sub-catchment areas as illustrated in (Figure 5-20).

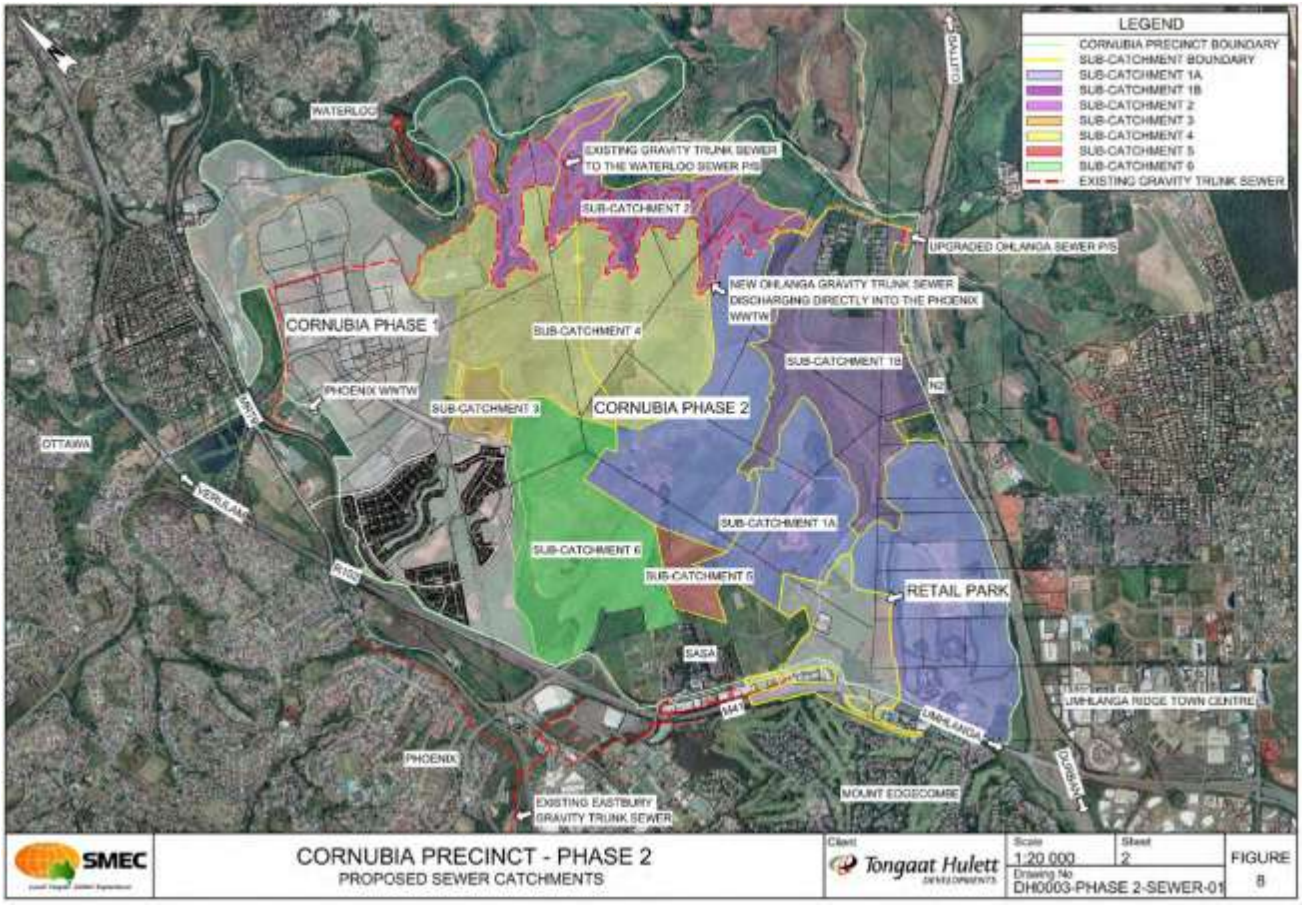


Figure 5-20: Proposed sewer catchments

5.2.2.3.1 Northern Catchments

Sewer generated from sub-catchments 1A, 3, 4 and 5 will gravitate to the new Ohlanga gravity trunk sewer and be treated at the Phoenix WWTW (Figure 5-21). Sewer effluent from sub-catchments 1B and 2 will gravitate to the Ohlanga sewer pump station and be pumped to the Phoenix WWTW. The total sewer ADF to be treated at Phoenix WWTW is approximately 26.63 Mℓ/day.

5.2.2.3.2 Southern Catchment

Sewer generated from sub-catchment 6 of approximately 2.87 Mℓ/day, will gravitate to the Eastbury gravity trunk sewer to be treated at the KwaMashu WWTW (Figure 5-21).

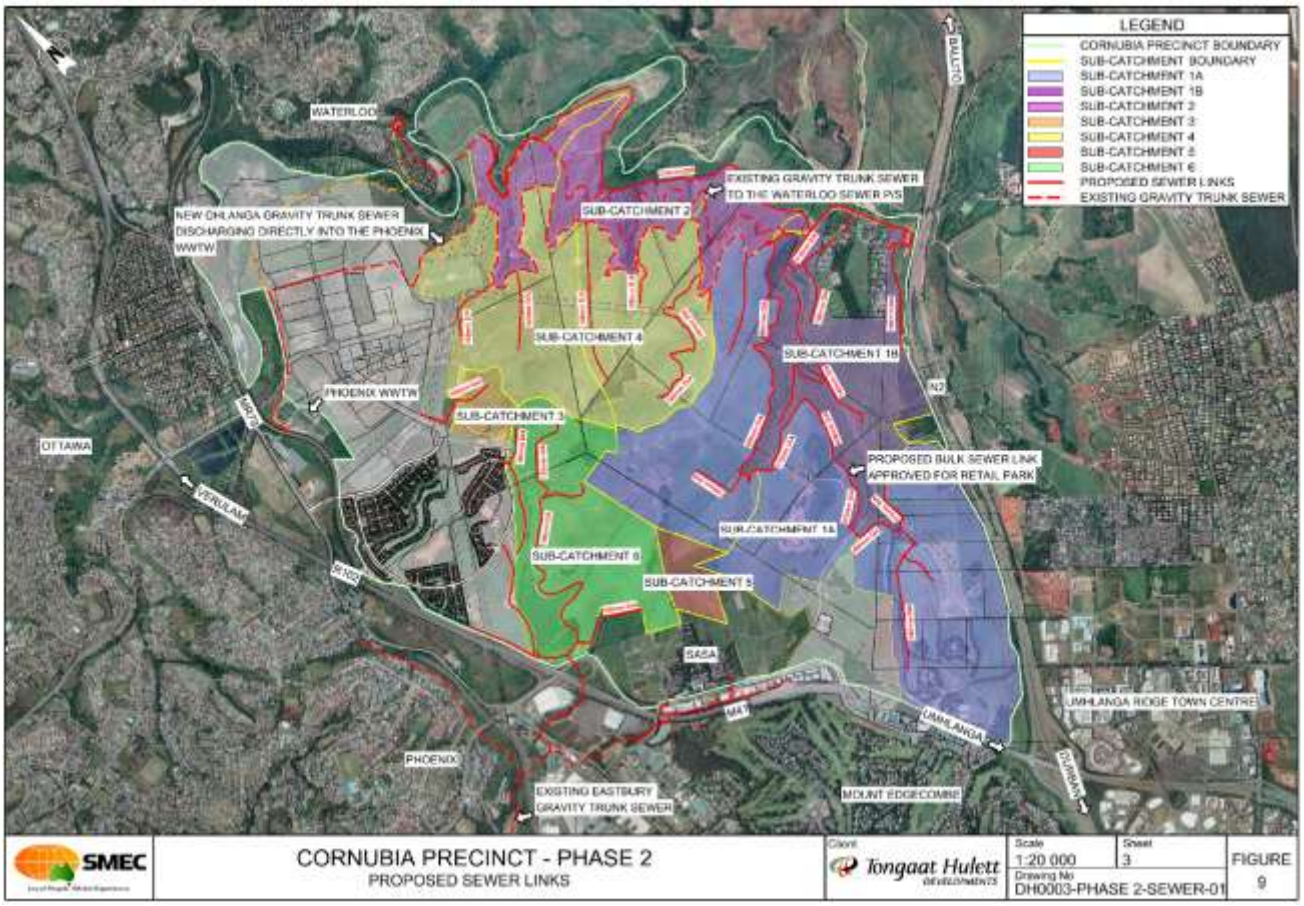


Figure 5-21: Proposed sewer lines

Confirmation of capacity to accept sewerage will be obtained from the eThekwini Municipality and included as Appendix G.

5.2.3 Roads

5.2.3.1 Roads Hierarchy

The road hierarchy model adopted for the Greater Cornubia Development generally follows the standard design guidelines applied to a project of this magnitude.

5.2.3.2 Road Classification

The road classification with related traffic calming measures is as follows –

- Class 1: Freeway – High mobility, no or very limited at grade access. No traffic calming.
- Class 2: Major Arterial/ Regional Distributor – High mobility, limited at grade access (intersections), no direct property access. No traffic calming.
- Class 3: Arterial/ Major Collector – Balanced mobility and accessibility function. Traffic calming only to consist of signage and road markings.
- Class 4: Collector – More accessibility, less mobility, direct property access. All types of traffic calming allowed.
- Class 5: Local Street – Limited mobility, more accessibility. All types of traffic calming allowed including speed humps.

5.2.3.3 Class 3 Roads

The following class 3 roads are proposed to be constructed as part of Cornubia Phase 2 (Figure 5-22):

- Extension of Cornubia Boulevard from the CIBE Cornubia Boulevard traverses the southern portion of Cornubia and runs parallel to the R102/M41. Cornubia Boulevard links directly in the east into Umhlanga Ridge Boulevard. Limited access onto Cornubia Boulevard from the N2 *via* a north bound off-ramp is provided as part of the Mount Edgecombe Interchange upgrade. Cornubia Boulevard is also the road that houses the future IRPTN. Through engagement with ETA and eThekwini Road provision, the horizontal and vertical alignment of this road has been agreed.
- The extension of Blackburn Link from CIBE/Ottawa Substation intersection. Blackburn Link traverses the northern portion of Cornubia and links up to the N2 in the east.
- Dube West is a natural extension of Phoenix Highway. The existing Marshall Dam Interchange and intersection of the M41 Phoenix Highway will require major reconfiguration to allow for the connection of Dube West. Dube West runs midway through Cornubia and it is the intention that this will ultimately link up to the west of the Dube TradePort. In the short-term Dube West ends north of the Ohlanga River.
- Dube East originates from Flanders Drive in the south. It runs parallel to the N2 freeway and is midway between Dube West and the N2 freeway. Dube East is also intended to be extended northwards to the east of Dube TradePort. In the short-term it will terminate at the Ohlanga River in the north.

5.2.3.4 Access Points

The access points to Cornubia are presented in Table 5-2.

Table 5-2: Ultimate access points to Cornubia

Access Point	Figure Reference	Description and Status
Proposed Blackburn Interchange on the N2	Figure 5-23	**Subject to this EIA Study**
Bridge over the N2 linking Cornubia Boulevard and Umhlanga Ridge Boulevard in Umhlanga Ridge Town Centre	Figure 5-24	Authorised and construction expected to commence in 2015
M41 / Flanders Drive Interchange (upgrade)	Figure 5-25	Authorised as part of the Cornubia Retail Park EA and construction expected to commence shortly
Proposed M41 / Marshall Dam Interchange (upgrade)	Figure 5-26	**Subject to this EIA Study**
Proposed R102 / Northern Drive Interchange	Figure 5-27	**Subject to this EIA Study**
Proposed bridge over the Ohlanga River from Dube West linking up to Waterloo road network and future developments to the north of Cornubia	n/a	Subject to a future EIA Study
Proposed bridge over the Ohlanga River from Dube East linking up to future developments to the north east of Cornubia	n/a	Subject to a future EIA Study

5.2.3.5 Pedestrians

According to the Cornubia Phase 1 Engineering Services Report No.DR2009/17, adequate provision will be made to ensure that sufficient width is allowed for within the sidewalks to accommodate pedestrians.

5.2.3.6 Public Transport Network

According to the Traffic Impact Assessment (TIA) (Appendix C 9), the following public transport services will be incorporated:

- ***Bus Rapid Transit (BRT) Services*** - two main BRT services will be provided within Cornubia, namely King Shaka International Airport to Durban CBD *via* Umhlanga (IRPTN C8 Corridor) and Bridge City to Umhlanga Ridge Town Centre (IRPTN C9 Corridor).
- ***Feeder Services*** - feeder services will provide local bus services that will support the BRT routes. This will improve the access to the BRT service and local road networks.
- ***Quality Bus Services (QBS)*** - the QBS will transport passengers not within the catchment areas of the BRT routes. The QBS routes will be located outside of Cornubia.

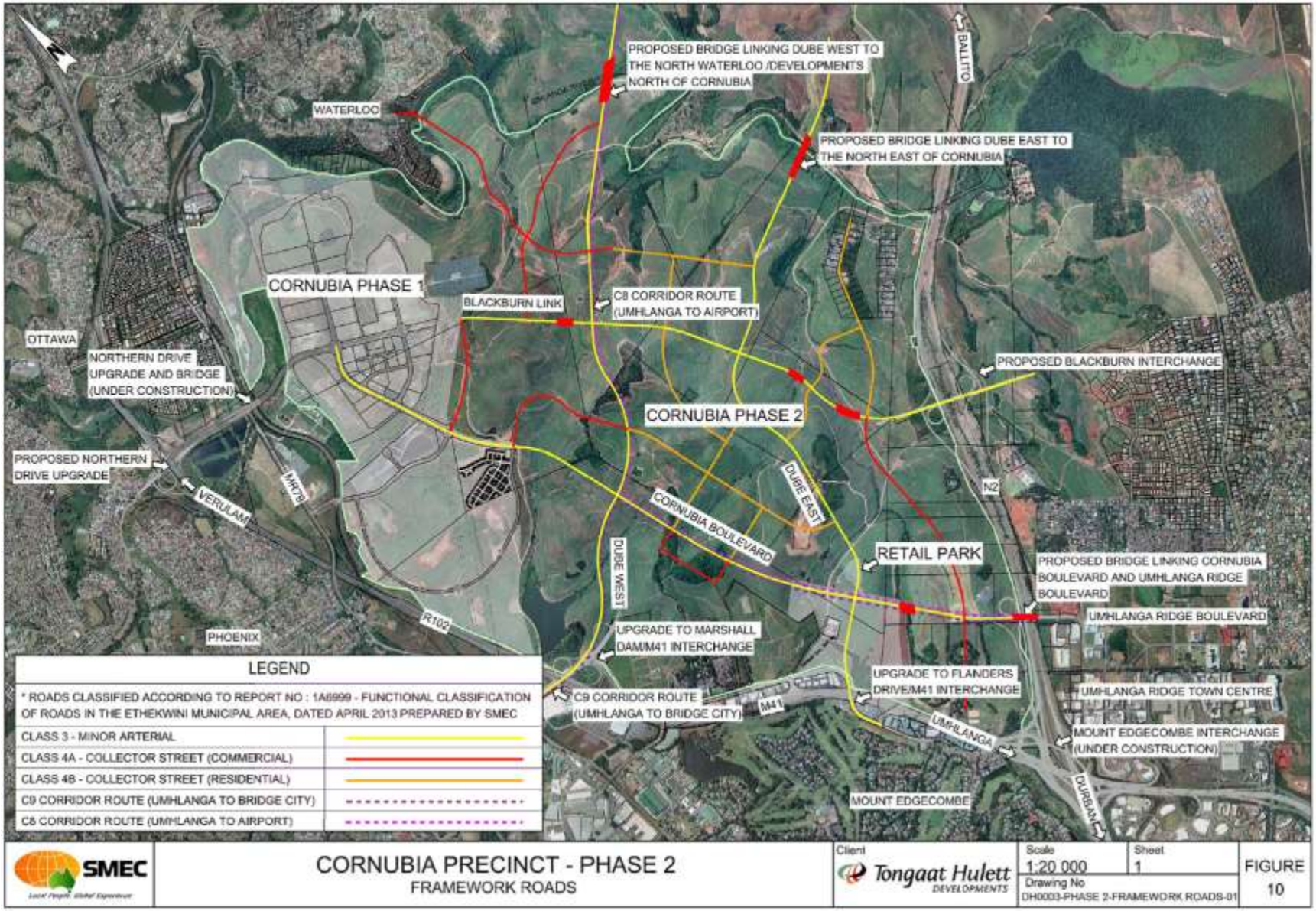


Figure 5-22: Proposed road network

Figure 5-23: Proposed Blackburn Interchange

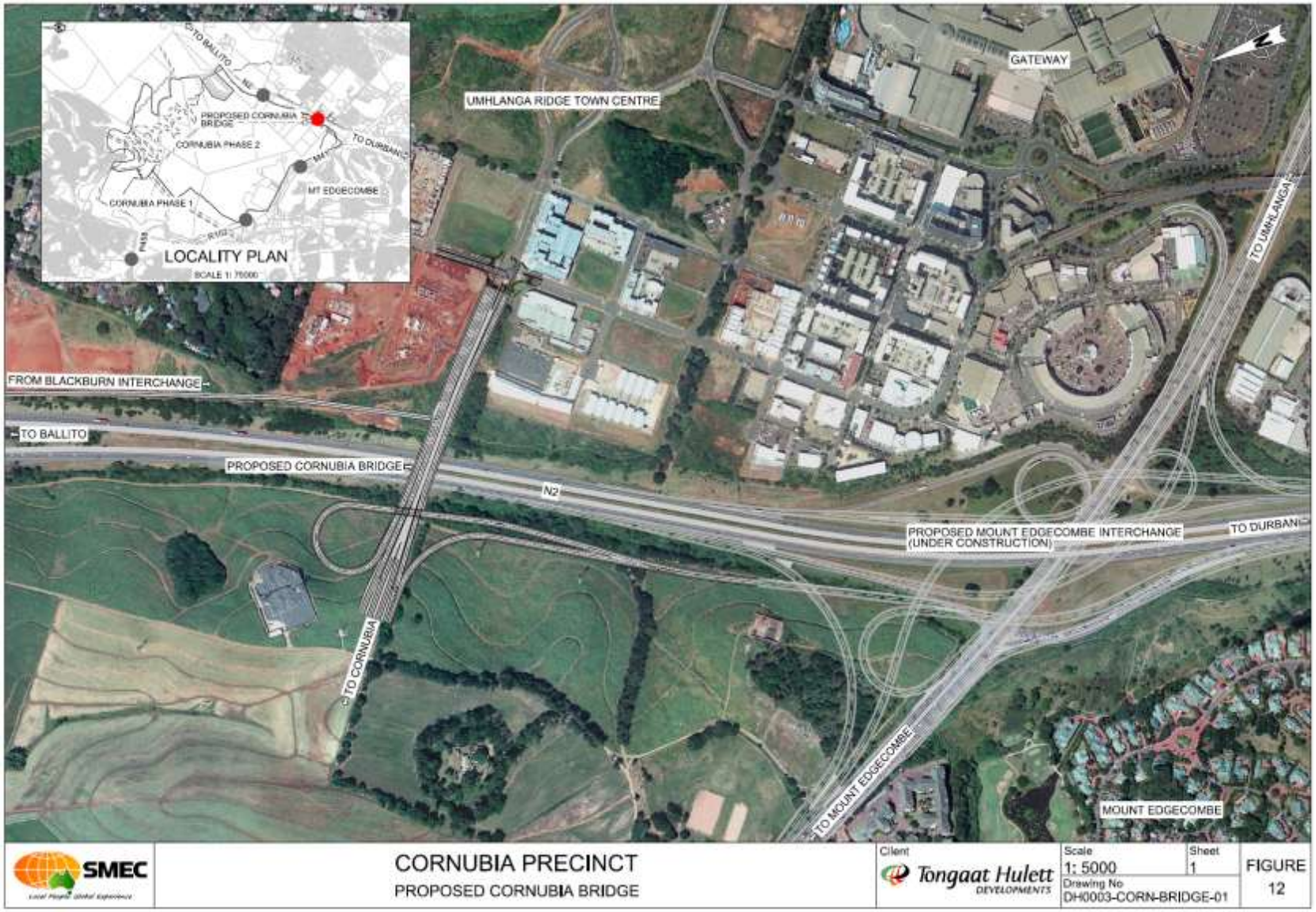


Figure 5-24: N2 Cornubia Bridge and Interchange (authorised)

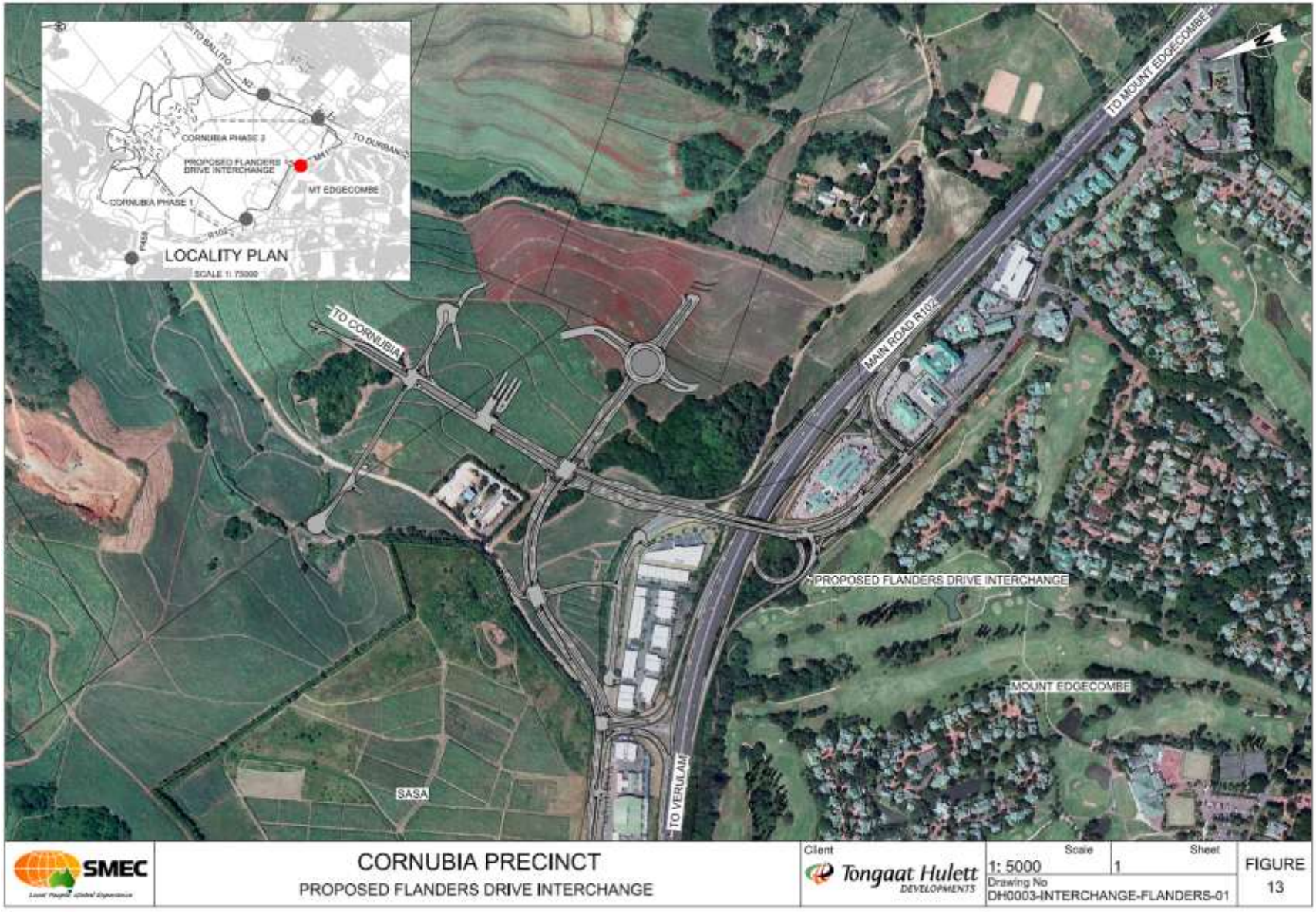


Figure 5-25: M41 / Flanders Drive Interchange upgrade (authorised)

Figure 5-26: Proposed Marshall Dam Interchange

Figure 5-27: Proposed R102 / Northern Drive Interchange

5.2.4 Stormwater

The stormwater management requirements have been addressed in a separate SMEC South Africa report entitled “Stormwater Management Plan (SMP) for Cornubia Phase 2” (Appendix B 3).

A Stormwater Attenuation Facility report was prepared by SMEC in November 2014 analysing the feasibility of attenuation features outside the wetland boundaries and will be detailed in Section 6.3.1.

The aim of the report is to explain the benefits of attenuating within the wetlands.

The detailed proposal for stormwater attenuation is presented in Section 7.10. Attenuation will take the form of detention storage. All internal stormwater reticulation will be designed in accordance with the layout and sizes of the various stormwater elements as determined by the SMP and the relevant applicable standards. The design of the stormwater attenuation will be subject to approval by the eThekwini Coastal and Drainage Section.

5.2.5 Bulk Irrigation

Raw water will be required for irrigation of the extensive open space network as part of rehabilitation measures. SMEC South Africa is currently investigating possible bulk irrigation options for the Greater Cornubia Development. It is proposed that water for irrigation purposes will be sourced from Marshall Dam. Further investigation and detailed designs are required in this regard. Preliminary drawings are presented as Figure 5-28 and Figure 5-29.

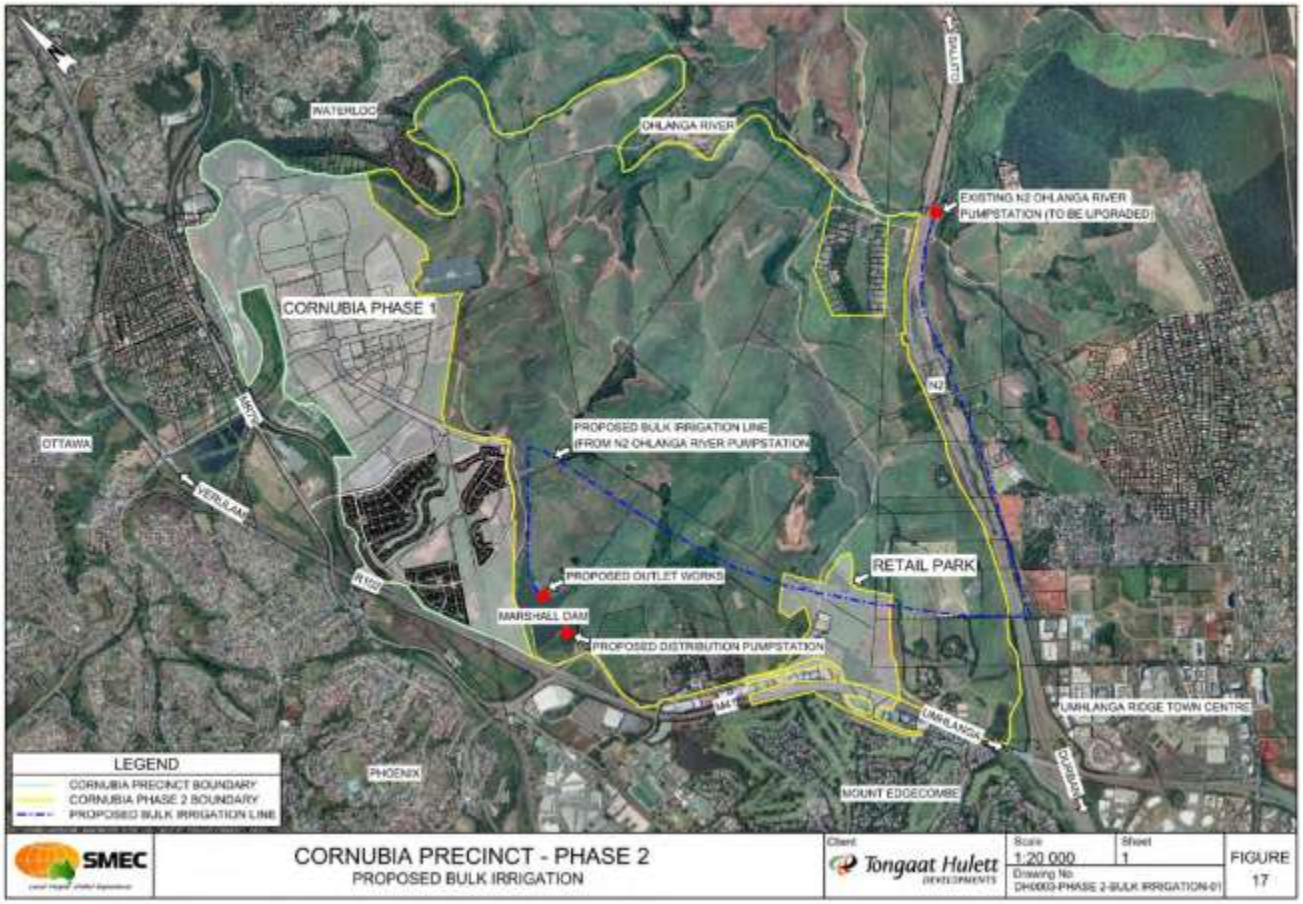


Figure 5-28: Proposed bulk irrigation

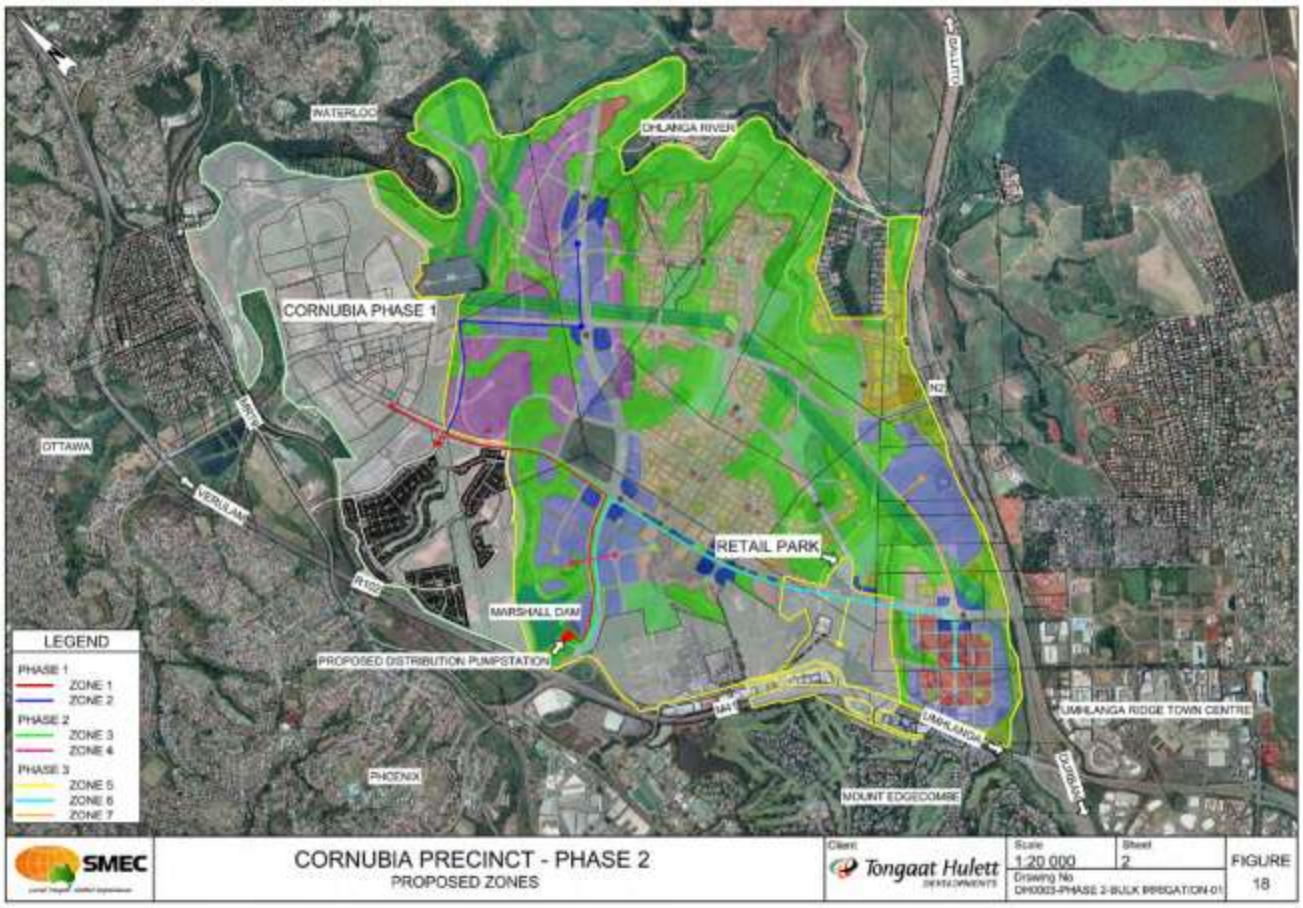


Figure 5-29: Proposed zones for irrigation

5.2.6 Electrical[13]

5.2.6.1 Existing Electrical Infrastructure

The existing electrical infrastructure is divided into the following categories:

- ***Transmission (275/132 kV)***

  The Ottawa major substation is located to the north of the proposed Development area. This substation is supplied *via* two 275 kV overhead transmission lines from the Eskom Avon Substation. Ottawa supplies the Sunningdale North, Gateway and Ridgeside major substations in Umhlanga Ridge as well as the Greenbury major substation. The Ottawa major substation (132/11 kV) has been operational since April 2013 with a firm 30 MVA capacity and ten 11 kV circuit breakers. The substation can be upgraded to a firm 60 MVA capacity and more circuit breakers can be added to the existing 11 kV panel.

- ***Servitudes***

  eThekwini Electricity have registered servitudes for all transmission lines entering and leaving the Ottawa substation, as well as proposed servitudes for future 275 kV transmission and 132 kV sub-transmission lines. The registered transmission servitudes are depicted in Figure 5-30.

- ***Distribution (11 kV)***

  There is electrical supply at 11 kV available in close proximity to the proposed development, however, it cannot support the demand of the development.

[13] *The information provided in this section has been obtained from the Cornubia Phase 2 EIA Electrical Services Report (2014) prepared by Bosch Projects and provided in Appendix C 12. This section must be read in conjunction with this report.*

Reticulation

There is electrical supply at 400 V available in close proximity to the proposed development, however, it cannot support the demand of the development.

Street Lighting

There is no street lighting installation available within the boundaries of the proposed development as there are no formal roads at present.

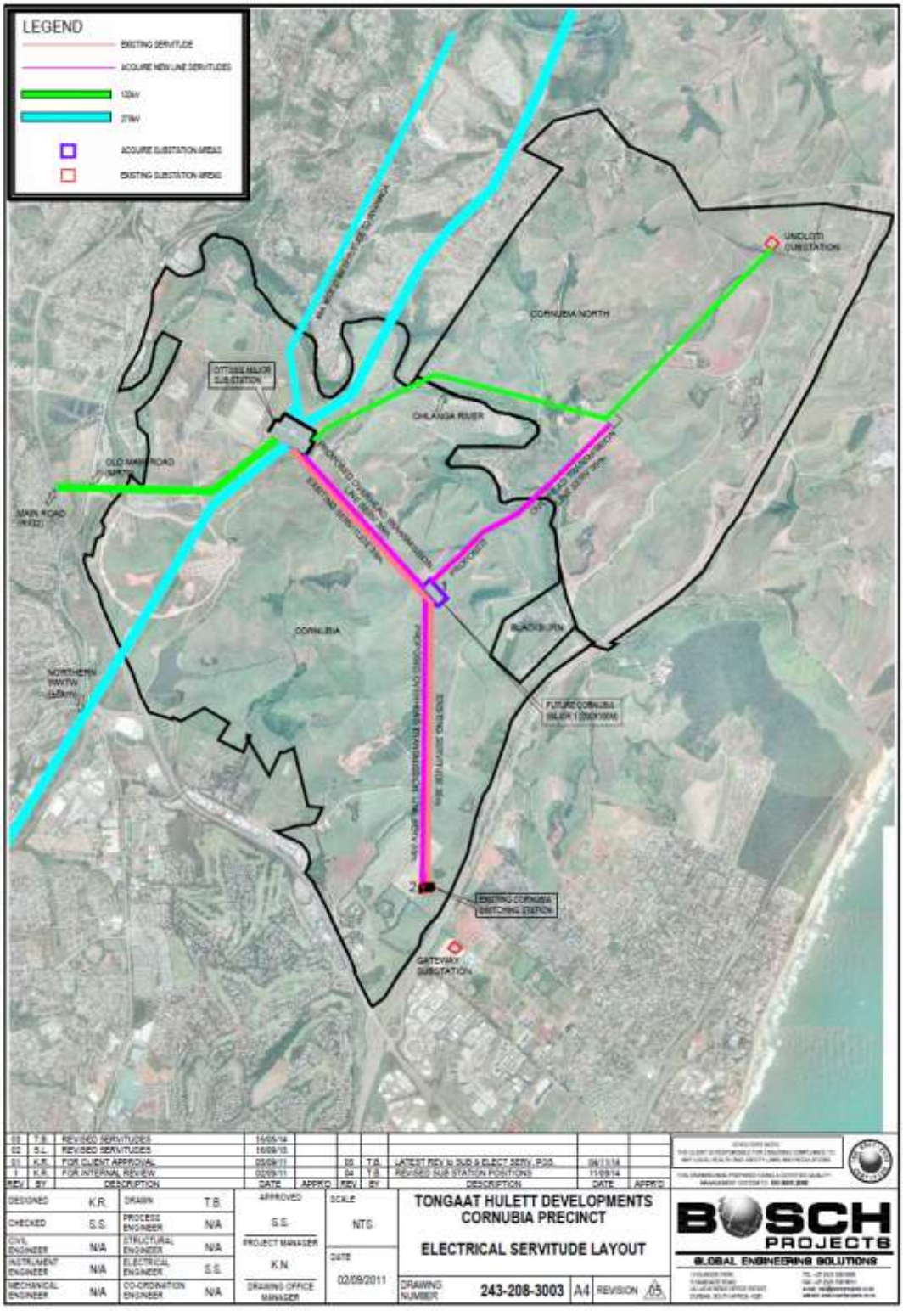


Figure 5-30: Electrical servitude layout

5.2.6.2 Electricity Supply Planning Criteria

In formulating the preliminary planning criteria, good engineering practice and load factors as per NRS 069: 2004 which are approved by eThekwini Electricity, have been used. The system will be designed to cater for the failure of any single MV cable i.e. electrical load can be transferred *via* switching in the event of a fault occurring.

5.2.6.2.1 Demand Side Management

It is currently proposed that the individual sites be allocated a maximum allowable electrical load based on the property usage and allowable bulk. Should the proposed End-use developer/s wish to exceed this figure, proof of calculations with energy saving strategies by their designers must be submitted for verification to eThekwini Electricity prior to electricity applications being approved.

5.2.6.2.2 Bulk Load Estimate

The bulk load estimates for Cornubia Phase 2 are presented in Table 5-3.

Table 5-3: Bulk load estimates for Cornubia Phase 2

Desired Activity Patters	Gross Developable Area (ha)	Non-Residential Bulk (m^2)	Residential Units	Connected Load kVA
Medium Density Residential – Subsidised Duplex / Simplex Housing (BNG)	58.61		6 447	16 118
Medium Density Residential – Affordable	15.07		3 494	8 735
High Density Residential – Affordable	5.03		1 555	3 888
Mixed Use 1 (Residential Apartments + Retail Base) – 90% / 10@ desired split)	17.48	24 477	4 005	17 978
Mixed Use2 (Residential Apartments + Retail Base) – 90% / 10@ desired split	11.23	23 592	3 539	16 043
T. O. D. 1 zone Mixed Use (with residential – 90% / 10% desired split)	5.35	18 721	2 808	12 730
T. O. D. 2 zone Commercial Only (no residential)	8.31	211 823		16 946
T. O. D. 3 zone – Centre Median Development (50% / 50% desired split)	1.61	17 128	285	2 510
General Business	83.79	603 277		48 262
Light Industry	58.86	317 527		21 592
Social Facilities	44.24	110 601		4 424
Community Facility	4.04	24 259		970
Transport: IRPTN Depot Site	3.75	24 392		112
Total: Cornubia Phase 2	**317**	**1 375 797**	**22 134**	**170 318**

The potential electrical load at the major substation/s after a diversity factor has been applied will be in the order of 119 MVA.

5.2.6.3 Proposed Electrical Infrastructure

The proposed design and implementation of the electrical infrastructure is detailed below:

- ***Transmission (275/132 kV)***

  eThekwini Electricity have ordered an additional 315 MVA 275/132 kV transformer to increase the capacity of the Ottawa transmission substation.

- ***Sub-Transmission (132/11 kV)***

  The Ottawa major sub-transmission substation can be upgraded to 60 MVA by installing a further two new 30 MVA transformers and more 11 kV circuit breakers. One further new 60 MVA sub-transmission substation and the existing Cornubia Switching station will be converted into a new sub-transmission

substation are proposed within Cornubia Phase 2 to cater for the anticipated new load. Refer to Figure 5-30 for the proposed positions.

Servitudes

A new 35 m sub-transmission servitude will be required from Ottawa major to the proposed new Cornubia #1 major and Cornubia Switching Station. Refer to Figure 5-30.

Distribution (11 kV)

The distribution substations will be planned and positioned within the first building of the development. These locations will be determined by electrical load centres and will be identified during the design phase of this project. Provision must be made by the Developer/owner to provide the room on his site to house the distributor substation equipment required, in addition to the normal transformer/meter rooms in accordance with eThekwini Electricity Standards at the Developer's cost. The rooms shall be positioned on the street frontage with 24 hour unrestricted access provided to eThekwini Electricity vehicles and staff. The distributor internal room dimensions are 7 m x 5 m x 3.1 m high. The switchgear will be provided by eThekwini Electricity who will charge a reduced connection fee to the Developer/owner on whose property the distributor substation is located in accordance with the appropriate bylaws. 11 kV cable routes will be planned to run adjacent to or be in close proximity to each proposed site within the road reserve thereby allowing sales and transfers of each site to take place. The costs of the 11 kV switchgear only within the distributor substation will be borne by eThekwini Electricity.

Reticulation

The internal electrical reticulation of retail developments (i.e. within the property) will be undertaken by each Developer to meet his specific requirements. THD will be responsible for the costs of the 11 kV bulk supply to the boundary of these developments (Figure 5-31 and Figure 5-32).

Street Lighting

Provision is made for street lighting.

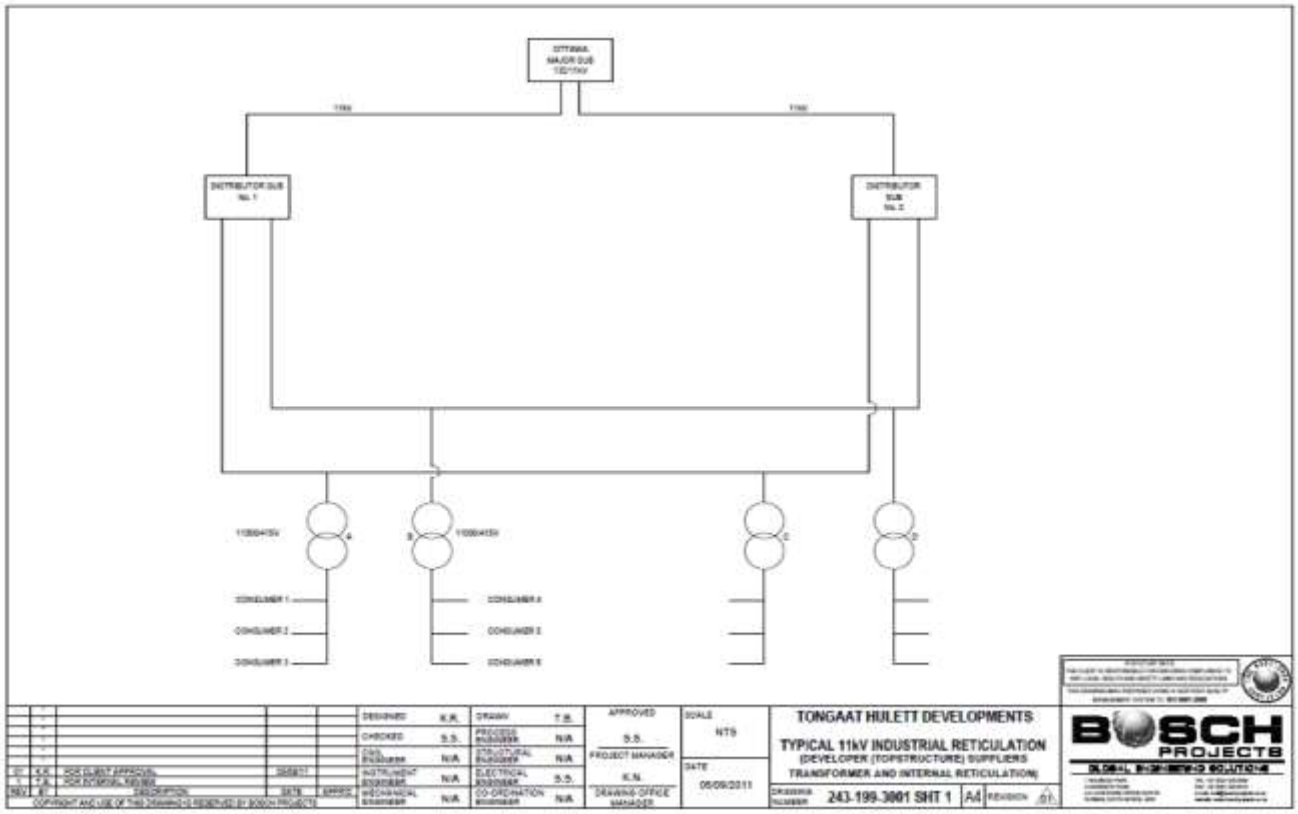


Figure 5-31: Typical 11 kV industrial reticulation

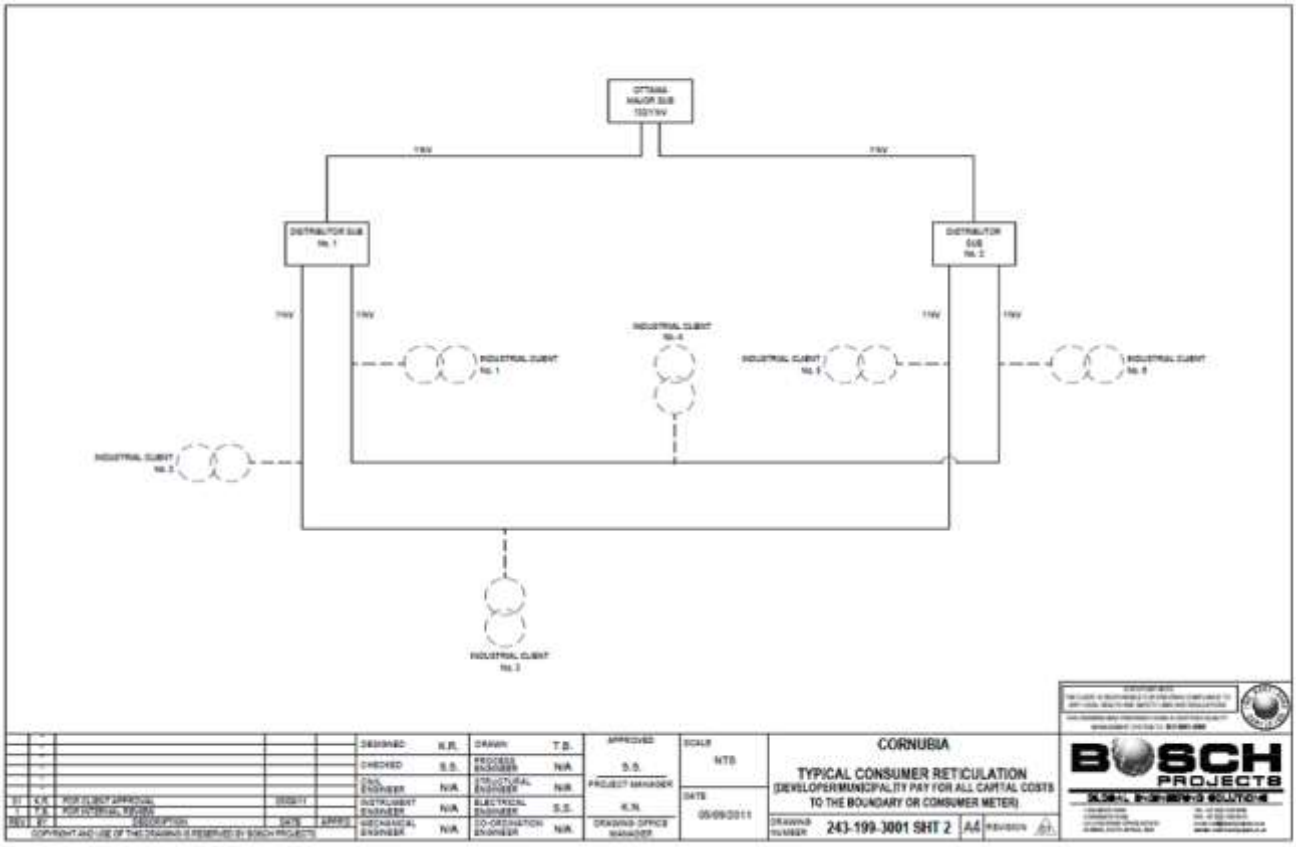


Figure 5-32: Typical consumer reticulation

Confirmation of capacity to provide electricity will be obtained from the eThekwini Municipality and included as Appendix G.

5.2.6.4 Alternative Energy Sources

Currently, no viable alternative energy source (Green power) on the scale required is available within or adjacent to this proposed development.

5.2.7 Internal Services

As described in Section 5.1.6, Cornubia Phase 2 will be developed in a phased manner to respond to market demand over a 15-20 year horizon. During the detailed design stage of each individual sub-phase of Cornubia Phase 2, it will be necessary to confirm the following aspects:

- Sizes, positions and levels of existing underground services i.e. water mains, sewers and stormwater pipes;
- Levels of existing roads at new tie-in positions; and
- Additional topographical survey.

All internal services within Cornubia Phase 2 for end-use developers or top structures will be provided for as follows:

5.2.7.1 Water

All internal water reticulation will be designed by and in accordance with EWS's standards and subject to their approvals.

5.2.7.2 Sewer

All internal sewer reticulation will be designed in accordance with EWS's standards and subject to their approvals.

5.2.7.3 Roads

All internal roads will be designed in accordance and conjunction with the eThekwini road design manual – Part 3 (1985) with occasional reference to the relevant UTG standards and all designs will be subject to approval from: eThekwini Roads/ Materials Department, ETA and eThekwini Roads Provision.

5.2.7.4 Stormwater

All internal stormwater reticulation will be designed in accordance with the layout and sizes of the various stormwater elements as determined by the SMP and the relevant applicable standards. The design will be subject to the approval of eThekwini Coastal and Drainage Section.

6 PROJECT ALTERNATIVES

In terms of the EIA Regulations, Section 28 (1) (c) feasible alternatives are required to be considered as part of the environmental studies. In addition, the assessment of alternatives is also a requirement of Section 24(4) of the NEMA (as amended). An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity (as defined in Government Notice R.543 of the EIA Regulations, 2010), which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity; and
- the option of not implementing the activity.

6.1 Site Alternatives

No other site alternatives have been investigated due to the fact that the Greater Cornubia Development is the closest large parcel of land adjacent to existing developed areas of the City and thus can be integrated naturally and positively into this existing fabric. The Greater Cornubia Development has a number of and a wide variety of objectives to meet and such objectives would not be met if the development was attempted elsewhere. Furthermore, the eTM have purchased land within the Cornubia site for the provision of housing to those who do not have formal houses.

It must be reiterated that any proposed development within Cornubia is required to be aligned, in broad terms, with the accepted Cornubia Development Framework Plan. Given these critical constraints together with the extent of land required, the potential site locations for such a development, within the broader region are limited.

6.2 Land Use Alternatives

During the early stages of the Environmental Scoping Study that culminated into the compilation of the final ESR, it was proposed that SASA owned land would be included as part of Cornubia Phase 2. As no formal agreement has been reached between the Developers and SASA, the Cornubia Phase 2 LUM Precinct Plan presented in this EIA excludes SASA owned land from Cornubia Phase 2 but does include three interchanges, one of which occurs on land owned by SASA.

Furthermore, the final ESR proposed that land use mix alternatives would be considered such as solely residential or a significantly reduced commercial component, solely commercial or significantly reduced residential component or a much lower residential density. Alternatives that include solely commercial and/ or industrial land uses had however been discounted due to the eTM's need to provide housing and the fact that sustainable cities need to provide a broad mix and range of uses and encourage and design for closer living-working relationships.

As noted in earlier Sections, the Cornubia Development Framework Plan has been based upon a number of existing constraints including topography, geology, water resources, existing servitudes and services, roads and rail line and limited access and linkage opportunities as detailed in Figure 4-8. Furthermore, it is noted that rigorous scientific assessments have informed the Cornubia Phase 2 LUM Precinct Plan. As a result there is limited scope for alternatives related to the primary components of the Cornubia Development Framework Plan. Without doubt each and every potential access and development opportunity has been utilised together with identifying potential new linkages to existing and future development in the region.

It is therefore acknowledged that the Cornubia Development Framework Plan structure is sound and, critically, delivers upon the strategic objectives that have been identified by both THD and the eTM. Furthermore, it is noted that the two parties have spent a considerable amount of time and effort in the planning and contextualisation of the development and there is broad acceptance that the Cornubia Development

Framework Plan (at a principle level at least) is appropriate and will add value to the region and enable the Greater Cornubia Development to fulfil its regional responsibilities, objectives and mandate.

The accepted Cornubia Development Framework Plan was finalised in February 2011. Whilst every effort has been made to ensure alignment with this Plan, it must be reiterated that the Cornubia Development Framework Plan is a high-level plan intended to strategically guide the overall development intent of the Greater Cornubia Development. It is noted that very limited engineering input was provided into the formulation of the Cornubia Development Framework Plan in the initial stages due to the high-level nature of the planning at the time.

Through the course of the development, as land use plans for surrounding regions have evolved, as lessons have been learnt from earlier phases and after many meetings between the Developer, engineers, urban planners, various technical specialists and scientists and various service authorities, the Cornubia Phase 2 LUM Precinct Plan was developed which has been refined to its present state.

Several land use alternatives were considered by the design team in consultation with the service authorities. However, whilst many alternatives were considered, only the most feasible alternatives have been integrated into the current proposed Cornubia Phase 2 LUM Precinct Plan. Hence, no other land use alternative will be presented in the EIA, as the current plan satisfies the objectives of Cornubia and all service authorities whilst aligning with environmental and technical considerations. The Cornubia Phase 2 LUM Precinct Plan is a product of the Cornubia Development Framework Plan in which detailed town planning regulations and norms will be applied to evaluate the potential bulk yields with a higher level of certainty.

Changes to the Cornubia Development Framework Plan have been kept to a minimum, and every effort has been made not to deviate significantly from the Plan. The most obvious changes to the original Cornubia Development Framework Plan are the road networks, which are directly affected by development along their extent. These changes are detailed below, following a brief description of the original framework road alignments.

6.2.1 Roads[14]

As indicated in Section 5.1.2, detailed engineering design has necessitated realignments to some of the roads presented in the Cornubia Development Framework Plan. These realignments are presented below:

6.2.1.1 Blackburn Link

Blackburn Link originates in the west at the R102 and is a natural extension of Northern Drive into Cornubia. Blackburn Link traverses the northern portion of Cornubia and links up to the N2 in the east. A new interchange is proposed on the N2 to accommodate the linkage.

The western portion of Blackburn Link, from the R102 to Dube West, was finalised as part of the development of the CIBE. No significant changes are evident in this portion.

The eastern portion of Blackburn Link changed significantly due to the location of the Blackburn Interchange on the N2 freeway. The position of the Blackburn Interchange is constrained by the on and off ramps of the Sibaya Interchange to the North, and the Mount Edgecombe Interchange to the South.

With the finalisation of the design of the Mount Edgecombe Interchange, the position of the Blackburn Interchange could be tested and hence it was moved southwards from its original position to satisfy all the geometric design criteria. This therefore meant that to maintain the linkage of Blackburn Link, the eastern portion had to be re-aligned to connect into the interchange. The existing wetlands and drainage lines also were taken into account and therefore Blackburn Link was shifted further south.

Various alignments and options were taken into consideration when considering the revised alignment. These options included using the shortest most geometrically efficient route, whilst taking into consideration

[14] *The information provided in this section has been obtained from the Cornubia Phase 2 Framework Road Alignment Changes Report (2014) prepared by SMEC South Africa and available on request.*

geometric standards, wetland positions and crossing requirements. In order to reduce the impacts on wetlands, larger horizontal curves were introduced. These entail larger radial horizontal curves in opposite directions, separated by a minimum straight tangent length of 60 m. The 60 m allows for the development of adequate super elevation between reverse back to back[15] curves. The larger radial curves create a more generous, flowing alignment, and mitigates the "kink" occurrences of horizontal curves which often lead to high accident locations due to drivers not noticing the change in direction.

6.2.1.2 Cornubia Boulevard

Cornubia Boulevard starts in the west, within the CIBE, at an intersection with Blackburn Link. Cornubia Boulevard traverses the southern portion of Cornubia and runs parallel to the R102/M41. Cornubia Boulevard links directly into the Umhlanga Ridge Town Centre on Umhlanga Ridge Boulevard in the east. Limited access onto Cornubia Boulevard from the N2 *via* a north bound off ramp is provided as part of the present Mount Edgecombe Interchange upgrade.

Cornubia Boulevard's alignment is marginally changed at the intersection of Dube East and Dube West. The change occurred in the vicinity of the intersection of Dube East and the horizontal curves either side. This change was introduced to reduce the impacts of the Cornubia Retail Park Development with the inclusion of all the required turning slots at the intersection. Therefore, the proposed road reserve was widened towards the north necessitating the horizontal curves on either side to be adjusted. Dube West intersection was moved eastwards in order to straighten up the intersection of the two framework roads. The original skew alignment of the intersection was not ideal or geometrically correct.

The 2 typologies that are proposed to both be approved have been described in Section 5.1.2.

6.2.1.3 Dube West

Dube West is the natural extension of the Phoenix Highway. The existing Marshall Dam interchange and intersection of the R102 Phoenix Highway will require major reconfiguration to allow for the connection of Dube West. Dube West runs midway through Cornubia and it is the intention that this would ultimately link up to the west of the Dube TradePort. In the short-term Dube West ends in the north at the Ohlanga River.

With the straightening up of the intersection with Cornubia Boulevard, a back to back horizontal curve had to be introduced to maintain the connection into the Marshall Dam interchange upgrade. The portion of Dube West between Cornubia Boulevard and Blackburn Link similarly had to have a back to back horizontal curve introduced. This change also required to accommodate the proposed Blackburn Reservoir site.

The proposed Blackburn Reservoir is to be located on the North Eastern corner of the Dube West/Cornubia Boulevard intersection. This site was chosen due to topographical reasons as it is the highest point on Cornubia. The original alignment of Dube West traversed through the middle of the proposed reservoir site, also contributing to the required change.

The northern portion of Dube West was realigned for two main reasons. The first is the connection into Cornubia North was directly into very steep terrain and would incur huge expense due to the earth-works required to maintain the linkage in the proposed location as indicated on the Cornubia Development Framework Plan. The proposed alignment in the land use is further down the steep slope and the earth-works are reduced considerably.

The second reason is the road realignment was going to cross two existing live trunk sewers mains. Due to the large size of the existing trunks sewer (1,35 m diameter) and the impracticality of doing a relocation of two live sewers, the road had to be in a fill situation at the sewer crossings to maintain minimum cover to the two trunk sewers. The road was subsequently relocated to ensure the above condition was achieved.

[15] *Back to Back curves are two horizontal or vertical curves that closely (sometimes precisely) follow-on each other. These curves can be in the same or opposite direction (commonly known as an s-curve).*

6.2.1.4 Dube East

Dube East originates at the existing Marshall Dam Interchange in the south. Dube East runs parallel to the N2 freeway and is midway between Dube West and the N2 freeway. Dube East is also intended to be extended northwards to the east of Dube TradePort. In the short-term it will terminate at the Ohlanga River in the north.

As shown on the Cornubia Development Framework Plan, the intersection of Blackburn Link and Dube East is skew. The original skew alignment of the intersection was not ideal or geometrically correct. In order to rectify this, a horizontal curve was introduced south of the intersection.

The road realignment was also going to cross the two existing live trunk sewers mains. Due to the large size of the existing trunks sewer (1,35 m diameter) and the impracticality of doing a relocation of two live sewers, the road had to be in a fill situation at the sewer crossings to maintain minimum cover to the two trunk sewers. The road was subsequently relocated to ensure the above condition was achieved.

6.2.2 Other Changes

Other changes to the accepted Cornubia Development Framework Plan were as a direct result of realigning the framework roads, and were minimal by comparison. These include:

- Optimisation of land use areas adjacent to the revised framework roads that have resulted in these roads being realigned; and
- Omission of the SASA land holdings from the Cornubia Phase 2 boundary.

6.3 Design and Layout Alternatives

6.3.1 Stormwater Attenuation

Current industry norms suggest the positioning of stormwater attenuation facilities within wetlands, as wetlands are situated in valleys (i.e. the natural drainage line), and therefore provide a suitable environment, from an engineering point of view, to intercept the increased surface run-off using an attenuation facility. However, the wetland specialist team from SiVEST have advised that affected stakeholders are currently not approving the placement of stormwater attenuation structures within wetlands as this results in a change to the hydrological patterns.

In light of this, SMEC South Africa noted that the stormwater attenuation facilities would need to be repositioned, and the proposed position is within the wetland buffer. As the wetland buffer is not in the natural valley line, shaping and excavation would be required during the construction of the attenuation facilities. Furthermore, the stormwater does not drain naturally to these proposed facilities, and therefore measures (drainage channels, swales, etc.) would need to be implemented to force the water to the proposed facility positions.

Additionally, a larger number of attenuation facilities would be required, as not all the structures can now be located along the natural drainage line. The shaping of the facility and the implementation of drainage control measures would result in increased construction costs and footprint within the open spaces.

Therefore, the Developers requested SMEC South Africa and the wetland specialists to investigate two alternatives with regard to stormwater attenuation at Cornubia as follows: (i) stormwater attenuation facilities within wetlands and (ii) stormwater attenuation facilities outside wetlands but within 30 m wetland buffers. The intention being to compare the technical, ecological and cost implications of the two alternatives.

As it is neither practical nor feasible from a time and cost perspective to prepare detailed design and undertake an alternative assessment for all stormwater attenuation facilities in wetlands (Option A) verses attenuation facilities within the 30 m wetland buffer (Option B), a case study approach to the alternatives assessment was adopted. A typical catchment area within the Greater Cornubia Development was identified for the assessment. This same catchment was used to analyse both scenarios.

A Dry Attenuation Facility (DAF) is proposed for both Option A and Option B. A DAF can be defined as a mechanism which is designed to slow the passage of water from surface run-off to the ground/drainage system e.g. stormwater. It does this by storing the run-off during times of peak flow (i.e. heavy rainfall), and slowly releases it at a controlled rate after the peak flow has passed. Such facilities are often referred to as dry attenuation ponds or detention basins.

An attenuation facility, or dry detention basin, has an orifice level with the bottom of the basin, so that all of the water eventually drains out, and it remains dry between storms – hence, a dry basin.

The actual area affected by the attenuation facility is the footprint of the earth-works berm constructed. This berm creates a swamped area footprint which is the “possible” area of swamping for a 1:50 year storm.

Through analysis of these attenuation facilities during 1:50 year (and even 1:100 year) storms, the time taken for the surface run-off caught by the berm to drain through the orifice at the toe of the berm is in the region of 1.5 to 2 hours maximum. This equates to a maximum of 2 hours swamped area every 100 years.

The orifice used as a control, is constructed with circular pipes sized to discharge run-off at pre-development flow rates. Larger pipes are constructed downstream with a field inlet to allow emergency flow through the berm in the event the orifice is blocked temporarily, as well as an emergency overflow weir on top of the berm to cater for storms greater than 1:50 year. Examples of this are evident in and around Durban as illustrated below.

Notable Features:

i. Placed in valley along drainage line (within wetland) for maximum catchment area.
ii. Extent and growth of vegetation within possible swamped area (Elevation top of Berm upstream)
iii. Flow dissipaters (concrete blocks) at outlet pipe to slow water velocities exiting orifice
iv. Gabion/Reno Mattress overflow weir top of Berm.

Figure 6-1: Example of a dry attenuation facility at King Shaka International Airport

Notable Features:

i. Placed in drainage line (within wetland).
ii. Rehabilitation of Facilities (grass, reed growth etc.)
iii. Stepped weirs to dissipate runoff flows from hardened areas.

Figure 6-2: Flow dissipater facilities upstream of the attenuation facility at King Shaka International Airport

Notable Features:

i. Placed in low point (drainage line) within loop ramp.
ii. Extent and growth of vegetation within possible swamped area.

Figure 6-3: Example of a dry attenuation facility at the Millennium Bridge / M41 Loop

Notable Features:

i. Placed at low point along drainage line (within wetland) for maximum catchment area.
ii. Extent and growth of vegetation within possible swamped area (Elevation top of Berm upstream)
iii. Concrete overflow weir top of Berm.

Figure 6-4: Example of a dry attenuation facility at the Umhlanga Ridge Town Centre

Notable Features:

i. Rehabilitation of Facilities (grass, reed growth etc.)

Figure 6-5: Downstream outlet protection for the Umhlanga Ridge Town Centre

Drawings which detail an attenuation facility constructed at the CIBE are presented in Appendix C 13. The drawings provided illustrate the catchment areas post-development, indicating where each area is being attenuated. This plan was required and approved by the eThekwini Municipality Coastal and Drainage Department. The drawings further show the actual extent of the attenuation facility, as well as the details required to ensure stability of the berm, and its ability to retain surface run-off. The rock-fill layer beneath the berm provided for stability also acts as a channel to allow sub-surface water through unimpeded maintaining the wetland features below the surface. A drawing illustrating the emergency overflow weir to cater for flows greater than 1:50 year is also provided.

Based on these drawings, two options are presented for stormwater attenuation as follows:

6.3.1.1 Stormwater Attenuation Facility – Option A (preferred)

In this scenario, the attenuation structures are located within the wetlands intercepting the drainage lines, as per current industry norms. The calculated post-development run-off for the selected catchment required 10 000 m^3 total storage volume. This is catered for with one attenuation facility located within the wetland. Table 6-1 shows information for the proposed attenuation facilities positioned within the wetlands.

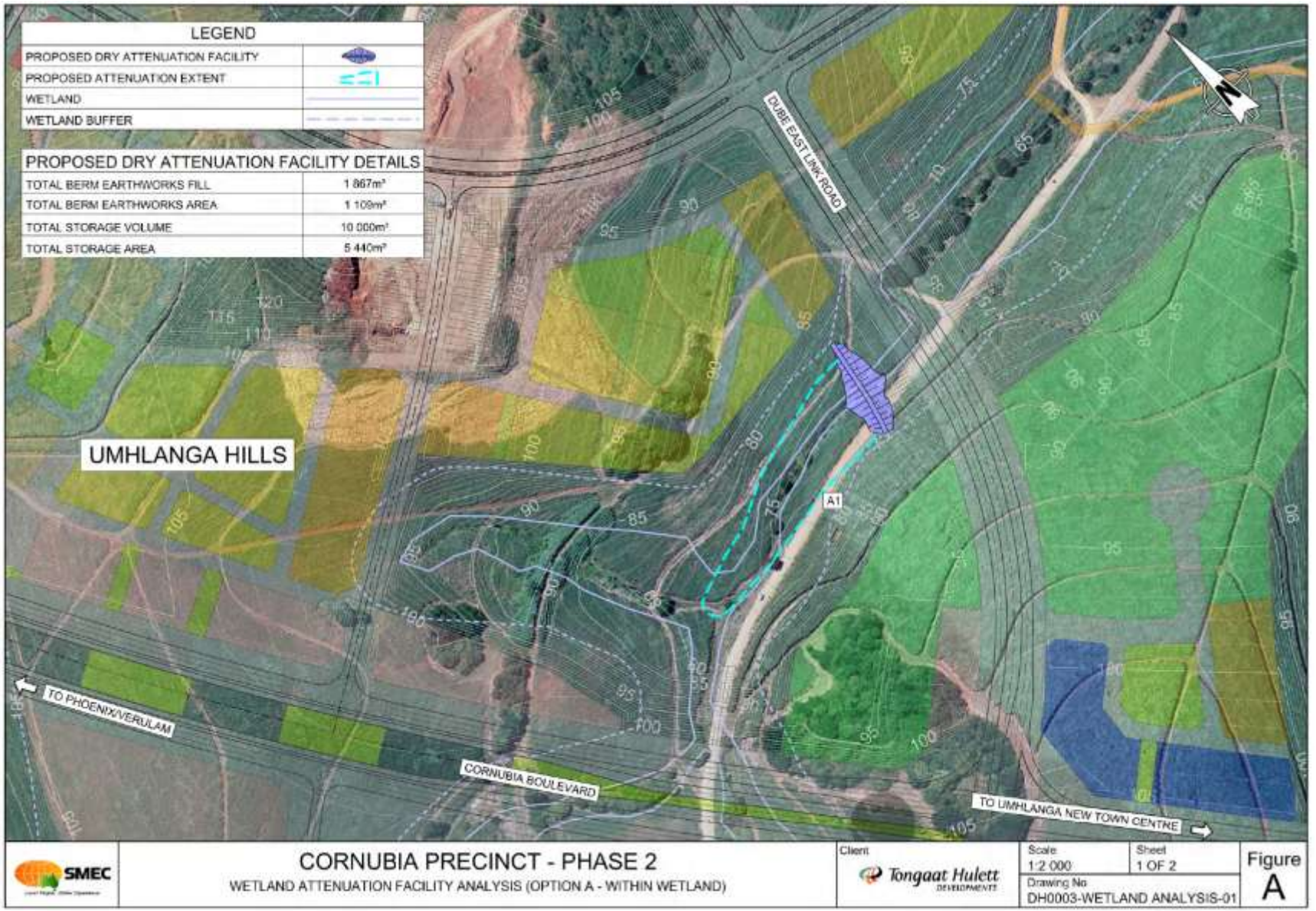


Figure 6-6: Stormwater attenuation facility – Option A

Table 6-1: Stormwater attenuation facility details – Option A – within wetlands

Facility Number	Actual Storage Volume (m^3)	Berm Earth-works Fill (m^3)	Berm Earth-works Area (m^3)	Facility Area at Maximum Depth (m^2)
A1	10 000	1 867	1 109	5 440
Total	**10 000**	**1 867**	**1 109**	**5 440**

6.3.1.2 Stormwater Attenuation Facility – Option B

In this scenario, the attenuation structures are located outside the wetland units but within the 30 m wetland buffer (Figure 6-7). The calculated post-development run-off for the selected catchment remains 10 000 m^3 total storage volume. In this scenario, the attenuation structures are located within the 30 m wetland buffers, outside of the wetlands. This does not intersect the drainage lines, therefore, additional infrastructure to redirect the natural flow is required. Shaping is also required to form the facility. Shaping is in the form of shallow excavations upstream of the attenuation facility to create more capacity for attenuating volume. Five attenuation facilities were modelled within these buffers, as well as wherever the proposed development allowed. Table 6-2 shows information for the proposed attenuation facilities positioned outside the wetland but within the buffers.

Table 6-2: Stormwater attenuation facility details – Option B – within wetland buffers

Facility Number	Actual Storage Volume (m^3)	Berm Earth-works Fill (m^3)	Berm Earth-works Area (m^3)	Facility Area at Maximum Depth (m^2)
A1	57	720	886	179
A2	355	2 180	1 632	585
A3	353	620	874	851
A4	1 170	3 550	1 971	1 142
A5	265	1 080	1 034	406
Total	**2 200**	**7 452**	**8 931**	**3 164**

As can be seen in the table above, the total storage volume is 2 200 m^3. This results in a shortfall of 7 800 m^3 still required to be attenuated within the developable area. The shortfall of required attenuated run-off could be attenuated by various means. These include, within the stormwater system (underground attenuation tanks, Sustainable Urban Drainage Systems [SUDS], etc.), as well as on-site attenuation by all developable industrial/commercial platforms. These various alternatives have not been analysed and quantified for this report as they will add significantly to the capital costs as detailed below.

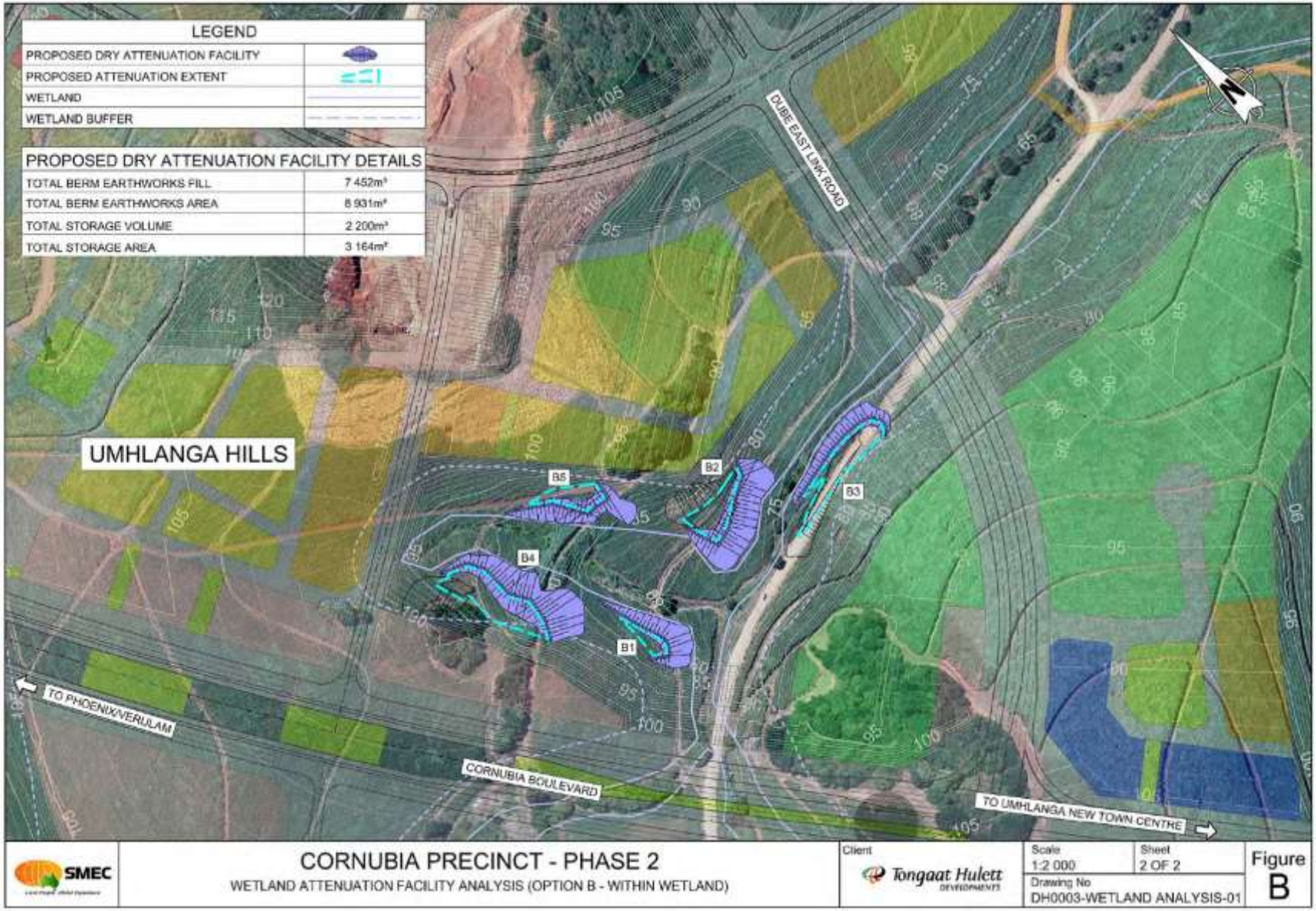


Figure 6-7: Stormwater attenuation facility – Option B

6.3.1.3 Comparison of Quantities

Table 6-3 summarises the quantities of earth-works fill operations to be done to construct the attenuation facility berms for both Option A (preferred) and Option B. From the table it can be seen that there is a Storage Volume to Earth-works ratio of 1: 0.19 for Option A, and 1: 3.39 for Option B. This means for Option A (within wetland) will require 0.19 m^3 of earth-works for 1 m^3 of storage (surface run-off), compared to 3.39 m^3 of earth-works for 1 m^3 of storage.

Table 6-3: Comparison of quantities of earth-works fill operations for stormwater attenuation facility options

Option	Total Storage Volume (m^3)	Total Earth-works Fill (m^3)	Total Earth-works Area (m^2)	Storage Volume to Total Earth-works Ratio	Storage Volume to Earth-works Ratio
A (Within Wetland)	10 000	1 867	1 109	1 : 0.11	1 : 0.19
B (Outside Wetland)	2 200	7 452	8 931	1 : 4.06	1 : 3.39

Table 6-4 summarises the areas impacted by earth-works fill operations, as well as the proposed attenuation area (flooded area) for both Option A (preferred) and Option B. The table shows a Storage Volume to Total Area ratio of 1: 0.65 for Option A, and 1: 4.34 for Option B. This means that Option A (within wetland), it will require 0.65 m^2 of impact area for 1 m^3 of storage (surface run-off), compared to 4.43 m^2 of impact for area for 1 m^3 of storage for Option B (outside wetland).

Table 6-4: Comparison of impacted areas for stormwater attenuation facility options

Option	Total Storage Volume (m^3)	Total Earth-works Area (m^2)	Total Storage Area (m^2)	Total Impacted Area (m^2) – Earth-works + Storage	Storage Volume to Total Area Ratio
A (Within Wetland)	10 000	1 109	5 440	6 549	1 : 0.65
B (Outside Wetland)	2 200	8 931	3 164	9 557	1 : 4.34

Therefore, Option B (outside the wetland) will result in a greater area to be impacted which will result in additional earth-works producing more surplus fill material.

6.3.1.4 Comparison of Cost

The estimated cost for each option is presented in Table 6-5. The table suggests an estimated cost of R1 361 585 for Option A (within wetland), and R5 434 670 for Option B (outside wetland). This equates to a cost per cubic meter of earth-works of R136.16/m^3 for attenuation facilities located within wetlands, and R2 470.30/m^3 for attenuation facilities outside wetlands but within the 30 m wetland buffers. The additional cost of implementing the additional systems (within system, on site) required for Option B (outside wetlands) has not been quantified, but will obviously be over and above the estimated cost of attenuating within the buffers.

Table 6-5: Estimated costs for stormwater attenuation facility options

Option	Total Earth-works Volume (m^3)	Rate (R/m^3)	Estimated Cost	Total Storage Volume (m^3)	Rate / Storage Volume (R/m^3)
A (Within Wetland)	1 867	R729.29	R1 361 585	10 000	R136.16
B (Outside Wetland)	7 452	R729.29	R5 434 670	2 200	R2 470.30

Both Option A and Option B have been assessed in Section 9.3.14 and a recommendation provided as part of this EIA study.

6.3.2 Wetland Rehabilitation

Following extensive planning and assessment by the various specialists, a large portion of the Cornubia Phase 2 study area has been set aside as open space. These open spaces take into account sensitive biological features, such as wetland systems and green linkages between existing vegetation units, as well as topographical constraints such as steep slopes. In addition, the open space system makes use of existing servitudes to further enhance the linkages across the site, as these areas can be viewed as open space, with restrictions around the land use associated with them. As part of the open space, extensive wetland rehabilitation is proposed. Wetland rehabilitation is the process of rehabilitating existing wetland systems by increasing the wetland footprint using minimal invasive techniques. This is in order not to damage the existing system, and promote regeneration and growth of the existing systems.

An overriding concept of the Cornubia SSIP is that of stakeholder value creation through the Cornubia Integrated Human Settlement Development. Within this value creation approach is the need to ensure that Cornubia is developed and managed in a sustainable and resilient manner. This means going beyond mere 'compliance' but ensuring planning and designing for the realities of the future to ensure the most effective and sustainable means of protecting the core ecological assets whilst at the same time providing appropriately and adequately for the needs of the new community within Cornubia and those who will come to rely on Cornubia for employment, economic and social activities. It is important to acknowledge that people value what they derive or see benefit from and therefore, it is the intention to have a well-managed housing environment which is clean, vegetated and secure, which enhances the value of community and property, which has access to social services and employment and economic opportunities as well as other basic needs including food production.

The Developers envisage a well-managed open space environment which provides for both ecological management as well as active community use including agriculture and recreation and enables job creation and enterprise development. It is important to have an 'operational' environment where 'resources' such as waste, water, transport and energy are managed from a sustainability perspective and jobs created together with enterprise development opportunities. This is the foundation for economic environment that facilitates (through an inclusive approach) skills development, new employment and enterprise development. Ultimately this should lead to a productive, healthy and 'wealthy' community in harmony with the surroundings.

In an effort to ensure the long-term maintenance and integrity of the open space network within Cornubia, it is proposed that this area becomes a communal area for which the community can ultimately become custodians. Disadvantaged communities in South Africa are being encouraged to investigate conservation and sustainable subsistence agriculture as potential livelihoods strategies. Similarly, conservation initiatives are under increased pressure to show, not only economic sustainability, but also realised livelihoods outcomes. Traditionally, conservation areas in South Africa have been controlled and supported by the State. However, as state support is channelled to other areas of development, there is increasing pressure on nature conservation initiatives to show value outside of the traditional scientific arguments (relating to biodiversity, ecology and ecosystems). As a result, conservation initiatives are diversifying to involve community collaboration as the key mechanism to help sustain economic viability.

Therefore, as part of the Cornubia SSIP, it is proposed that the wetland buffers[16] be used for market gardening opportunities by the local community as well as for green walkways and trails (Figure 6-8). Further refinement during the planning phase has included the investigation of potential uses for the open space network, and these include *inter alia*:

- The rehabilitation of core wetland systems and an associated buffer;
- The creation of non-motorised trails for use by the public;

[16] *10 to 30 metres only, i.e. agriculture will not be directly adjacent the wetlands but will be buffered by a 10 metre strip of indigenous vegetation.*

- The use of some open space areas as linear parks; and
- The potential use of some open space areas for communal gardens and subsistence agriculture.

The typical section presented in Figure 6-8 is taken through a wetland area. The design ethos is to transform the areas within the buffer zones. It is proposed a linear park can be developed along suitable interfaces. The linear park may include seating areas, planting, non-motorised transport paths, etc. In order to establish this condition, existing fill within the development could be used to develop the areas within the buffers. A 10 m rehabilitation zone on either side of the buffers are retained for indigenous vegetation. On the remaining areas within the buffers, it may be conducive for agricultural productivity which could be used for small scale market/community gardens. In this way, the development is utilising the green space for recreation as well as for local production. The detailing of the concept will occur in discussions with the eThekwini Municipalities Environmental Planning and Climate Protection Department in the detail design phase.

Following the above investigation an Open Space Zonation Plan has been developed, that incorporates the above uses in a manner that considers the sensitivities of the various systems and features on site. The result is the zonation map included as Figure 6-9 that incorporates the rehabilitation of all wetland areas that are retained as offset within the study area, as well as the rehabilitation of the buffer zones around the wetland systems adjacent to the Ohlanga River.

In addition, a number of linear parks are proposed to act as additional buffers between these wetland systems and the proposed agricultural use. The agricultural zone makes use of the servitudes that exist across the property, which have a limited planting assemblage allowance, thus being the perfect areas for the planting of low growing crops, such as vegetables and herbs. In addition, some areas around wetland systems have been designated as agricultural zones.

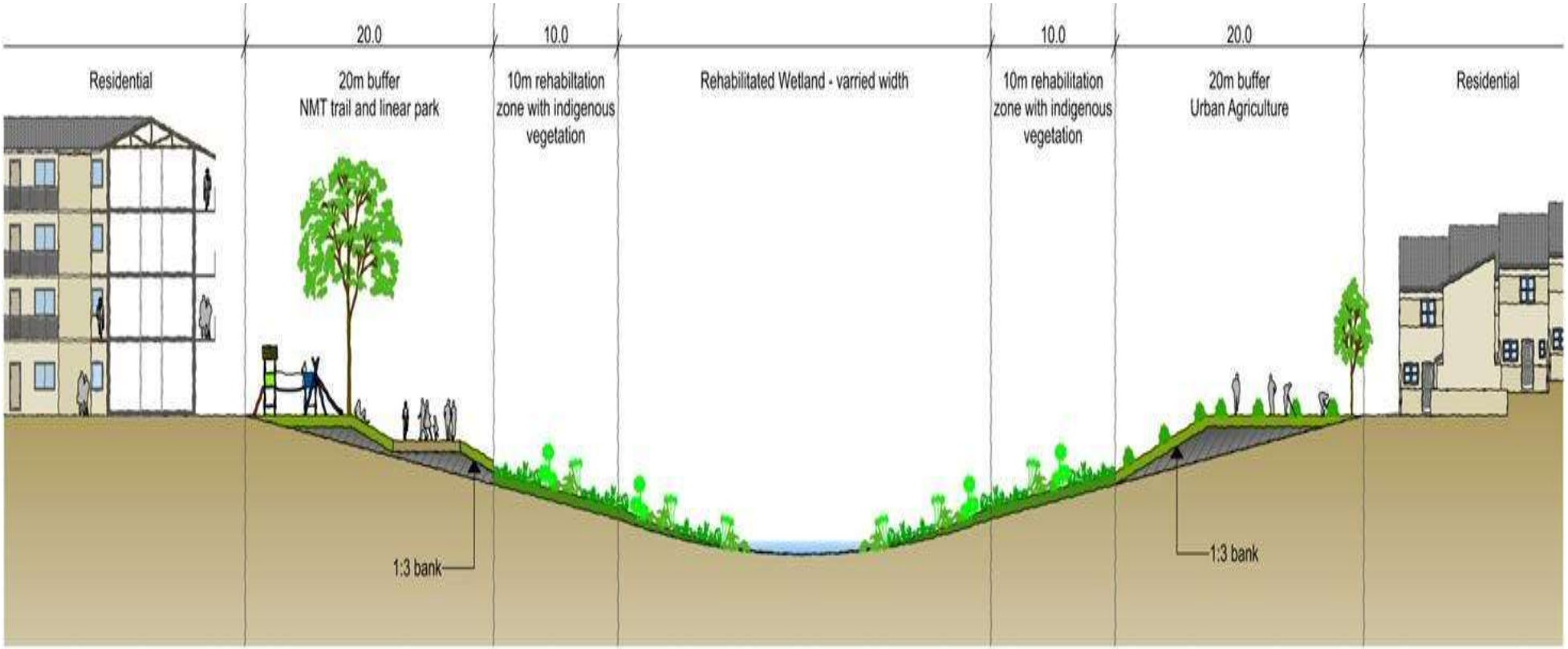


Figure 6-8: The Open Space Rehabilitation Concept

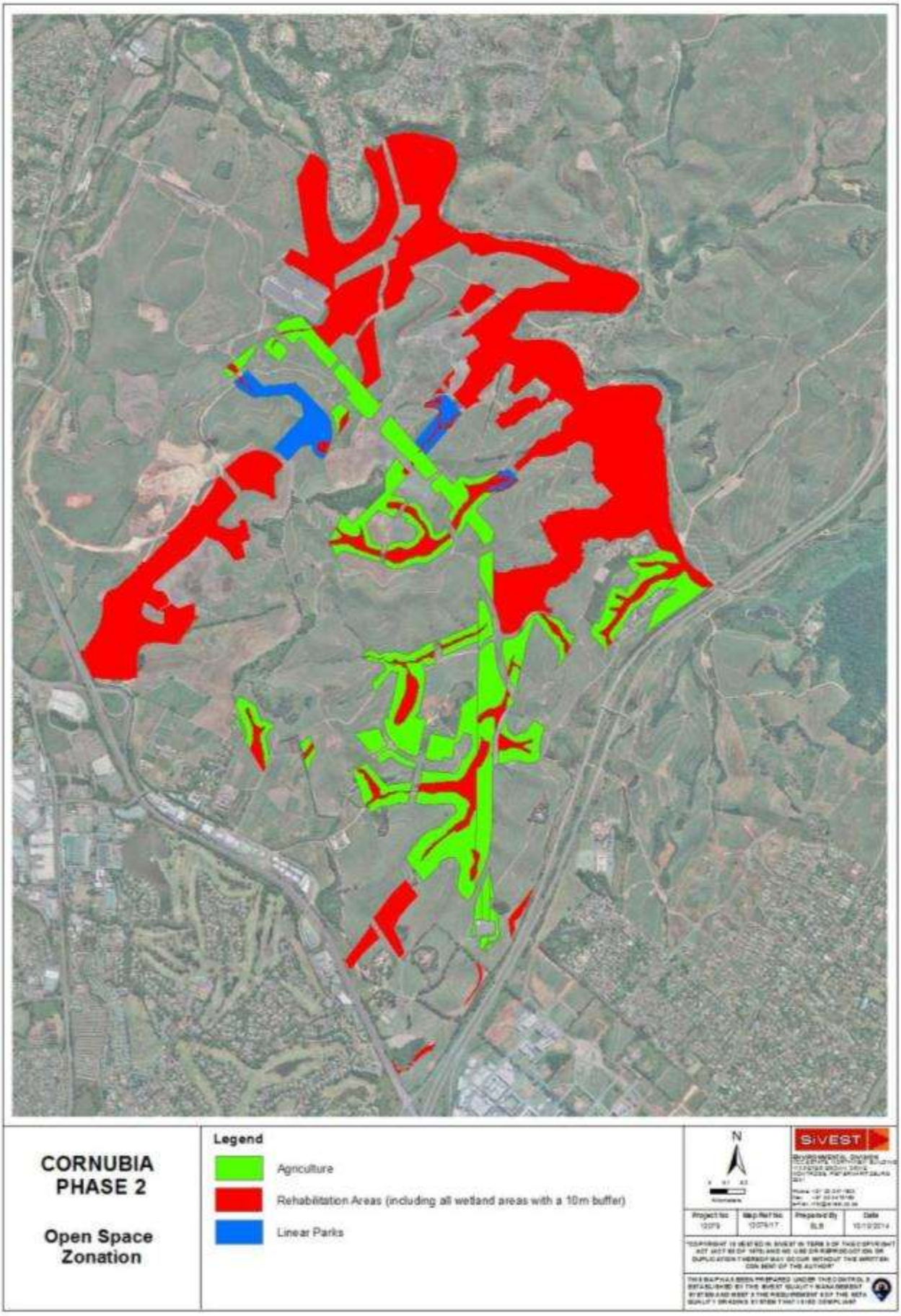


Figure 6-9: Open Space zonation map

6.3.3 Surplus Fill Material

Significant quantities of surplus soil material (i.e. otherwise surplus fill material) are expected to be produced during construction activities for Cornubia Phase 2, due to a number of factors. These factors include, *inter alia*, the topography and poor soil quality (for construction purposes) within the area.

The challenge within the context of the development lies in how to ensure the amount of surplus soil/fill material can be minimised through re-use, reduction and/or recycling, so as to make it easier and more cost effective for the joint Developers to deal with, whilst taking cognisance of the natural environment and environmental legislation in South Africa.

It is neither feasible nor practical to transport surplus fill material off-site due to the prohibitive cost and also because nearby landfill sites simply do not have the capacity (or desire) to cater for the significant volumes of surplus material that needs to be accommodated.

The amount of surplus fill material expected is directly related to the amount of developable land to be transformed to accommodate new land-uses, through major earth-works (cut and fill) to create platforms suitable for the construction of top-structures. It can therefore be assumed that based on experience to date and calculations based on preliminary design, that Cornubia Phase 2 will produce significantly more surplus fill material than has been encountered to date. A more strategic and proactive approach would therefore be required to reduce the need for a significant number of Surplus Fill Material Sites (SFMS), colloquially referred to as ‘spoil sites’.

In an effort to pro-actively deal with the surplus fill material challenge, the Developers and project team are working towards a long-term Soil Resource Management Plan for the Greater Cornubia Development. Due to the lack of detailed design and detailed geotechnical investigations at this stage, a Soil Management Framework Strategy (Appendix B 4) is presented with the EMPr to outline the principles for surplus fill material management for Cornubia Phase 2. The intention of the Soil Management Framework Strategy is to present the framework, principals and controls within which a future Soil Resources Management Plan will fit – and thus the strategy forms the first significant step towards ensuring suitable management of the soil resources, particularly surplus fill material. It is the intention that this document will be updated / elaborated on as further detail becomes available and will eventually detail a plan of action, thus becoming a Soil Resources Management Plan.

By maintaining the full use-value of the surplus soil resources, as far as practicable, the resource would have the best chance of being allocated to a specific use, which in turn, would limit the amount of unallocated or surplus material.

It is estimated based on the Engineer’s preliminary design, the current total of unallocated surplus soil resources is equivalent to approximately 4 513 960 m³. To place this amount of surplus material in context, Cornubia Phase 1 has to date produced a total of 599 000 m³ of surplus material, 349 000 m³ of which is / will be accommodated in five approved Surplus Fill Material Sites (SFMSs) and the balance of which (250 000 m³) is still awaiting a suitable location for temporary stockpiling until it may be allocated (if possible).

To summarise, if the average size of the potential SFMSs were therefore maintained for Cornubia Phase 2 as well, the Developers could require approximately 65 surplus fill material sites within Cornubia Phase 2. Therefore, options for reducing, re-using and recycling are critical to the success of the Greater Cornubia Development.

Options for re-use, recycling and disposal have been identified and must be critically evaluated per area and nature of the soil type to determine a suitable allocation for the identified surplus soil resources, keeping in mind that it is neither feasible nor practical to allocate all surplus soil resources to SFMSs within the development, nor to transport all surplus soil resources off site.

Critical in determining whether or not an allocation to a particular option is feasible, is the legality of such options, the cost of allocation, the demand for the soil resource, the available suitable land and the social considerations.

Several options for the beneficial use of surplus fill material are presented in the framework strategy and are briefly detailed below:

6.3.3.1 Engineering (Design) Changes and Incorporation of Surplus Soil Resources

This option proposes altering the design and construction methodology, where practicable, to include the use or incorporation of additional quantities of surplus soil resources. Platforms could potentially be increased in height, to accommodate more fill material. However, by raising the height of the platforms the developable area would reduce in size. This may thus be an option for the Developers to significantly reduce the amount of surplus soil material, but would come at great cost and at a certain point would render the development economically unfeasible.

Furthermore, it is noted that the quality of surplus fill material is graded above a G10 type which is therefore unsuitable for engineering fill, thus reducing the viable quantity that can be used.

Additional quantities of unsuitable fill material may potentially be included in the design by 'wedging' or 'sandwiching' – which is the practice of alternating layers of good- and poor- fill material as platforms are constructed. This practice requires careful selection of materials, close supervision and much time and likely additional costs.

It is further noted, that this option also depends on the quality of material as not all soil material can be wedged. A conservative estimate indicates that the 10% estimated as surplus fill material is of poor quality that cannot be used as engineering back-fill.

6.3.3.2 Creating Arable Land – In Degraded Open Space – for Nurseries and/or other Urban Agriculture – in line with the Alternatives for Wetland Rehabilitation

This option proposes that historically degraded areas in the open space, previously impacted upon by agricultural activities (e.g. remnant sugarcane lands), may be rehabilitated for the purpose of establishing nurseries and/or other forms of urban agriculture. These areas would benefit specifically from additional topsoil where topsoil is lacking or is of poor quality.

Additional quantities of topsoil could potentially be allocated to raised beds, pots and/or bags for the cultivation of plants.

Another advantage of this option is that it would allow for an additional, if relatively small, revenue stream from sale of plants or produce that could help to offset the costs of the development thereof. The nurseries would also crucially allow for growth of landscaping plants for the greater site thus reducing the cost of purchasing of such materials over the lifespan of the greater site.

6.3.3.3 Creating Arable Land – Generally in Open Space – for Nurseries and/or other Urban Agriculture - in line with the Alternatives for Wetland Rehabilitation

This option is a variant of Section 6.3.3.2.

This option proposes that areas within the less sensitive open space areas to be identified as potentially suitable for creation of arable land.

These areas are noted as being generally outside of historically degraded areas and may for instance include areas such as the slopes of platforms – by lengthening the slopes to create a more gentle slope (perhaps 1:5 – 1:10) and which can be benched or terraced to accommodate the establishment of nurseries and/or other forms of urban agriculture.

These areas would benefit specifically from additional topsoil to allow for a gentler slope from platform sites and deeper soils that would assist root establishment.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features such as berms. Furthermore additional quantities of topsoil could potentially be allocated to raised beds, pots and/or bags for the cultivation of plants.

6.3.3.4 Creating Wetland Habitats - in line with the Alternatives for Wetland Rehabilitation

This option proposes using suitable soil resources, especially clay material, to potentially artificially create wetland habitats. The artificial creation of wetland habitats will be used to off-set impacts on existing wetlands within the development. These artificially created wetland habitats would include the establishment of stormwater attenuation facilities, especially as sediment traps below areas assigned to urban agricultural use (where applicable).

Additional (mainly inert) materials that could potentially be re-used through 'soft-engineering' in the artificial creation of wetland habitats, including, tree stumps and branches, wetland vegetation ear-marked for destruction due to approved infilling of wetlands, wetland buffer vegetation that may be otherwise removed, and, rock material from excavations. The aim being to re-use as much material on the greater site in such a way that it has value and further does not incur a disposal cost.

The aim would be to produce more natural appearing wetland areas thus enhancing the greater site's functionality and ecological value.

6.3.3.5 Wetland Rehabilitation - in line with the Alternatives for Wetland Rehabilitation

This option proposes using suitable soil material, especially clay material, to potentially improve upon existing structures within wetlands that have been rehabilitated as part of Cornubia Phase 1. The additional allocation of material could potentially improve these existing wetland footprints and thus bolster the wetland off-set calculation.

As in Section 6.3.3.4, additional materials (as specified above) can potentially be re-used through 'soft-engineering' in the artificial creation of wetland habitats.

6.3.3.6 Creating Other Habitats

This option proposes using suitable soil material to create habitats that could potentially accommodate various fauna and flora. These habitats could be strategically located away from possible disturbance, where suitable soil material could be utilised to artificially create and/or enhance existing habitats for birds and reptiles, amongst others.

As in Section 6.3.3.4, additional materials (as specified above) can potentially be re-used as 'soft-engineering' in the artificial creation of other natural habitats.

6.3.3.7 Creating and/or Enhancing Gardens and/or Parks - in line with the Alternatives for Wetland Rehabilitation

This option proposes (a) creating additional gardens and/or parks, or (b) enhancing existing areas ear-marked for gardens and/or parks. The aim is thus to make the establishment of vegetation cover as cost-effective as possible, and to allow for potentially more extensive habitat creation than would otherwise be viable.

These landscaped areas would benefit specifically from additional topsoil where topsoil is lacking or of poor quality, and allow for deeper topsoil profiles which would assist with more effective root establishment.

Additional quantities of subsoil and topsoil could also potentially be allocated to creating stormwater features such as berms. Through the use of additional materials being re-used through 'soft-engineering', the landscaping and ecological value of the greater site is further enhanced with additional habitats being created. Such berms can also help in the potential separation of clean and potentially dirty stormwater streams, linked to stormwater attenuation, and further for noise attenuation both to those within the greater site, and to those outside of the site from activities on site.

6.3.3.8 Creating and/or Enhancing Roadside Verges

This option proposes creating additional roadside verge features, or allowing for additional topsoil within the existing design of roadside verges thus allowing better establishment of plant material in these areas. These

landscaped areas would benefit specifically from additional topsoil where topsoil is lacking or of poor quality, and deeper topsoil profiles would assist with root establishment.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features along the roadside, especially in areas prone to flooding nearby platform sites, where perhaps higher embankments would act as a suitable stormwater control measure. Where possible / feasible, such features can be developed as stormwater control and ecological habitat niche development sites – space constraints may not always make this a viable option in verge areas.

6.3.3.9 Restoring Landfills

This option proposes the sale of suitable surplus soil resources as lining or capping material at local or regional landfill sites. This option needs to be investigated further in order to gauge the present demand. It is known that materials most sought after at the present time by these sites for the restoration (ongoing or moving towards final closure) of the known landfill sites are clays and topsoil. Sub-soil may also within certain parameters be used as daily capping and stabilisation material.

The landfill sites that will be investigated include: Bisasar Road and Buffelsdraai; especially as the former is believed to be reaching capacity and ready for final closure. The viability of this option depends on timing as demand and supply must correlate.

6.3.3.10 Rehabilitating Borrow Sites

This option proposes the placement within and rehabilitation of existing borrow sites within or near to the development.

More specifically, Flander's Quarry can potentially be ear-marked for placement (infill) of surplus subsoil and rehabilitation thereafter with surplus topsoil material. The most-suitable material for infilling within the Flander's Quarry would be material that has been mixed (to a predetermined mix and distribution of soil grades, not merely material that has been accidently mixed) and as such, has the lowest use-value in the context of the development.

The availability of Flander's Quarry for infilling and rehabilitation would firstly need to be established by the Developers.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features, such as berms, upon rehabilitation of the Flander's Quarry. Some additional materials could also potentially be re-used through 'soft-engineering' as detailed previously.

6.3.3.11 Rehabilitation of Erosion Features

This option proposes the placement within and rehabilitation of existing erosion features; this would include the potential rehabilitation of stormwater blow-outs, unstable embankments and other erosion features.

This option needs to be investigated further in order to gauge the present demand, however, depending on the haulage distance, this may provide a number of suitable locations for allocating surplus soil resources not only within the development footprint, but within the surrounding area.

The Developers will discuss this option with the relevant Departments at the eTM who may potentially have suitable areas, as described above, on land that they own that require such rehabilitation to be carried out.

6.3.3.12 Placement as Acoustic Bund

This option proposes that surplus soil resources potentially be allocated to an acoustic bund at the planned noise contour and/or incorporated elsewhere within the development as an acoustic bund, depending on the nature of the development; as a barrier between industrial and residential land-uses.

This option needs to be investigated further by the Engineer (SMEC) in order to determine feasibility.

6.3.3.13 Placement within Existing Servitudes

This option proposes that surplus topsoil material potentially be allocated to raising the profile of the soil within existing servitudes (e.g. electrical servitudes). Such profile raising should be limited to areas outside of wetland areas, but potentially in consultation with EDTEA extending into limited wetland buffers to an agreed degree only.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features such as berms within the servitudes. These berms could double as noise attenuation mechanisms as well.

6.3.3.14 Placement within Future Servitudes

This option is as per Section 6.3.3.13, but for future proposed servitude areas. Obviously any such landscaping would need to be planned taking the future servitude use into account and should be carried out accordingly (e.g. no trees in those servitudes that will include future power lines) and should allow for effective development of the infrastructure required to run via these servitudes with minimal disturbance.

6.3.3.15 Commercial Topsoil Sale Off-site

This option proposes that clean surplus topsoil material potentially be sold commercially off-site. Although the Developers are investigating the demand options to sell topsoil to other developers within the region, it is envisaged that the vast majority of surplus topsoil resources will be sold to commercial sources.

Major construction projects in the area include the Western Aqueduct, where additional quantities of topsoil could potentially be allocated to the rehabilitation of their construction servitude.

It is further noted that in order to allow for this beneficiation that a mining permit may be required for a ‘sand mining’ operation as this may well fall within the definition thereof. Even if it does not, confirmation should be obtained from the Department of Mineral Resources (DMR) as to how such an activity should be handled, and to ensure that any required permits are obtained timeously.

Note that, if the material is not sold but is given to another site for an approved use, that such mining approvals may not then be required. Given the amount of material that may be considered for such off-site sale and the related revenue that could be generated, the cost and time related to obtaining the DMR permits may well be worth the effort.

6.3.3.16 Commercial Clay Sale Off-site

This option proposes that surplus clay material potentially be sold commercially off-site. Although the Developers are still investigating the demand options to sell clay to other developers and commercial sources within the region, it is envisaged that the vast majority of surplus clay resources will be sold to commercial sources.

Surplus clay material will potentially be sold as lining or capping material at local or regional landfill sites, such as Bisasar Road and Buffelsdraai.

The same constraints as detailed in Section 6.3.3.15 are relevant to this option.

6.3.3.17 Commercial Shale Material Sale Off-site

This option proposes that shale material potentially be sold commercially off-site. The Developer has already established that there is a demand for suitable shale material for making bricks. It is envisaged that the vast majority of shale material will potentially be sold to commercial sources, such as COROBRIK.

The same constraints as detailed in Section 6.3.3.15 are relevant to this option.

6.3.3.18 Construction of Sandbag Houses

This option proposes that surplus soil resources be utilised according to at least three alternative construction methodologies for building houses, namely, (a) Traditional Sandbag Houses; (2) Rammed Earth (earth within a shutter and compacted); and (3) Cob (which is a method comprising a mix of mud and straw/hay in building a structure).

The construction process is highly labour intensive, and therefore could provide a welcome source of employment to the local community which is aligned with the Developer's social development strategy – the Cornubia SSIP.

6.3.3.19 Manufacturing of Topsoil for Allocation on Site and/or Commercial Sale Off-site

This option proposes that suitable soil-forming material may potentially be blended with an appropriate source of organic matter, at the required mixing ratio, in order to effectively manufacture topsoil. Suitable soil-forming material may include: subsoil and mixed soils which would need to be analysed first to see what additions or processing would be required to make a useful (functional topsoil) for use on the greater site or for sale to commercial sources off-site.

The process for this option would need to be discussed with EDTEA and DMR to determine whether any permitting requirements are triggered – however, this is strongly dependent on the specific inputs needed.

6.3.3.20 Manufacturing of Suitable Fill Material for Allocation on Site and/or Commercial Sale Off-site

This option proposes that suitable soil-forming material may potentially be blended with appropriate materials, at the required mixing ratio, in order to effectively manufacture a suitable fill material (even if low-grade). Suitable soil-forming material may include: subsoil and mixed soils which would need to be analysed first to see what it would take to make a useful (functional fill material) for sale to commercial sources off-site.

The same constraints as detailed in Section 6.3.3.15 may be relevant to this option and should be confirmed prior to being initiated.

6.3.3.21 All Surplus Soil Resources to Landfill

This option proposes (in theory only) that all surplus soil resources be removed from site to landfill.

This option is not considered viable due to (a) excessive cost, (b) a lack of capacity at local and regional landfill sites, (c) the undertaking of what would essentially equate to poor environmental practice and wastage of finite resources, and (d) a significant impact on the development's carbon footprint, amongst other reasons.

6.3.3.22 Creating Tracks and/or Trails

This option proposes creating additional recreational areas, specifically for mountain biking, horse-riding and/or walking. These landscaped areas consisting of tracks and trails would be transformed to create a degree of difficulty and also to stabilise areas which could potentially pose a hazard to the rider.

Additional quantities of subsoil and topsoil could potentially be allocated to creating stormwater features such as berms. Furthermore, additional materials that could potentially be re-used through 'soft-engineering'.

6.3.3.23 Placement of Surplus Soil Resources to SFMSs

This option proposes that only the surplus soil resources, remaining after all other options have been investigated and actioned as far as viable, are placed within designated SFMS and levelled, and rehabilitated so as to blend into the open space network. These sites may then be transformed to accommodate a prescribed activity such as urban agriculture, various recreational opportunities, and other applicable activities as described above.

6.3.3.24 Summary

Three surplus fill material sites are proposed within Cornubia Phase 2 as illustrated in Figure 6-10. These sites are located outside of wetland units but are located within the open space network and specifically the 1:100 year floodline of the Ohlanga River. It is noted that the location of these sites are due to the fact that there is no other viable option for these sites as all other land will be developed. It is further noted that these sites will be rehabilitated according to the Wetland and Open Space Rehabilitation Plan and form part of the open space area.

It is further noted that these sites do not accommodate the entire quantity of surplus fill material estimated to be generated at the Cornubia Phase 2, and therefore, alternatives have had to be considered as proposed above. Twelve temporary construction phase surplus fill material sites are proposed, the majority of which are located within the 2035, 55 dB noise contour. The intention for these sites are to stockpile and separate surplus fill material until an alternate use is identified or available (e.g. haulage to a commercial site, use for rehabilitation purposes etc.). The reasoning behind the location of these sites within the 2035, 55 dB noise contour is to avoid double handling of the material as this is not only expensive, it also reduces the quality of the material. As development within the 2035, 55 dB noise contour is expected to be at a much later stage, this area was deemed to be the most feasible for temporary sites.

The impacts associated with surplus fill material and the proposed sites within the open space specifically are assessed in Section 9.3. As the detailed design and geotechnical investigations will inform the specific management of the surplus fill material and a framework strategy has only been provided at this stage to guide the overall management of surplus fill material at Cornubia Phase 2, the merits of each specific use identified in this section cannot be assessed further. However, the following alternatives in terms of surplus fill material will be assessed further:

- Option 1 – Authorisation of three surplus fill material sites within the open space network; and
- Option 2 – No stockpiling of surplus fill material within the open space network.

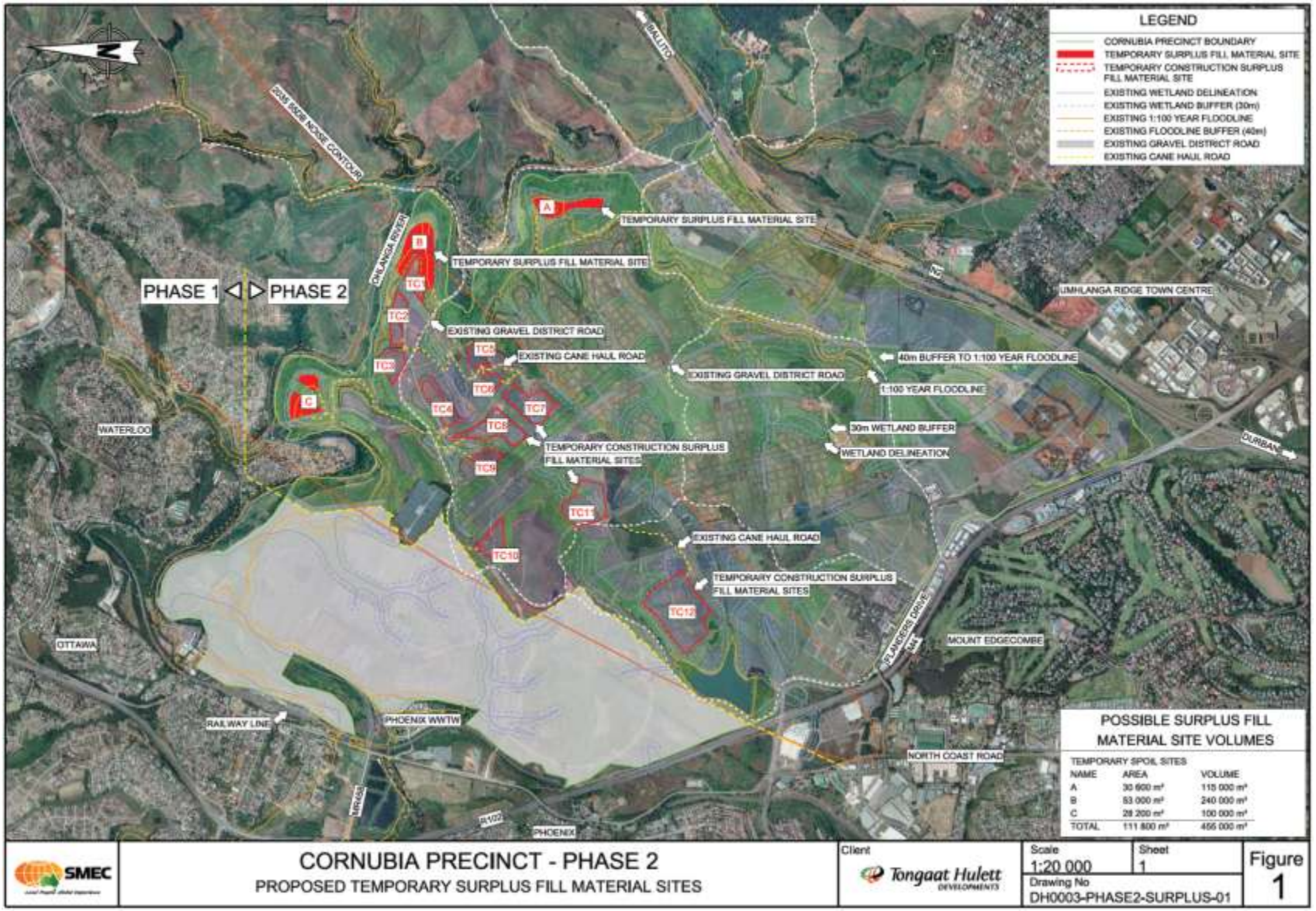


Figure 6-10: Proposed sites for surplus fill material at Cornubia Phase 2 (preliminary estimates)

6.4 Operational Alternatives

THD and the eTM are committed to ensuring that the development is sustainable and adheres to stringent environmental management procedures. With this is mind, operational methods and approaches must adhere to best-practise alternatives, which this EIA process seeks to achieve. The EIA phase will seek to establish best-practise approaches for the following:

- Water management;
- Land management;
- Waste management;
- Air quality management;
- Rehabilitation and closure.

These aspects will be specifically detailed in the EMPr (Appendix B).

Various housing typologies and social facility typologies have been proposed in the Urban Planning Report (Appendix C 10) however, this EIA study assesses the Cornubia Phase 2 LUM Precinct Plan at a block layout level, the top-structures cannot be assessed further as the level of detail and design will only unfold as each of the project's sub-phases are initiated.

6.5 No-go Alternative

This option involves retaining the existing land use – agriculture. The property would remain under sugarcane cultivation, and would continue to operate as a working sugarcane farm.

The Cornubia Phase 2 Development is a mixed-use development that entails a huge component for housing that seeks to redress the spatial planning imbalances of apartheid. The no-go option will limit the opportunities within the eTM in providing housing to a community in dire need of appropriate housing with "proper" services. Government is committed to solving the housing crisis but it requires Greenfield land to deal effectively with this and Cornubia represents a unique, strategic opportunity to make a significant dent in the housing backlog. The location of Cornubia within the broader region is such that housing will be extremely well located for easy access to employment and urban amenities – in stark contrast to traditional low cost housing developments that have historically been developed on the periphery of the city at huge costs – not only from a servicing perspective but from a living perspective.

The location and situation of Cornubia also dictates that it be appropriately and sustainably developed to uses and activities which offer the best value, returns and benefits to the city.

6.6 Summary of Alternatives to be Assessed

This EIA study therefore considers the following alternatives (Table 6-6):

Table 6-6: Description of alternatives

Alternative	Description
Site Alternatives	
Site alternatives	No other site alternatives have been investigated due to the fact that the Greater Cornubia Development is the closest large parcel of land adjacent to existing built up areas of the City and that can be integrated naturally and positively into this existing fabric. The Greater Cornubia Development has a number of and a wide variety of objectives to meet and such objectives would not be met if the development was attempted elsewhere. Furthermore, the eTM have purchased land within the Cornubia site for the provision of housing to those who do not have formal houses. It must be reiterated that any proposed development within Cornubia is required to be aligned, in broad terms, with the accepted Cornubia Development Framework Plan. Given these critical constraints together with the extent of land required, the potential site locations for such a development, within the broader region are limited.

Alternative	Description
Land Use Alternatives	
Land use alternatives	From a land use perspective, given that there is an adopted Cornubia Development Framework Plan in place and that the proposed land use aligns with the Framework, there is no need to consider alternative land uses unless there are extenuating or mitigatory circumstances which there are not. It is therefore necessary to ensure that the land use proposed is aligned with the Cornubia Development Framework Plan. Specific layouts (e.g. road and services) relating to the alternate site layouts are presented. Two typologies for Cornubia Boulevard are also presented, however, it is requested that both typologies are authorised.
Design and Layout Alternatives	
Stormwater Attenuation	• Stormwater attenuation facilities located within wetland units. • Stormwater attenuation facilities located outside of wetland units but within the 30 m wetland buffers.
Wetland Rehabilitation	• Option 1: Options for the development of alternative rehabilitation measures in the wetland buffer e.g. **Linear Parks and Market/Community Garden opportunities.** • Option 2 – Maintaining the 30 m buffer exclusively with conservation initiatives.
Surplus Fill Material Management	A number of alternatives exist for the re-use/recycling of surplus fill material. These have been listed in Section 6.3.1.3. It should be noted that not all of the alternatives will be used during this phase of the project or similarly a combination of the alternatives will be used. Therefore, from an environmental licencing perspective the two options are proposed: • Option 1 – Authorisation of three surplus fill material sites within the open space network; and • Option 2 – No stockpiling of surplus fill material within the open space network.
Operational Alternatives	
The EMPr details operational best practise approaches to be adopted.	
No-Go Option	
This option involves retaining the existing land use – agriculture. The property would remain under sugarcane cultivation, and would continue to operate as a working sugarcane farm. The location and situation of Cornubia also dictates that it be appropriately and sustainably developed to uses and activities which offer the best value, returns and benefits to the city.	

7 FINDINGS OF THE SPECIALIST ASSESSMENTS

The findings and recommendations of the specialists and reports of specialised processes have been incorporated in this chapter. The following studies have been incorporated into this EIA study:

- Agricultural Potential Study (Appendix C 1)
- Geotechnical Assessment (Appendix C 2)
- Heritage Assessment (Appendix C 3)
- Vegetation Assessment (Appendix C 4)
- Wetland Assessment (Appendix C 5)
- River and Estuarine Assessment (Appendix C 6)
- Social Impact Assessment (Appendix C 7)
- Socio-economic Study (Appendix C 8)
- Traffic Impact Assessment (Appendix C 9)
- Stormwater Management (Appendix B 3)

7.1 Agricultural Potential Study

The Greater Cornubia Development site and its soils do offer high value agricultural potential but the context and location of the development within the broader region necessitates the transformation of the land use for the greater societal good. Tongaat Hulett, who currently farm this land, have been proactive with regards to the 'replacement' of agricultural land that has been lost (the loss will be gradual over a number of years) in more, long-term and appropriate locations such as within the iLembe District Municipality.

To this end, initiatives such as Operation Vuselela which is a partnership between Tongaat Hulett and the Department of Economic Development, it is estimated that over 3 300 ha of fallow land will be planted with sugarcane. Already in 2010, Tongaat Hulett rehabilitated nearly 6 000 ha of land for sugarcane production and is targeting substantial additional areas over the next few years. In the 2012/13 season over 11 500 ha of new sugarcane had been planted. It is also worth mentioning that from a sugar production perspective, there will be no nett loss suffered by the Maidstone Sugar Mill or Tongaat Hulett.

An Action Plan for the Loss of Agricultural Land is presented as Appendix C1.1 that has been accepted by the Department of Agriculture.

7.2 Geotechnical Assessment

The development proposes platforms created by cutting the hill tops and spurs and creating fill embankments on the lower slopes for development. The geotechnical assessment indicates that the proposal is feasible; however there are a few challenges/ constraints which need to be taken into consideration.

7.2.1 Development Constraints

7.2.1.1 Slope Stability

The bedrock Vryheid Formation underlying the area is in general laminated to thinly bedded siltstone/shale or thinly bedded sandstone with dolerite intrusions. Predominantly the sedimentary bedrock is closely jointed and inherently unstable, if cut where the bedding planes are dipping out of the slope or embankments are over steepened. No present or past conditions of instability could be observed, but might be invisible due to the dense cane on the site.

In general, the sediment bedrock of the Vryheid Formation is found to dip gently in a northern or southern direction. Locally different dip directions cannot be excluded. However, slopes too steep for sugarcane farming, should be considered unstable as significant cutting and filling will be required to develop these areas.

7.2.1.2 Wetland and Conservation

Two major features should be considered as mainly wet areas and considered for conservation:

- The low flood plains on the southern embankment of the Ohlanga River; and
- The major valley line systems, draining:
  - North towards the Ohlanga river; and
  - South towards the existing Marshall Dam.

These geomorphological features play important roles in flood protection for the existing and proposed developments in periods of high water levels and floods. Once sealed by development, the absence of the water absorption of those flood plains and major valley systems could cause major problems during periods of heavy rain and unfortunate weather conditions and cause severe damage to existing and proposed development. It has therefore been suggested to limit all development to outside of the 100 year floodline and initiate a re-naturalisation towards the indigenous flora within the 100 year floodline to the recreational benefit of the area and to prevent future damages by floods. It is noted that minor wet drainage lines have been engineered on almost all slopes to optimise commercial farming, prior to the present environmental regulations and concerns. Although those drainage lines contain wet soils, no other wetland characteristics (vegetation) have been observed.

The impacts on the Ohlanga River and wetlands on site have been assessed further by specialists in the respective fields and the findings are presented in Sections 7.5 and 7.6 below.

7.2.1.3 Subsoil Activity

The residual material derived from weathered Vryheid Formation and the Berea Formation clayey soils, generally have a high clay content and are likely to be moderately to highly active. These soils will in general be subjected to volume changes with changes in moisture content. Furthermore, the colluvial clays and residual clayey soils deriving from dolerite intrusions locally have high clay contents and are also likely to be moderately to highly active.

7.2.1.4 Heave

The sample materials within the area, except some completely to highly weathered sandstones, are in general predicted low in their expansive potential according to Van der Merwe (1964), (<2%). However, the completely weathered Vryheid Formation and dolerite intrusions as well as the clays of the Berea Formation may have higher swell potentials depending on composition. These heaving soils may occur locally on a smaller scale where these formations are predominant.

The sample from the completely to highly weathered sandstones of sampling site IP 187 of the Vryheid Formation show a linear shrinkage of 12% and a California Bearing Ratio (CBR) swell of 8.74% and should be considered active.

7.2.1.5 Collapsible Soils

The loose collapsible recent dune sands in the south eastern corner of the area are loose up to depth 3.90 m and 4.20 m below EGL (DCP 267 and DCP 268). Furthermore, these collapsible sands will be very prone to erosion by wind and water, if exposed during development over long periods.

7.2.1.6 Subsoil Seepage

No subsoil seepage was only observed in the inspection pits excavated outside the valley and drainage lines on the site. However, during periods of high rainfall, seepage may occur at the contact of permeable soils underlain by less non-permeable clays or bedrock formations throughout the area.

7.2.1.7 Founding Conditions

Founding conditions on the hill tops and slopes are in general moderate to good, depending on the proposed structures and the depth of the active soils underlying the surface. However, the recent dune sands in the south east of the area reaching a thickness in excess of 4.00 m before capping the Berea Formation may require medium deep to deep founding solutions depending on the structures to be founded.

7.2.1.8 Construction Material

Some residual clayey materials and the completely weathered bedrock materials from both Vryheid Formation rocks (IP 196) and the dolerite occurring in the area classify as A-4, A-6 or A-7-5 soils in terms of the Revised U.S. Classification. Furthermore, the clayey sands of the Berea Formation encountered classifies as A-7-5 (21) material. Locally weathered Vryheid Formation Shale and Dolerite bedrock materials classifies as a G6/7 material, where the sand content is effectively high enough and is therefore, considered good for use as subgrade and for selected layers in road and pavement construction.

7.2.1.9 Flanders Quarry

Flanders Quarry is presently not operating as a quarry/borrow pit. The borrow pit comprises an inclined sheet of dolerite that has intruded into the shale and sandstones of the Vryheid Formation. It is approximately comfortable to the bedding of the sedimentary rocks of the Vryheid Formation and strikes north south along the spur. The type of mineral excavated from the borrow pit comprises weathered dolerite gravel, suitable for the use in construction as G5, G6 and G7 gravel soils.

It is the intention that the quarry will eventually be capped and rehabilitated to form part of the Cornubia Public Open Space Area.

7.2.1.10 Excavatability

The soils and weathered Vryheid Formation bedrock are locally excavatable to a depth up to 3.20 m below present ground level. However, the weathered bedrock does get increasingly hard with depth and in places, where the bedrock is shallow, pneumatic tools might be necessary for excavation.

The soils and weathered bedrock of the dolerite bedrock are locally excavatable to a depth up to 3.20 m below present ground level. However, the weathered bedrock does get increasingly hard with depth and in places, where the bedrock is shallow, pneumatic tools might be necessary for excavation.

The recent dune sands and the Berea Formation will be easy to excavate to depths in excess of 4.00 m below present ground level. However, due to the collapsible nature of those materials, the recommendations detailed below for cut embankments must be considered.

7.2.2 Development Recommendations

A number of individual building platforms or terraces are proposed to be constructed. In this regard, cutting and filling to balance the earth-works of individual platforms is likely to be the most practical and an economical earth-works solution. Careful planning of the earth-works is required. This is not only necessary to ensure stability of cut and fill banks, but also, it will be beneficial in that the depth to founding below the final ground level may be reduced. Where possible, individual dwelling plots on the steeper slopes should be designed to have their axes orientated in an up-downslope direction, rather than along the contours. Therewith, associated cut and fill slopes can be contained within individual plot boundaries.

Detailed recommendations pertaining to cuts, fills, founding and drainage and erosion controls are presented in Section 9.3.1, Table 9-4. Recommendations relating to sanitation and road construction are presented below.

7.2.2.1 Sanitation

The subsoil conditions prevailing in the predominantly clayey areas are such that subsoil percolation disposal of septic tanks and wastewater effluent by means of soak pits or French drain trenches cannot be satisfactorily practised therein.

Regional waterborne sewerage should be installed throughout the area as part of the development, also to prevent any negative environmental impacts on the surroundings.

This is also considered necessary for the south eastern part underlain by the loose recent dune sands and clayey sands of the Berea Formation. Although percolation will be sufficient, the environmental impact in this area could not be justified.

7.2.2.2 Road Construction

In general, the colluvial and residual clayey material, occurring at a relatively shallow level on the site is considered poor as a subgrade material in road construction and for use in bulk filling. As such, some subgrade improvement will be required in these areas. On the other hand, the Vryheid Formation bedrock materials with an effectively high sand content are considered excellent to good as a subgrade material and suitable for use in selected layers in road and pavement construction. The design of the road layer works here should be based on a material classifying as a minimum G8/G9 gravel in terms of TRH 14 1985 having a CBR value of about 10.

Furthermore, the dolerite bedrock of most intrusions, including the existing borrow pit, are considered excellent materials for road and pavement construction, if not completely weathered to a silty clay. The design of the road layer works here should be based on a material classifying as a minimum G8/G9 gravel soil in terms of TRH 14 1985 having a CBR value of about 10.

It is recommended that attempts are made to re-establish and, if needed, extend Flanders Quarry as a source of G5, G6 and G7 gravel soils for the proposed development of the entire Cornubia Development.

7.3 Heritage Assessment

Four heritage resources occur within the Greater Cornubia Development. None of the identified heritage resources occur within the Cornubia Phase 2 site.

The proposed development will transform the site from agriculture to mixed land uses. It is recommended that this project may proceed with the proposed heritage resource mitigation. If permission is granted for the development to proceed, the Client is reminded that the Act requires that a developer cease all work immediately and notify Amafa aKwaZulu-Natali should any heritage resources, as defined in the Act, be discovered during the course of development activities.

7.4 Vegetation Assessment

Four areas were identified where the proposed Cornubia Phase 2 LUM Precinct Plan and the Cornubia Development Framework Plan differed slightly and the result would be some limited encroachment into areas of indigenous vegetation that were originally mapped in 2008.

The four areas of concern are as follows and are highlighted in Figure 7-1. The first area identified is the area at which Cornubia Boulevard crosses HGM Unit A9. The second area is the Bush Clump 4, the third area is the Highway Planting area where a new proposed interchange will be situated and the final area is the woody vegetation occurring within the proposed Cornubia Boulevard interchange.

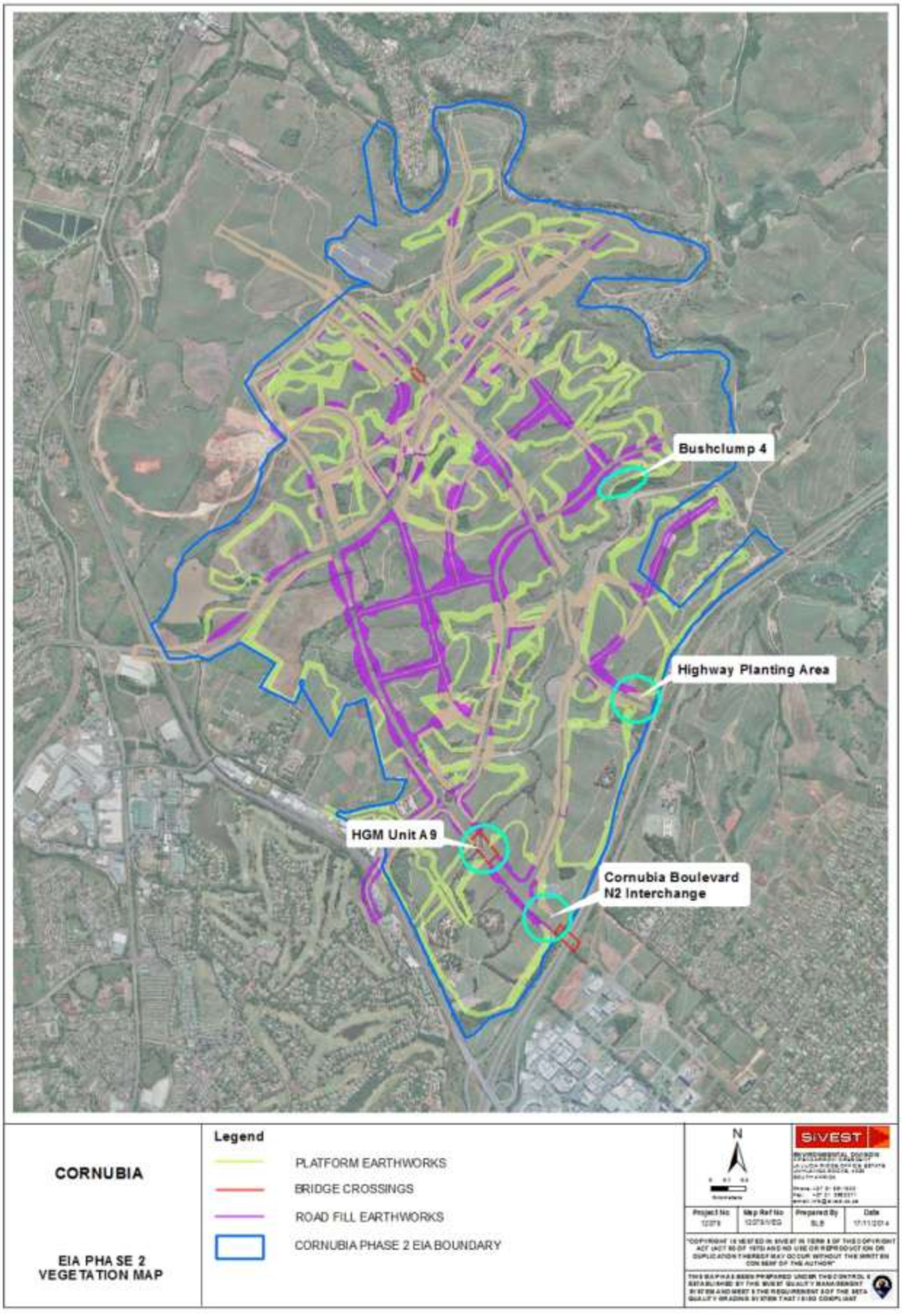


Figure 7-1: Cornubia Phase 2 vegetation map

7.4.1 Description of Affected Areas and Mitigation

7.4.1.1 HGM Unit A9

It is proposed that the Cornubia Boulevard will pass over this wetland unit. With the adoption and incorporation of the fill embankments in order to obtain the correct vertical alignment for this proposed major arterial road, it is evident that slightly more of the vegetation that falls within the wetland unit will be lost.

The vegetation within this area is considered to be of a low significance, as for the most part it is dominated by a mix of alien invasive plant species and indigenous plant species. The majority of these indigenous woody plant species have been planted and comprise relatively common species, such as, *Bridelia micrantha*, *Syzygium cordatum, Ficus burkei* and *Erythrina lysistemon*. Additional species that were encountered, and unlike the above mentioned, were self-propagated from the surrounding areas and were probably not planted by the farm managers as a method of maintaining drainage channels and providing some open space in areas where the planting of sugarcane is not viable. These species, such as, *Apodytes dimidiata, Clerodendrum glabrum, Allophylus africanus, Canthium inerme, Grewia occidentalis* and *Maytenus peduncularis* all produce edible fruits that are vectored into and across sites by birds and mammals alike. The planting of woody species and the presence of alien invasive plant species, would have created the ideal microclimate for the establishment of these species. The large majority of the second class of species listed above are all of a relatively similar cohort which leads one to assume that they were all self-introduced and only post the establishment of the larger woody species.

Thus, the loss of a number of these species from within the footprint of the embankments that will be required to be created for the proposed Cornubia Boulevard, will not be significant. The additional space required to be cleared will need to be rehabilitated and individuals comprising these species could thus be used along the toes of the embankments and on the steeper faces to re-introduce woody species and provide habitat for birds that may be transient or resident; and small mammals that are likely to colonise these areas post development. The species listed above cannot be considered rare or threatened and for the most part are considered to be precursors to the establishment of later successional forest, i.e. they are pioneer species, which will for the most part only establish in disturbed areas and along the ecotone.

7.4.1.2 Bush Clump 4 (Forest Patch)

The proposed impacts that are associated with the Forest Patch or what was commonly referred to as Bush Clump 4 (Rapid Vegetation Assessment January 2009) are not considered to be of a high significance even though there may be the potential for a slight loss of vegetation to the west of an existing road-way that traverses through the very upper section of this bush clump. It must be noted that a DAFF permit will need to be obtained for the destruction of this area as it is considered forest by the DAFF.

The vegetation associated with the westerly and isolated portion of the bush clump lacks any significantly large woody species and species of any conservation significance. It is postulated based on the woody species assemblage and the lack of a suitably developed under–storey which for the most part is dominated by alien invasive species and ruderal indigenous species. The steepness of slope resulted in the land having been historically converted to the west of the road for the purposes of sugarcane cultivation. Over time these areas were identified as difficult to farm productively and viably and were thus allowed to return to some semblance of a mixed composition of indigenous woody and alien invasive species. This is strongly evidenced by the relative size of the woody species on the east (below the road) which are significantly larger and established individuals than the westerly ones. Having noted this, the species to the east of the road play an important role in maintaining a buffer between the agricultural pursuits and the remaining forest patch. The loss of these species may pose a significant impact should no mitigation measures be put in place to ensure that a buffer zone is created to replace the area that is lost. Having assessed the drawings it is apparent that the toe of the bank will now encroach into portions of the buffer zone. In order to offset this loss it is proposed that during earth-works the portion of the forest to the west of the road is protected using some form of barrier to prevent earth from entering the forest and impacting upon the under-storey. This barrier must remain in place for a period of time post-earth-works to ensure that the toe of the bank is not eroded away and that any wash down the embankment is prevented from carrying sediment into the well-established forest. Further, as

soon as the earth-works on this portion of the site are concluded the rehabilitation of the newly created bank must be initiated. The rehabilitation here would comprise the planting of woody species, similar to what is being lost and an under-storey mimicking the under-storey on the westerly side of the road be established.

In addition, the proposed Trunk Sewer Line has been aligned along the existing contour road. In terms of its construction and excavation the following is proposed in mitigation of its placement along this alignment.

All earth-works must be restricted to the road bed, this includes the placement of the excavated material. If there is not enough room to place the material along the trench the material must be taken out of the forest patch and stockpiled until required when back-filling commences.

The area to the east of the road is considered to be a 'no-go' area and barriers must be erected to prevent material being deposited into the forest area. We would recommend that the works along this portion of the sewer line be undertaken in late autumn and completed by mid-winter. This will alleviate the possibility of significant rainfalls which will make working in this area difficult and will prevent earth from making its way down into the forest below the road.

Thirdly, when this area is programmed for earth-works a qualified botanist must be in attendance to ensure that no trees are damaged or cut down during the pipe line construction. In addition, an area must be identified prior to construction to receive the excavated material to ensure that it will not enter any wetlands or damage any other existing woody vegetation. Once the earth-works are completed a site specific species list of plants identified for this specific area must be obtained and planted out and maintained until the onset of summer and regular rainfall events.

7.4.1.3 Highway Planting

This area was historically identified as highway planting and is a combination of woody alien invasive species and grass species comprising the following species; *Eragrostis curvula, Melinis repens, Cynodon dactylon, Stenotaphrum secundatum, Digitaria eriantha* and *Chloris guyana*. In terms of the woody vegetation, the most prevalent species are alien invasive species, namely*, Schinus terebinthifolius, Psidium guajava* and *Senna didymobotrya*. The potential presence of any species of conservation significance within this area is highly reduced as a result of the fact that the grassland is secondary in nature and is a manifestation of the standard grass seed mix used by SANRAL to re-vegetate embankments and areas that fall within their servitudes.

Therefore, the specialist notes that any loss in this area will not be significant, however, it is required that due to the proposed land use that the area is re-vegetated using grass species that would commonly occur in natural grasslands surrounding the site. The reason for this is that the slopes will be steep, in terms of created embankments and not conducive to utilisation by people. The planting of woody species in this area would not be ideal either as they may create visual intrusions for vehicles and drivers that utilise the roadway.

7.4.1.4 Cornubia Boulevard Interchange on N2

The proposed Cornubia Boulevard Interchange will be constructed within an area of woody vegetation that currently is dominated by alien invasive species. There are some indigenous species present however, none of the species recorded are considered rare or threatened. One provincially protected plant species was recorded, namely, *Dracaena aletriformis*. This species will be required to be moved and transplanted elsewhere in the open space network. This species will require a permit from Ezemvelo KZN Wildlife for its relocation. There are some large indigenous *Ficus natalensis* trees occurring within the proposed footprint of the interchange that will be lost as a result of the proposed interchange.

In addition, the potential exists that where the off-ramp is proposed to be constructed there is a small and relatively recently established *Ficus polita* tree. Should this tree require removal we would propose that a suitably qualified botanist is present to oversee the removal and transplantation of the tree within the proposed open space network. In mitigation of indigenous woody species being lost during the construction phase of the proposed interchange it is recommended that given the receiving environment conditions, that the plant species assemblage proposed would mimic vegetation that occurs within seasonal wetland systems, namely, *Bridelia micrantha, Syzygium cordatum, Ficus sur, Cassipourea gummiflua, Rauvolfia caffra, Macaranga capensis* and *Barringtonia racemosa*. These species are all suited to having their root systems inundated for

periods of time and will play a vital role in stabilising the remaining wetland areas that will not be impacted upon by the proposed construction of the interchange. These species should be planted in the remaining areas as the alien invasive species are removed.

7.4.2 Biodiversity Assessment

In terms of assessing the impacts of a proposed development on the receiving environment, it is vital that the current state of the environment is assessed, and the level at which it contributes currently, is considered and recorded.

SiVEST have developed an assessment matrix which assists in determining the current biodiversity and conservation value of the various vegetation types that were encountered during the field survey. In addition, consideration is afforded to the biodiversity noteworthiness of the receiving environment (i.e. does the environment hold any rare species, protected species and unique landscape features) as well as the functional integrity and future sustainability of the vegetation types in the immediate vicinity of the development. The final condition score of each landscape is calculated adding the Biodiversity noteworthiness score with the Functional integrity and Sustainability score. It must be noted that the two scores are weighted 50:50% respectively.

The detailed methodology for the Biodiversity Assessment and matrices are provided in **Appendix C 4**. The findings of the Biodiversity Assessment are as follows:

- The overall rating for the proposed alteration to the vegetation component of the HGM Unit A9 is **0.4** which is interpreted as providing a **very low** level of service provision.
- The overall rating for the proposed alteration to the vegetation component of the Bush Clump 4 is **3.06** which is interpreted as providing a **moderately high** level of service provision.
- The overall rating for the proposed alteration to the vegetation component of the Highway Planting Area is **0.6** interpreted as providing a **low** level of service provision.
- The overall rating for the proposed alteration to the vegetation component of the Cornubia Boulevard N2 Interchange Area is **0.8** interpreted as providing a **low** level of service provision.

The significance of the above impacts are assessed further in Section 9.3.7.

7.4.3 Summary of Findings

The natural vegetation that occurs within Cornubia Phase 2, for the most part, is considered degraded and transformed to varying degrees. Bush Clump 4 is the least degraded area and will show the most resilience to disturbance should all the mitigation measures be put in place, based on the existing species assemblage and its relatively large size (approximately 3 ha). It is important to note that a DAFF permit will be required for the destruction of the forested area to the west and above the contour road as this area is considered forest and will require approval from DAFF. The identified areas that will be affected by the proposed amendments to the Cornubia Development Framework Plan and the Cornubia Phase 2 LUM Precinct Plan specifically have been evaluated and their significance has been rated accordingly. There will be a need to mitigate these identified impacts to ensure that any alteration or impact is of a suitably low nature not to have a significant and overall cumulative effect on the vegetation assemblage going forward.

7.5 Wetland Assessment

7.5.1 Present Wetland Health

A summary of the present hydrological, geomorphic and vegetation states and associated impacts are presented in Table 7-1.

Table 7-1: Summary of the impacts on wetland hydrology, geomorphology and vegetation for each HGM Unit

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
A	A1	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off, and loss of wetland ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Scour ▪ General disturbance, crossings	▪ High prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A10	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Road Run-off, and loss of wetland ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Scour ▪ General disturbance, crossings	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A11	Channelled Valley Bottom	▪ Cultivation in channel ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation (zonation)	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening and source of sediment) ▪ Scour	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A11a	Valley Head Seep	▪ Cultivation ▪ Artificial drainage	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.)
	A12	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Scour	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.) ▪ Stabilising plant species planted on banks
	A2	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel)	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
	A3	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ General disturbance, crossings	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A3a	Valley Head Seep	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation (zonation)	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.)
	A3b	Channelled Valley Bottom	▪ Cultivation ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A3c	Channelled Valley Bottom	▪ Cultivation ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ High prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A3d	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ General disturbance	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A4	Channelled Valley Bottom	▪ Cultivation ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A4a	Valley Head Seep	▪ Artificial drainage ▪ Decrease in wetland saturation (zonation)	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.)
	A4b	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
			▪ Decrease in wetland saturation	▪ Roads (Hardening) ▪ General disturbance	
	A4c	Valley Head Seep	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Cultivation (removal and reduction number of spp.)
	A5	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Scour ▪ General disturbance, crossings	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.) ▪ Stabilising plant species planted on banks
	A6	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Scour ▪ General disturbance, crossings	▪ High prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A6a	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A8	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.) ▪ Stabilising plant species planted on banks
	A8a	Channelled Valley Bottom	▪ Cultivation ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	A8b	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement	▪ Canalisation (increased erosion in the channel)	▪ Low prevalence of alien vegetation ▪ Bamboo

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
			▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Areas outside channel starved of sediment ▪ Limited scour	▪ Cultivation (removal and reduction number of spp.) ▪ Stabilising plant species planted on banks
	A9	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.) ▪ Stabilising plant species planted on banks
B	B1	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culverts) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Scour ▪ General disturbance	▪ High prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	B2	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culverts) ▪ Road Run-off ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ Roads (Hardening) ▪ Limited scour ▪ General disturbance, crossings	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	B3	Flood Plain	▪ Cultivation ▪ Flow Confinement (Culverts) ▪ Road Run-off ▪ Crossings ▪ Artificial drainage ▪ Increase in flood peaks ▪ Effluent from upstream ▪ Increase in nutrient load ▪ Pollution	▪ General disturbance, crossings ▪ Alteration of erosion and deposition regime ▪ Roads crossings (deactivation of processes)	▪ Cultivation (removal and reduction number of spp.) ▪ Decrease in ecological complexity. ▪ Moderate alien prevalence ▪ Fragmentation
C	C1	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Road run-off	▪ Canalisation (increased erosion in the channel) ▪ General disturbance, crossings ▪ Roads (Hardening and source of sediment)	▪ Cultivation (removal and reduction number of spp.)
	C2	Channelled	▪ Cultivation	▪ Canalisation	▪ Cultivation

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
		Valley Bottom	▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Road run-off	(increased erosion in the channel) ▪ General disturbance, crossings ▪ Roads (Hardening and source of sediment)	(removal and reduction number of spp.)
	C3	Un-Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Road run-off	▪ Canalisation (increased erosion in the channel) ▪ General disturbance, crossings ▪ Roads (Hardening and source of sediment)	▪ Cultivation (removal and reduction number of spp.)
	C4	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Road run-off	▪ Canalisation (increased erosion in the channel) ▪ General disturbance, crossings ▪ Roads (Hardening and source of sediment)	▪ Cultivation (removal and reduction number of spp.)
	C5	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.) ▪ Moderate alien prevalence
	C7	Un-Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Road run-off	▪ Canalisation (increased erosion in the channel) ▪ General disturbance, crossings	▪ Cultivation (removal and reduction number of spp.) ▪ Moderate alien prevalence
	C8	Flood Plain	▪ Cultivation ▪ Flow Confinement (Culverts) ▪ Road Run-off ▪ Crossings ▪ Artificial drainage ▪ Increase in flood peaks ▪ Effluent from upstream ▪ Increase in nutrient load ▪ Pollution	▪ General disturbance, crossings ▪ Alteration of erosion and deposition regime ▪ Roads crossings (deactivation of processes)	▪ Cultivation (removal and reduction number of spp.) ▪ Decrease in ecological complexity. ▪ Moderate alien prevalence ▪ Fragmentation
	C8b	Channelled Valley Bottom		▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.) ▪ Moderate alien prevalence

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
	C9a	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.) ▪ Moderate alien prevalence
	C9c	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ General disturbance, crossings	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
D	D1	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ General disturbance, crossings	▪ Cultivation (removal and reduction number of spp.)
	D2	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ General disturbance, crossings	▪ Cultivation (removal and reduction number of spp.)
	D3	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ General disturbance, crossings	▪ Cultivation (removal and reduction number of spp.)
	D4	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ General disturbance, crossings	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	D5	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ General disturbance, crossings	▪ Low prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
E	E1	Flood Plain	▪ Cultivation ▪ Flow Confinement (Culverts)	▪ General disturbance, crossings ▪ Alteration of erosion	▪ Cultivation (removal and

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
			▪ Road Run-off ▪ Crossings ▪ Artificial drainage ▪ Increase in flood peaks ▪ Effluent from upstream ▪ Increase in nutrient load ▪ Pollution	and deposition regime ▪ Roads crossings (deactivation of processes)	reduction number of spp.) ▪ Decrease in ecological complexity ▪ Moderate alien prevalence ▪ Fragmentation
	E1	Flood Plain	▪ Cultivation ▪ Flow Confinement (Culverts) ▪ Road Run-off ▪ Crossings ▪ Artificial drainage ▪ Increase in flood peaks ▪ Effluent from upstream ▪ Increase in nutrient load ▪ Pollution	▪ General disturbance, crossings ▪ Alteration of erosion and deposition regime ▪ Roads crossings (deactivation of processes)	▪ Cultivation (removal and reduction number of spp.) ▪ Decrease in ecological complexity. ▪ Moderate alien prevalence ▪ Fragmentation
	E2	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ General disturbance	▪ Cultivation (removal and reduction number of spp.)
F	F1	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ Canalisation (increased erosion in the channel) ▪ General disturbance	▪ Cultivation (removal and reduction number of spp.)
G	G1	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off, and loss of wetland ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Dam (change in flow patterns, deposition)	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ General disturbance, crossings ▪ Alteration of erosion and deposition regime	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	G2	Channelled Valley Bottom	▪ Cultivation ▪ Flow Confinement (Culvert) ▪ Road Run-off, and loss of wetland ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Dam (change in flow patterns, deposition)	▪ Canalisation (increased erosion in the channel) ▪ Areas outside channel starved of sediment ▪ General disturbance, crossings ▪ Alteration of erosion and deposition regime	▪ Moderate prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	G3	Lost	▪ Lost	▪ Lost	▪ Lost
	G4	Lost	▪ Lost	▪ Lost	▪ Lost

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
H	H2	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ General disturbance	▪ Cultivation (removal and reduction number of spp.)
	H3	Channelled Valley Bottom	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation	▪ General disturbance	▪ Cultivation (removal and reduction number of spp.)
I	I1	Channelled Valley Bottom	▪ Cultivation	▪ General disturbance	▪ Cultivation (removal and reduction number of spp.)
J	J1	Flood Plain	▪ Cultivation ▪ Flow Confinement (Culverts) ▪ Road Run-off ▪ Crossings ▪ Artificial drainage ▪ Increase in flood peaks ▪ Effluent from upstream ▪ Increase in nutrient load ▪ Pollution	▪ General disturbance, crossings ▪ Alteration of erosion and deposition regime ▪ Roads crossings (deactivation of processes)	▪ Cultivation (removal and reduction number of spp.) ▪ Decrease in ecological complexity. ▪ Moderate alien prevalence ▪ Fragmentation
	J2	Channelled Valley Bottom	▪ Cultivation ▪ Road Run-off, and loss of wetland ▪ Incisement ▪ Artificial drainage ▪ Decrease in wetland saturation ▪ Wastewater discharge ▪ Increase in nutrient load ▪ Pollution	▪ Canalisation (increased erosion in the channel) ▪ Roads (Hardening) ▪ Scour ▪ General disturbance, crossings	▪ High prevalence of alien vegetation ▪ Cultivation (removal and reduction number of spp.)
	J3	Valley Head Seep	▪ Artificial drainage ▪ Decrease in wetland saturation (zonation)	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.)
	J4	Valley Head Seep	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation (zonation)	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.)
	J5	Valley Head Seep	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland saturation (zonation)	▪ Canalisation (increased erosion in the channel)	▪ Cultivation (removal and reduction number of spp.)
	J6	Valley Head Seep	▪ Cultivation ▪ Artificial drainage ▪ Decrease in wetland	▪ Canalisation (increased erosion in	▪ Cultivation (removal and

Catchment	Wetland Unit	HGM	Impacts on Wetland Hydrology	Impacts On Wetland Geomorphology	Impacts On Wetland Vegetation
			saturation (zonation)	the channel)	reduction number of spp.)

As presented in Section 4.6.3, the following wetland HGM units were identified in the study area, the extents of which were presented in Table 4-2:

- Forty channelled valley bottom wetlands;
- Two un-channelled valley bottom wetlands;
- Eight valley head seep wetlands; and
- Five floodplain wetlands.
- And two wetland units that have been lost already.

7.5.1.1 Channelled Valley Bottom Wetlands

The general Present Ecological State (PES) of the channelled valley bottom wetlands was found to be Greatly (Category E) to Critically Modified (Category F). Despite differences in the sizes of the wetlands, many of the same impacts were found to affect all of the wetlands with varying degrees of severity.

The ecosystem service offered by the channelled valley bottom wetlands which scored the highest (moderately high) was the sediment trapping ability of the wetlands. Other ecosystem services which scored at an intermediate level include erosion control, toxicant removal, nitrate removal, phosphate trapping, flood attenuation and water supply for human use. The ecosystem services which scored below intermediate levels include stream flow regulation, maintenance of biodiversity, carbon storage, tourism and recreation, education and research, cultural significance, cultivated foods and natural resources. The current transformed state of the wetlands has bearing on the degree of ecosystem services offered by the wetland. As a result of the level of transformation, the ecosystem services are limited to intermediate to low scores.

Therefore, the channelled valley bottom wetlands all scored a Class D (Low) level of ecological importance and sensitivity. Contributing factors to the low level of ecological importance and sensitivity for most of the wetlands include transformation and channelization impacts, which have a bearing on habitat quality and the potential occurrence of wetland fauna.

7.5.1.2 Un-channelled Valley Bottom Wetlands

The PES of the un-channelled valley bottom wetlands was found to be greatly modified (Category E). Again, many of the same impacts were found to affect all of the wetlands with varying degrees of severity impacting on the overall present ecological status.

The ecosystem services provided by the channelled valley bottom wetlands are very similar to the channelled valley bottom wetlands given similar impacts and a similar ecological state. However, the un-channelled valley bottom wetlands were found to provide a higher level of ecosystem services for a greater range functions. Accordingly, the wetlands were assessed as providing a moderately high level of ecosystem services in terms of sediment trapping ability, phosphate trapping, nitrate removal, toxicant removal and erosion control. The only ecosystem service with an intermediate score was flood attenuation ability. The remaining ecosystem services that scored below intermediate included carbon storage, maintenance of biodiversity, water supply for human use, natural resources, cultivated foods, cultural significance, tourism and recreation, education and research as well as stream flow regulation. Transformation of the wetland for agricultural purposes and the resultant effect on alteration of flow can once more be considered to be a significant factor affecting the ability of wetlands to contribute to a higher degree of ecosystem services provided.

Wetlands C3 scored a Class C (Moderate) level of ecological importance and sensitivity. Transformation and channelization impacts again had a major influence decreasing the sensitivity of wetland C7, and thus it was assigned a Class D (Low) ecological importance and sensitivity. Both wetlands were impacted by artificial drainage ditches which further degraded the ecological condition and therefore sensitivity of the wetlands.

7.5.1.3 Valley Head Seep Wetlands

The general PES of the valley head seep wetlands was found to be Category E (Greatly modified). Many of the same impacts (sugarcane cultivation/transformation, roads and drainage channels) were found to affect all of the wetlands with varying degrees of severity impacting on the overall PES.

The ecosystem services identified that can be provided by the valley head seep wetlands are found to be diverse but very limited. The highest scoring ecosystem services, which were assessed at a moderately high level, include phosphate trapping, nitrate removal and toxicant removal abilities. At an intermediate level, the ecosystems services provided include sediment trapping, flood attenuation and erosion control. Most scores however were below intermediate to low. These include stream flow regulation, carbon storage, maintenance of biodiversity, water supply for human use, natural resources, cultivated foods, tourism and recreation, education and research. Complete transformation of the vegetation component of the wetland and associated impacts to the present ecological condition are the main contributing factors affecting the ability of the wetland to contribute to a greater degree of ecosystem services.

Due to the similar ecological state for many of the valley head seep wetlands, most of the valley head seep wetlands were scored to have a Class D (Low) level of ecological importance and sensitivity. Valley head seep wetland A11a however scored higher due to the decreased level of transformation of the wetlands. This wetland was scored as having a Class C (Moderate) ecological importance and sensitivity.

7.5.1.4 Floodplain Wetlands

The general PES of the wetlands is a Category D (Largely modified).

According to the results of the ecosystem services assessment for the floodplain wetlands, the highest scoring ecosystem services and assessed at a moderately high level included maintenance of biodiversity, sediment trapping, phosphate trapping, nitrate removal, toxicant removal, erosion control and as well as tourism and recreation. At an intermediate level, ecosystems services included carbon storage and flood attenuation. Below intermediate level of ecosystems services provided include stream flow regulation, water supply for human use, natural resources, cultivated foods and, education and research. The lowest scoring ecosystem services provided by the floodplain wetlands are cultural significance. Land use impacts associated with the wetlands catchment for the purposes of agriculture can be considered to be a factor affecting the ability of the wetland to provide a higher degree of wetland ecosystem services.

The wetland ecological importance and sensitivity for the floodplain wetlands was categorised as a Class B (High). The floodplain has been impacted on by three main factors including cultivation on the banks of the river, roads through the wetland and a degree of alien vegetation species encroachment. Nonetheless, functionality of the wetland and habitat quality is still good with a riparian habitat associated with the wetland. Assemblages of protected tree species were observed. Fish, amphibian and avifaunal occurrence and activity were also observed although the species could not be identified.

7.5.2 Potential Impacts and Recommendations

The layout for the project proposes to encroach into the wetlands and associated buffers of numerous HGM units. This impact has the possibility of reducing the ability of the wetland to perform many of the functions typically associated with such ecosystems. Loss of wetland area has implications for stormwater management and control, sediment trapping and the treatment or trapping of pollutants and sediments. Loss of wetland area also has the potential to reduce the biodiversity value of a system further.

The proposed Greater Cornubia Development (Phase 1, Phase 2 and Retail Park) will result in a permanent loss of some wetland areas. For wetland offsets, the no-net wetland loss principle is generally accepted as best practice when dealing with the issues of wetland loss. This means that wetland loss must be replaced by wetland gain so that the nett wetland loss is zero. The replacement of wetlands at a ratio of 1:1 is generally regarded as being insufficient to mitigate wetland loss as wetland rehabilitation cannot reproduce pristine wetlands. Internationally, a minimum ratio of 1:1.5 is generally required to achieve 1:1 compliance on the ground. However, this minimum ratio is only considered appropriate in situations where rehabilitation has a

low risk of failure, especially if the wetlands in question are degraded and of low conservation value from an ecosystem services perspective. After receiving comments from key stakeholders it has been decided to implement an area for area approach using a 1:3 offset ratio, as recommended by Ezemvelo KZN Wildlife. The area for area approach involves rehabilitating or reinstating an area of wetland equal to the wetland area being lost at the required offset ratio.

Given the above, SiVEST have completed a Wetland and Open Space Rehabilitation Plan (Appendix B 2) that aims to guide the rehabilitation of wetlands across the site, and thus fulfil the offset requirements mentioned above. The wetlands to be rehabilitated are shown in Figure 7-2, as well as the wetland that will be lost. Table 7-2 below summarises the current wetland losses and rehabilitation potential for the Greater Cornubia Project.

Table 7-2: Wetland loss and offset calculations for the Greater Cornubia Development

Phase	Wetland Area (ha)	Wetland Loss (ha)	Required Wetland Area to be Rehabilitated at the 1:3 offset Ratio (ha)	Wetland Area Available for Rehabilitation
Cornubia Phase 1	53.9	7.54	22.62	46.36
Cornubia Phase 2	123.3	24.05	72.15	99.25
Cornubia Retail Park	3.54	3.54	10.62	0
Combined Cornubia Phase 2 and Retail Park	126.84	27.59	82.77	99.25

All wetland units within the Cornubia Retail Park footprint will be lost and thus there was no opportunity to offset the loss of wetlands within the Cornubia Retail Park site. As a result the wetland loss associated with the Cornubia Retail Park has had to be offset within Cornubia Phase 2 (Figure 7-3). Even though greater development has been phased, from an environmental perspective the Greater Cornubia Development and particularly the Cornubia Retail Park needs to be viewed as a single entity. This holistic view will allow improved management of wetland resources and will also encourage consistency in terms of rehabilitation and management techniques. The wetland units, which will be rehabilitated to offset the loss associated with the Cornubia Retail Park have already been of nominated as part of the Cornubia Retail Park Impact Assessment (SiVEST, 2013). These nominated units are shown in Figure 7-3 and total 12 ha.

The current layout for Cornubia Phase 2 and the Cornubia Retail Park indicates that 82.77 ha of wetland area is required to be rehabilitated to offset the direct loss of wetland area, whilst the total wetland area available for rehabilitation is 99.25 ha, this is some 16.48 ha more than the required minimum. This equates to a **1:3.6** offset ratio, which is greater than the stipulated 1:3 offset ratio. Thus the overall wetland losses can be can be considered to be adequately offset and the significance of the impact reduced to acceptable levels.

Further to the above impacts, and associated mitigation, the land form has placed limitations on the ability of the stormwater engineers to attenuate stormwater created by the proposed development, and they have therefore requested the option of placing some attenuation facilities within wetland systems in order to adequately deal with the peaks and flows of a potential 1 in 100 year flood event. Analysis of the available options has yielded a number of attenuation structures that could be placed in wetland. However, in order to ensure that adequate offset is available, and given that the attenuation facilities would lead to the infilling of the wetlands at the site of the attenuation facilities, a calculation of available wetland for conversion to stormwater attenuation facilities was undertaken. The calculation takes into account that the minimum offset ratio for Cornubia Phase 2 is 1:3. Therefore wetland available for conversion, and subsequent offset is 16.48 ha. The wetland that can be lost to stormwater attenuation facilities, whilst still maintaining the target offset ratio of 1:3, is 4.12 ha. The calculations for the above are included in Table 7-4 below, and summarises the losses and offset and the stormwater attenuation facility losses that are permissible.

Table 7-3: Wetland loss and offset calculations for the Greater Cornubia Development

Phase	Wetland Area (ha)	Wetland Loss (ha)	Required Wetland Area to be Rehabilitated at the 1:3 offset Ratio (ha)	Wetland Area Available for Rehabilitation
Combined Cornubia Phase 2 and Retail Park	126.84	27.59	82.77	99.25
Permissible Stormwater Attenuation Facilities within Wetlands		4.12	16.48	0
Combined Cornubia Phase 2, Retail Park and Permissible Stormwater Attenuation Facilities	126.84	31.71	99.25	99.25

The above calculations still allow for the required offset of 1:3, and therefore the loss of some wetland areas for stormwater attenuation facilities is considered acceptable.

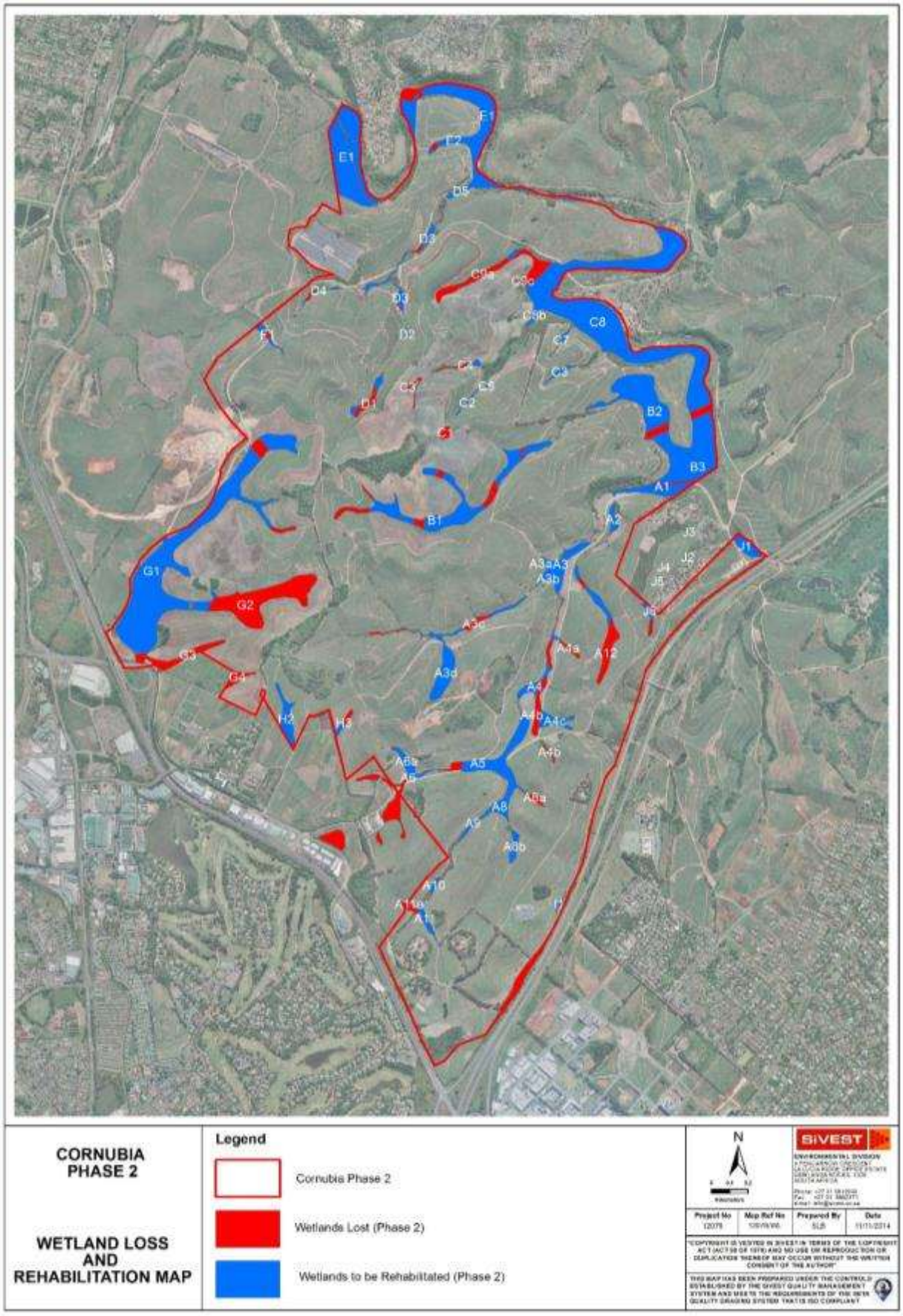


Figure 7-2: Wetland loss map

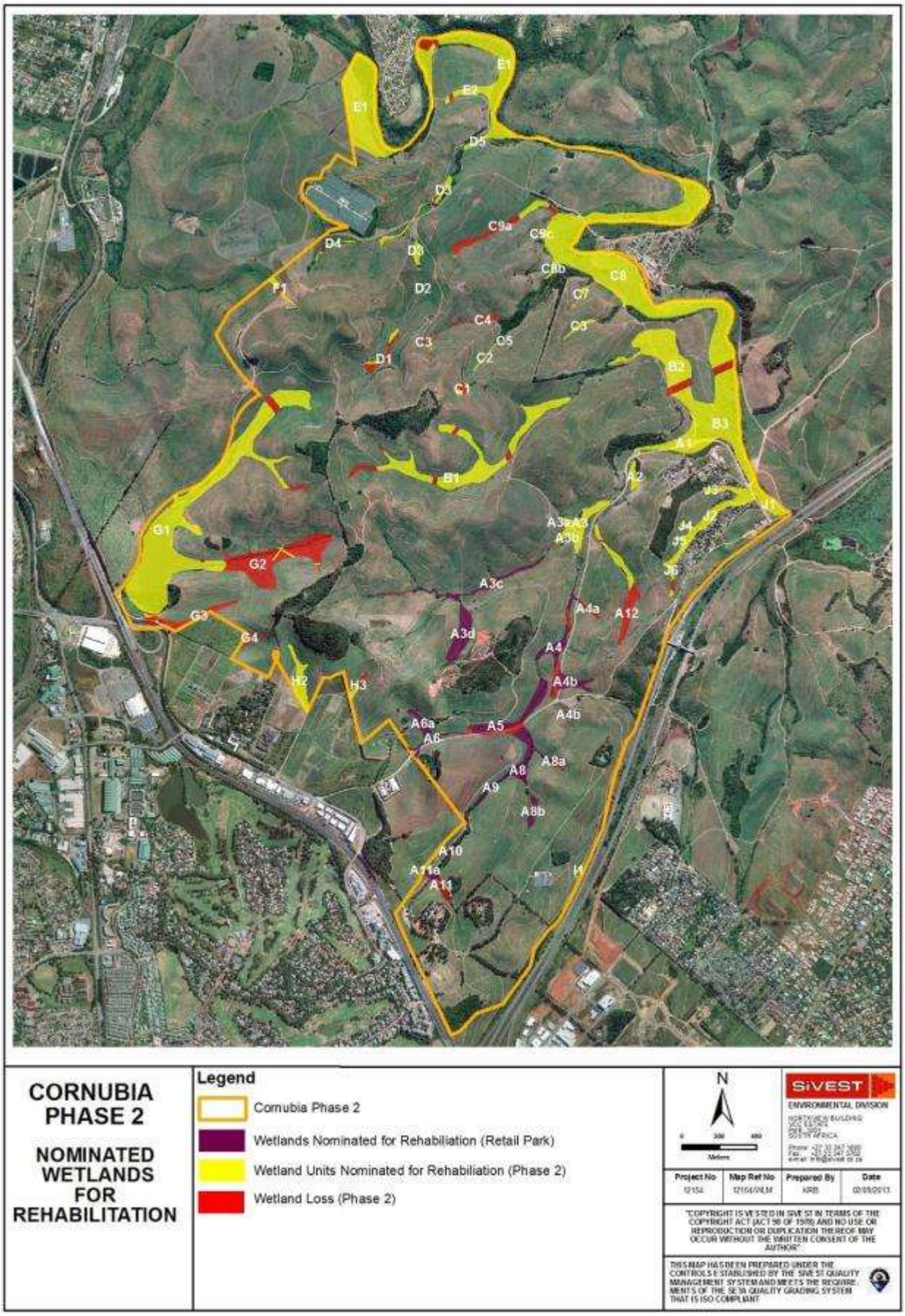


Figure 7-3: Nominated wetlands for Cornubia Retail Park offsets

Other potential impacts and recommendations are presented in Table 7-4.

Table 7-4: Potential impacts and recommendations

Key Concerns Raised	Recommendations
Stormwater run-off impacts during construction During the construction phase, portions of the catchment supplementing the wetland unit will be cleared for construction. The removal of the present vegetation will temporarily increase surface run-off throughout the cleared site and increase the erosion potential of the soils on site. If stormwater run-off and erosion control measures are not implemented during the construction phase, the exposure of the bare soils to the elements will likely lead to the erosion of the soils on site. This is especially true during heavy rainfall events, which will encourage the formation of rills and dongas thus concentrating flow down-slope. The concentration of run-off down-slope within rills and dongas will increase the likelihood of the erosion and/or sedimentation of the wetlands. The negative effects of erosion and scouring on the wetlands will include; increased concentration and canalisation of flow within the wetlands, the reduction in diffuse flow and the extent of wetness within the wetland, the alteration of the vegetation communities due to decreased wetness and erosion disturbances and ultimately the reduction in the wetland's functionality and health. In addition to erosion within the wetland, sediment plumes/fans are likely to impinge on the wetland area if no erosion and stormwater control measures are implemented. The unnatural sedimentation of the wetland area will disturb the vegetation of the wetland and encourage the proliferation of pioneers and alien invasive species ultimately reducing the health and functionality of the wetland.	• To reduce the erosion risks on site during the construction phase, stormwater and erosion control measures must be implemented by the contractor to ensure that the erosion and sedimentation of the wetlands and streams do not occur during the establishment phase. The recommended stormwater and erosion control measures are presented as mitigation measures in Section (9.3.6) and in the EMPr (Appendix B).
Stormwater run-off impacts during operations Although there is likely to be some attenuation on-site and all outlets will have erosion protection, the amount of surface run-off inputs entering the on-site wetland during a storm event may still increase and the magnitude of the flood peak within this system will also increase as a result of the general increase in the rate of flow. The surface run-off inputs and the increased peak discharge will increase the risk of erosion within the wetland over time as the systems adjust to the modified mean and peak flows.	• Given the Stormwater Management Plan prepared by SMEC November 2014, the specialist concludes that the operational phase stormwater management has been thoroughly investigated, but that some issues still remain, specifically, the issue of the placement of stormwater attenuation facilities within wetlands on a large scale. • An analysis of the available wetland that can be converted to stormwater attenuation facilities is included above, and notes that the available area of wetland that can be converted is 4.12 ha. This area of wetland loss can still be offset through rehabilitation of other wetlands on site at the ratio of 1:3. However, the current options for stormwater attenuation on site allow for the facilities to either be 'within' the wetland system, or 'outside' of the wetland system. The option for 'within' wetland stormwater attenuation will lead to the loss of 16.07 ha of wetland habitat, which will require an offset amount of 48.21 ha of wetland rehabilitation. Since there is not enough wetland on site to offset the loss involved in this option, the 'within' wetland stormwater attenuation is not viable. In addition, the 'outside' of the wetland option has been assessed and is

Key Concerns Raised	Recommendations
	prohibitively expensive for each cubic meter of attenuation capacity, and still requires additional attenuation within the development areas. Thus the 'outside of the wetlands option is considered as not viable either. • Further to the above, it is therefore recommend the following mitigation measures are investigated in order to balance the loss of wetland associated with 'within' wetland attenuation facilities, with the expense of the 'outside' of wetland attenuation facilities. Further Stormwater design recommendations include: - The stormwater engineers should investigate the option of some (maximum of 4.12 ha) 'within' wetland facilities, and some 'outside' wetland facilities, in an attempt to balance costs and wetland losses. - The stormwater engineers should investigate the cost impacts of on-site attenuation through the use of alternative materials, such as porous paving systems, and onsite tank attenuation facilities. - In addition, given the irrigation requirements of the vegetated areas of the overall development, we would recommend the investigation of diverting stormwater to storage structures such as Marshall Dam, and using this water for irrigation, thus returning it to the hydrological system at ameliorated rates. • Should the above mitigation be instigated, it is the specialist's findings that the impacts of stormwater on site can be significantly reduced.
Pipe and road crossing impacts during construction The construction of roads within and across the wetlands may result in the filling in of a portion of wetland along the road surface and fill footprint and the permanent loss of wetland. In addition, pipes will need to be installed across wetlands. Other impacts include the compaction and clearing of areas outside of the road fill footprint during the construction phase and associated indirect impacts that include erosion and alien plant encroachment into the wetland.	• A water use license process will be required to establish the necessary infrastructure within the wetland as per Sections 21 *(c)* and *(i)* of the NWA. • The recommended mitigation measures are presented in Section (9.3.6) and in the EMPr (Appendix B).
Pipe and road crossing impacts during operations Besides the permanent loss of wetland below the road fill, the road will have a number of indirect impacts on the health of the wetland. These include: • The concentration of wetland flow through culverts and the erosion and scouring of the wetland below the culvert(s); and • The fragmentation of the wetland by the road, which represents a serious barrier to faunal movement along the wetland.	• With regards to the wetland crossing only, the road fill foundation and base should be permeable to water flow to ensure low flow seepage is maintained and that water does not dam up behind the road during heavy rainfall. • Erosion protection measures (e.g. Reno-mattresses) must be established below any box culverts. • The final design for the wetland crossing must be approved by the wetland specialist prior to construction commencing.
Urban Agriculture / Linear Parks within wetland buffer areas The use of the buffers around wetland systems has the potential to impact on the effectiveness of the buffer system, and could lead to increased siltation of the wetland system through the creation of bare	• It is proposed that there will be a minimum buffer of 10 m around all wetland systems that will be planted with indigenous plant species. • All linear parks will be planted using indigenous species, and will include seating areas and recreational trails.

Key Concerns Raised	Recommendations
surfaces between crop plantings, as well as the potential for increased nutrient levels if fertilisers are used. In addition, the use of herbicides and pesticides on crops has the potential to impact on fauna and flora within the wetland systems.	• All agricultural areas must be operated on a subsistence / community garden / small scale market system. • The use of pesticides and herbicides must be minimised, and all such chemicals must be carefully selected to ensure that biodegradable and wetland friendly variants are used. • Crops within wetland buffer areas must be selected for their longevity e.g. long intercrop periods must be discouraged. • It has been proposed that planting areas be filled slightly to ensure flatter planting areas, with gentle banks (1:3) falling towards the wetland. These banks can then be planted with indigenous vegetation to ensure that erosion is controlled and minimised. • The final zonation must be approved by the eThekwini Municipalities Environmental Planning and Climate Protection Branch prior to construction commencing.
Direct disturbance impacts Continued disturbance and a lack of management over the lifetime of a project is a problem that exists throughout South Africa where there is limited budget for the management and preservation of wetlands and often no 'buy-in' is achieved from local residents in terms of the conservation of important environmental systems and habitats. Some direct impacts on wetlands arising from a lack of management and protection within open spaces on-site include the establishment of informal crossings, illegal refuse dumping, wood harvesting and vegetation clearing and trampling. These disturbances result in the disturbance of the wetland soils and plants which encourages the proliferation of alien invasive and pioneer species that are better adapted to survive in disturbed soil and moisture conditions. In addition, the extermination and/or hunting of fauna (e.g. frogs, chameleons, snakes and antelope) is a common impact where access to open spaces is unrestricted. Over time, these impacts left unattended will contribute to the gradual reduction in the current health and value of the wetlands on-site.	• Any remaining wetland area should be clearly demarcated to inform the local residents of the wetland boundaries.

7.6 River and Estuarine Assessment

The impacts of the Greater Cornubia Development on the Ohlanga River and Estuary is presented in this section (Figure 7-4).

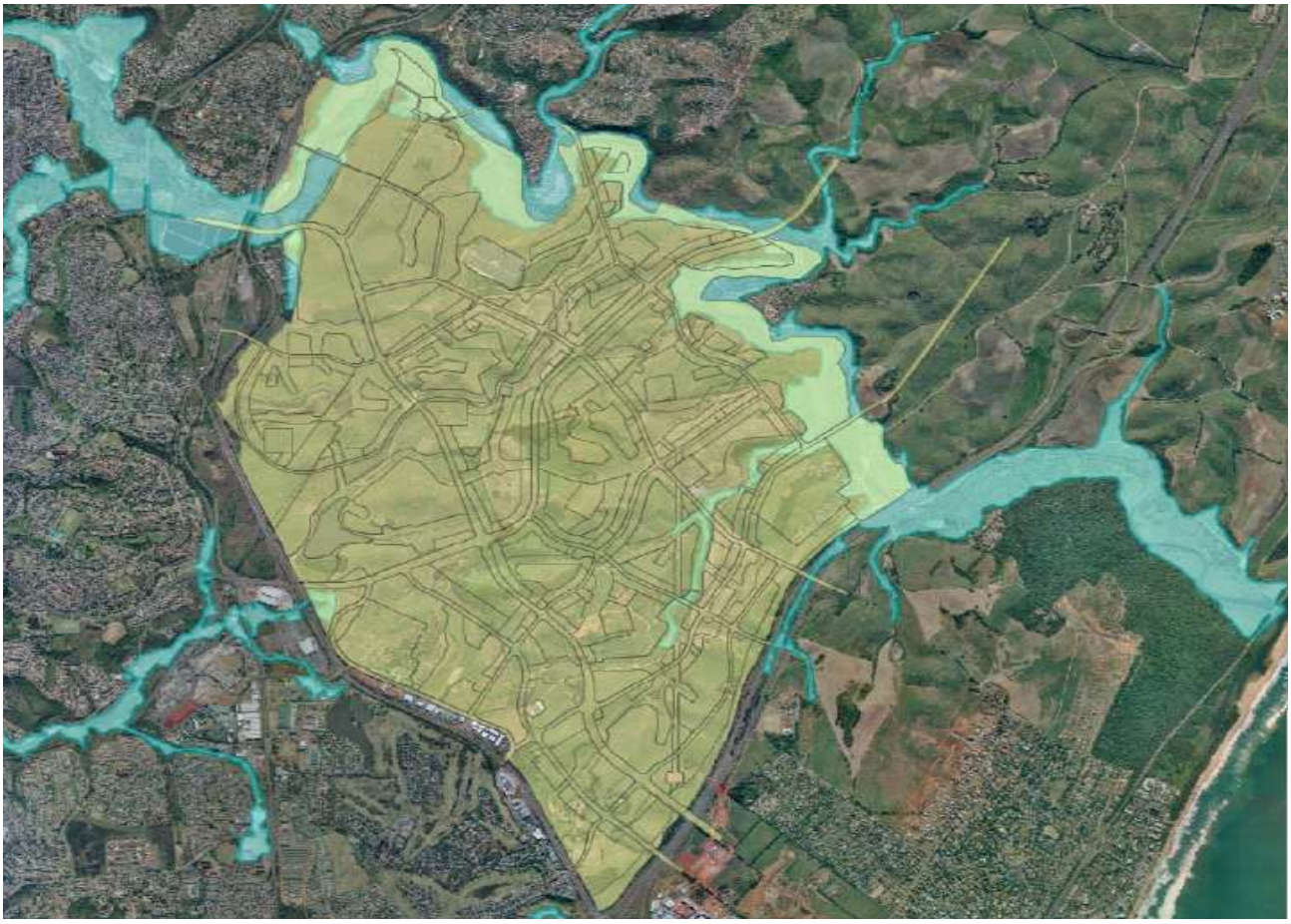


Figure 7-4: Cornubia Framework Plan (yellow) overlayed on the Ohlanga River and Estuary Boundaries (blue) and areas of overlap of Cornubia and ecological boundaries (green)

The geophysical nature of the Ohlanga estuary has not changed significantly in the 50 years (Cooper, 1989). The lagoon, its floodplain, the Hawaan forest and the dune forests are considered as one ecological unit and set aside as a nature reserve (Begg, 1978). The Hawaan forest on the south bank appears now to have become an accepted protected area, while the limited withdrawal of the sugarcane fields from the immediate edge of the north bank has allowed the re-establishment of reedbeds. There are no hard structures in the floodplain which could become inundated during mouth closure although the roads under the N2 are particularly vulnerable. Water quality and latterly increased flow volumes emanating from the sewage works have become major problems. These problems are reversible with appropriate management of the impacting activities and it should therefore be possible to maintain the system as one of the more functional estuaries in the Durban area.

As stated above, outflows from the treatment works strongly influence both river and estuary. The recovery capacity of the river is demonstrated by the consistent improvement in the health status between the upstream Ottawa rail bridge sampling site and the N2 Bridge. The river then unfortunately encounters the outflow from the Umhlanga treatment works before entering the estuary which provides nutrient rich and high volume freshwater directly to the upper estuarine system.

To date, quarterly water quality reports are presented to the Department of Water and Sanitation as a requirement of the Cornubia Phase 1 EA in which the water quality is tested upstream and downstream of the CIBE Development during the construction phase. The monitoring results indicate that the construction activities at the CIBE has had limited impact on water quality of the Ohlanga River.

Potential impacts and recommendations for mitigation are detailed in Section 9.3.5, Table 9-7.

7.7 Social Impact Assessment

On the whole, almost all communities likely to be affected are excited and enthusiastic about the Greater Cornubia Development, noting the positive potential in terms of housing opportunities, employment and business opportunities, access to social amenities and overall development of the northern and western corridors. During the PPP, and during the investigation for the SIA, a number of concerns and questions were posed. As the SIA inherently includes the opportunity to feed into the planning process, it is pertinent to log specific concerns and present recommendations that assist to neutralise the concerns where possible.

The receiving area includes areas surrounding the Cornubia site which form part of the following impact zones:

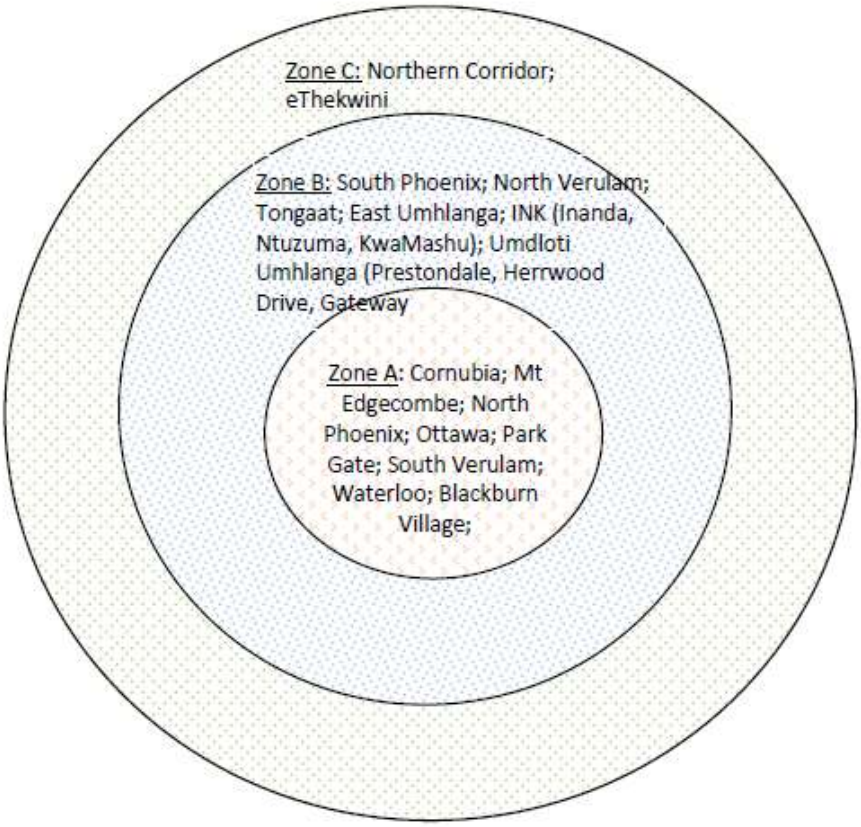


Figure 7-5: Zones of Impact

The informal settlements to be relocated into the housing component of the Greater Cornubia Development are the areas closest to the site as described in Zone A.

The areas that fall into Zone B are those that are likely to experience a less direct impact from the development of Cornubia, though they will enjoy the benefits of accessible goods and services that are part of the development.

The area described as Zone C addresses the regional impact of a development of the size and scope of the Greater Cornubia Development. The northern corridor refers to the areas of the eTM north of the city centre that has been the focus of considerable growth in the past two decades. The positioning of King Shaka International Airport and Dube TradePort in this area, the conceptualisation of the Aerotropolis and the realisation of the Greater Cornubia Development are all in line with the total transformation of this area, turning it into a of integrated economic activity, that is not only aligned to the economy of the eTM, but also that of the Zululand corridor to Richards Bay and to Gauteng. Aside from providing critical facilities within its boundary, the Greater Cornubia Development contributes powerfully to the impetus to develop important physical infrastructure in this development zone.

7.7.1 Public Concerns Raised

The primary concerns raised by the public include: information sharing and transparency; housing allocation guidelines and policies; corruption; housing typologies; maintenance of houses; impact on rates payers; impact on surrounding communities including traffic; housing densities; management of the public open space areas; provision of services; job opportunities; business opportunities; skills development; congestion; timing and provision of social amenities; safety and security and concerns relating to impacts on the biophysical environment. The key concerns raised and recommendations are presented in Table 7-5.

Table 7-5: Key concerns raised and recommendations

Key Concerns Raised	Recommendations
Lack of Information Transfer	It is encouraged that the Developers continue with stakeholder engagement beyond the EIA process.
Provision and allocation of housing As a significant portion of the Greater Cornubia Development is associated with the provision of housing (of one type or another). In the eTM there is a well-documented shortage of housing. All consultations held during the SIA process tabled concerns about housing shortages. An issue of significant concern is the perception that the process of allocation is not transparent, and that only certain segments of the population would benefit. There were additional concerns that the beneficiaries of BNG houses would be selected from other (further) areas, whilst the informal settlements closer to the site would not benefit. Residents from lower income groups, but who did not qualify for BNG houses in the CID Phase 1 (a) were concerned that processes for accessing housing in Cornubia were bound to be "corrupt".	The eTM's Housing Department needs a Communication Strategy to provide up-to-date information to the affected communities on the range of houses being built and offered on land owned by the City. An education / information campaign needs to be carried out to address this issue**.** It is important that this issue be handled with a full understanding of the concerns expressed by the affected communities on a number of fronts.
Management Associations and Body Corporates The issue of internal management is likely to present a number of challenges to residential and business owners alike. The size of the Greater Cornubia Development, and the varied components that make up the proposed plan; need to be factored into how the overall site and the individual precincts will be managed. This needs to be considered and worked out from the outset. The private sector owned areas are likely to draw on models that have been defined and which appear to function effectively in places like the Umhlanga Ridge Town Centre. The BNG housing precinct presents unique challenges. The prospective residents of this area are likely to be unfamiliar to the body corporate type approach to managing areas with extensive communal space. Of greater concern, however, is the fact that this constituency is unlikely to have the material resources to effectively manage the areas around individual homes. Even the housing typologies are likely to be unfamiliar and will require support in terms of maintenance and management.	It is proposed that the eTM's Housing Department strategise at this early juncture, in consultation with community leaders as to how these challenges should be handled.
Support for Homeowners in the BNG Housing Precinct It is unlikely that the homeowners in the BNG housing precinct will have the resources to maintain their homes and the areas around their homes adequately. Given the size of the precinct, this could become a	It is proposed that there be some kind of agency appointed to do a skills audit of all unemployed, and/or under employed residents of the BNG housing precinct at the earliest possible date. A database should then be developed to ensure that those who already have skills be identified,

Key Concerns Raised	Recommendations
problem. The present assumption is that as homeowners, they will be responsible for maintenance and upkeep. This is likely to be possible only if residents all have jobs from which they earn sufficient to spare money for home maintenance. This is likely to require interventions to maximise this outcome.	and that should the opportunity arise, that these individuals be given preferential treatment to take up opportunities. This skills audit should be linked with a skills development programme specifically targeting those living first within Cornubia and those within the Zone A area. • It is also proposed that a fund be established at the earliest by the developers, and into which all homeowners pay a small levy, specifically for the purposes of maintaining the precinct. • The Department of Parks and Recreation of the eTM should be responsible for the care taking of the open spaces within the Greater Cornubia Development. It is possible that they could establish maintenance teams drawn from the resident community but supervised by their staff to carry out this function. • It is noted that some of these initiatives are presently underway as part of the Cornubia SSIP.
Job Creation, Business Opportunities and Skills Development Job creation, business opportunities and skills development are likely to be high on the agenda of all concerned in relation to the Greater Cornubia Development.	• The respective Contractors should ensure that procurement policies are such that the maximum opportunities for employment, contracting and sub-contracting devolve to firstly those unemployed living inside the development and those living in areas surrounding the site. • In addition to providing job opportunities, it is important that skills development programmes be brought to bear on the communities in and around Cornubia. Skills development must be demand driven, of a high standard and designed to create sustainable workers. This programme could well be run in conjunction with other developments in the general neighbourhood, including the airport and Bridge City. • Skills development should be aimed at Adult Basic Education, skilling the unskilled, up skilling the semi-skilled, and providing extension to skilled personnel. In addition, Small, medium and microenterprise (SMME) support and business skills training should be introduced. Mentorship programmes should also be a part of the process.

7.7.1.1 Social Upliftment Programmes

Given the integrated nature of the proposed development, there are likely to be many opportunities for the establishment of a range of programmes and initiatives designed to support social upliftment. Some of these opportunities are presently underway as part of the Cornubia SSIP as presented in Section 3.6. Further opportunities are presently being explored and will be presented in the coming months.

7.7.2 Findings

The SIA presents the following findings:

- There will be an improved standard of living, especially for those within Zone A.
- There will be improved social well-being for most areas. Some surrounding areas such as Mount Edgecombe may experience reduced social well-being due to congestion and/or close proximity to low-income communities.
- Provision of service infrastructure is expensive, and depends on budget allocations. The probability of positive/negative impact depends on the decision to make qualitative and quantitative investment into

these services, timeously. If investment is indeed made, the impact will be positive, however if infrastructure is not provided sufficiently and timeously the impact will be extremely negative in every way – from the users in the residential and business communities both inside and outside Cornubia. It will also prove to be extremely undesirable publicity for such a high profile development.

- Cornubia Phase 2 will provide an opportunity for job creation. The impact of these opportunities on the local area is likely to be significant, although the impact on the greater region will be less visible given general unemployment statistics for the region. Given the proposed presence of the eTM housing development within the Greater Cornubia Development, and given that this precinct will accommodate people who are presently more or less unemployed, and given the stated commitment to preferential employment, or "zero unemployment" within Cornubia, for locals expressed by both Developers, the impact of these opportunities on the local (i.e. Zone A) communities will likely be significant.
- The proximity of Cornubia to the Dube TradePort and King Shaka International Airport represents significant opportunities for new and old businesses to take up residence in and around the Greater Cornubia Development. The provision of infrastructure, including road and rail, are likely to make the area particularly attractive.
- Given that eThekwini faces a massive housing crisis, with well over 200 000 families living in over 400 informal settlements in and around the city of Durban, an opportunity such as the Greater Cornubia Development offers an important if limited opportunity to impact on this crisis. The likely impact of the CIHD on informal communities will be significant, as they will be moving from shacks without services to free houses with services and access to purpose built amenities. There has been concern expressed around the achievement of densities, while at the same time providing houses that meet the expectations of people unused and often unwilling to live in high density structures. Housing typologies that have been built on the CIHD Phase 1 *(a)* will represent the type to be built on Phase 2.
- The impact of the proposed Cornubia development on education and learning could be significant given national, regional and local government commitment to building optimal numbers of schools inside the development. Education is a provincial mandate. This is an aspect of the Cornubia Development that depends on cooperation between different tiers of government.
- The physical nature of and the design ethic behind the Cornubia Development lends itself to contributing significantly to the provision of recreation and leisure in an area historically devoid of the same. However, it is noted that there is no clear management strategy that has yet been defined regarding this issue, although there is a commitment from THD that the part of the Cornubia site in its ownership will be managed as part of the duties of a Cornubia Management Association which is presently being formalised for Cornubia Phase 1.
- As on the provision of other social amenities such as education, it is noted that the development plans for Cornubia include the provision of two appropriate health facilities as determined by quotas. There is a shortage of health care facilities in the area presently and there is no possibility that existing facilities will cope with an influx of some 200 000 people into the area. If new facilities are not provided, the impact of the Greater Cornubia Development on health care in the area will be massive and negative. The CIHD Phase 1 *(a)* has the services of a mobile clinic that visits weekly. It should be noted that with the fact that the majority of people moving into Cornubia will be poor, health care is a major concern. It is noted that unless a holistic view is taken with regard to health and welfare, the health concern will be exacerbated. The BNG/GAP precincts must be managed in such a way as to promote health and not cause disease, through appropriate water, sanitation and waste disposal systems and procedures. The regional hospital to be erected at the nearby Bridge City Development will go a little way to alleviating the pressure on other hospitals, should none be built in Cornubia, but it will need to be supported by the provision of clinics.

7.8 Socio-economic Study

An addendum to the original socio-economic study was prepared to present updates on the previous report on likely socio-economic impacts of the Cornubia development in the eTM, dated February 2010. Since the time of that report development plans have been amended to accommodate a variety of factors, resulting in the need to reassess the likely scale and nature of impacts.

In the February 2010, during the compilation of the socio-economic impact report, the project extent and phases were still under discussion as was indicated in that report. The overall development was always

anticipated to be very substantial in terms of scale i.e. a total of 24 000 residential units and 1 359 280 m^2 of commercial bulk was planned for.

Cornubia Phase 1, as it is nearing completion has comprised of:

(i) An Industrial Precinct comprising 80 ha of platform, of which 70 ha had been sold to the investors by September 2014. Two buildings are operational and a number of others currently under construction; and
(ii) A pilot phase providing housing comprising of 482 units which have now been delivered.

In addition to this a 170 000 bulk m^2 retail park has since been approved and is presently under construction, the majority of this retail space has already been sold.

In terms of the Cornubia Phase 2 Development specifically, from a socio-economic perspective, it is noted that the differences in both the non-residential and residential scales of development are so slight to those initially proposed that they do not require analytically different revisions to the original projections of impacts as set out in the February 2010 report presented in the Cornubia Phase 1 EIA. In socio-economic impact terms the differences are, however, all positive with about a 4% increase in jobs, taxes, rates and related positives.

Cornubia was initially advocated as a major lower income housing development, and current figures still reflect this. The housing shortage in the eTM is well documented, and the Cornubia Phase 2 LUM Precinct Plan augments this beyond the projected rate of commercial space increase. There will, in addition, be positive jobs and national tax revenue implications deriving from the amendments, most notably through increased construction proposed. The likely implications in terms of additional demands for commercial space are not inconsistent with provisions that have already been made, and the commencement of the Cornubia Retail Park Development should provide impetus to the commercial component which is important for the projects' overall success. This project will be most unlikely to compete with other proposed retail expansions in the wider northern areas, which cater to different consumer sub-markets.

However, the amended projections for Cornubia Phase 2 do underscore the need for provincial and metropolitan authorities to budget for significant social infrastructure in these areas. High on the list of such priorities, given the high density housing and lower income nature of households, will be those relating to the needs of youth – schools, playing areas and sports fields prominent amongst them. High density, working class areas world-wide pose challenges of this nature, and it would be advisable to learn from international best practice in this regard.

This is especially pertinent in relation to the likely challenges of perceived relative deprivation, which world-wide are known to lie at the basis of expressed social grievances. Given the steep socio-economic gradient that will exist to the east of Cornubia, with the top end of the eTM's consumption patterns on display there, public sector planners would be well advised to make every effort to make Cornubia a model working class suburb, providing realistic hope for prospective upward class mobility. Education and training facilities are likely to lie at the centre of realistically catering for such hopes.

It is noted that the Cornubia SSIP aims to address many of these concerns. The SSIP is presented in Section 3.6.

7.9 Traffic Impact Assessment

The Cornubia Phase 2 TIA builds upon the previous studies completed and provides a macro-level analysis that supports both transport planning and traffic engineering and therefore, should be read in conjunction with TIAs prepared for earlier phases of the Greater Cornubia Development.

7.9.1 Public Transport Framework

The public transport (PT) framework for the Cornubia Phase 2 is illustrated in Figure 7-6. This provides an overview of the PT routes that were further refined as part of this study. The priority PT routes depicted in red represent the Bus Rapid Transit (BRT) corridors. The black dots on the red routes refer to the BRT station locations. The larger dotted circles shaded in red represent a 400 m radius that shows the BRT station walking catchment area.

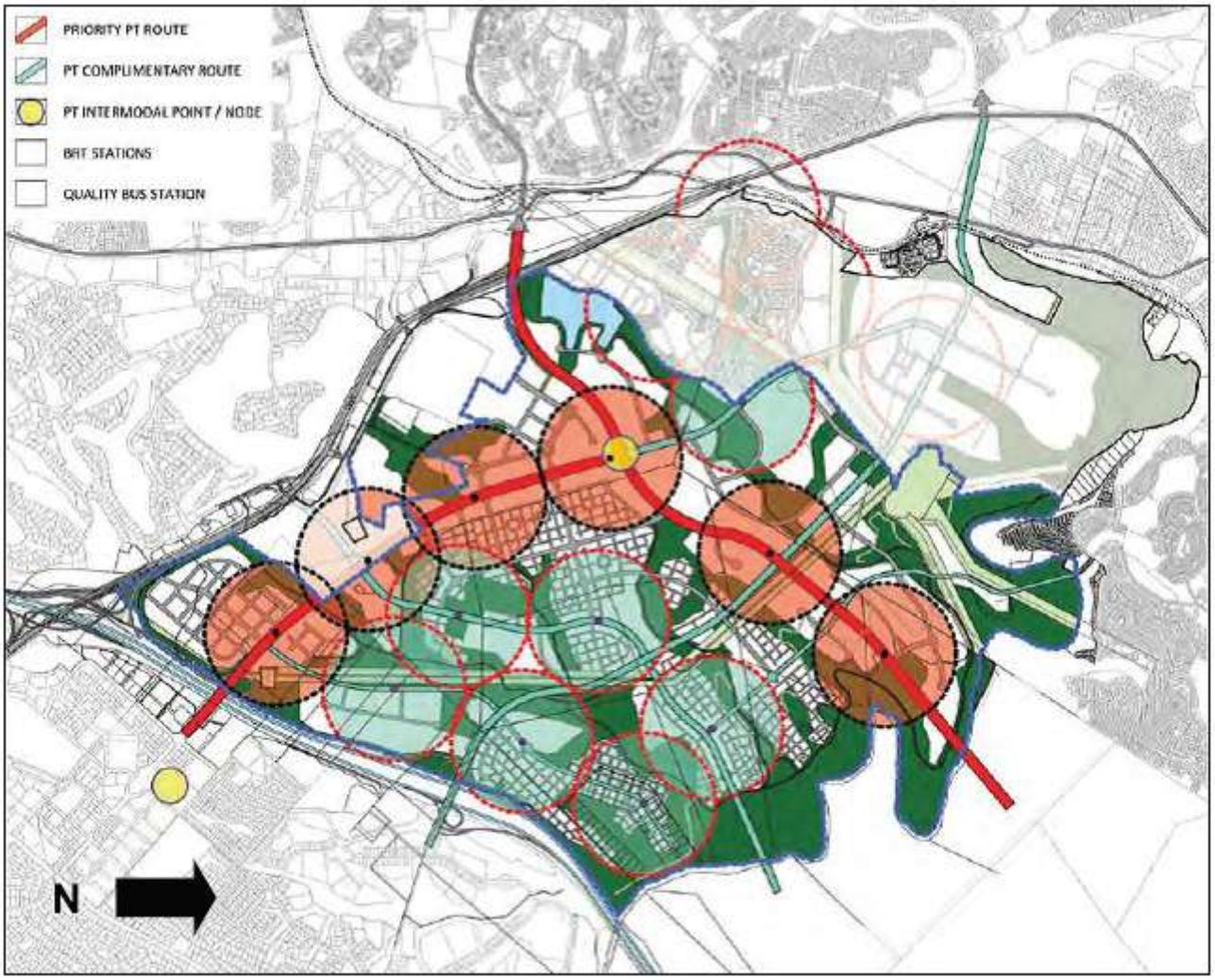


Figure 7-6: Public transport framework

7.9.2 Key Arterial Transport Routes (Public and Private Transport)

The key arterial transport routes through the Cornubia Phase 2 study area are:

- Cornubia Boulevard
- Blackburn Link
- Dube West
- Dube East

These arterial links and their associated intersections are to experience the majority of the vehicle based traffic and are to form the basis of the intersection analysis.

7.9.3 Traffic Framework Scenario

The transport framework scenario for the Cornubia Phase 2, has been based on the full completion of Phase 1 and 2, planned for completion by 2030. The framework scenario analysis uses the high modal split scenario.

7.9.4 TransCAD Road Network

The TransCAD road network is presented in Figure 7-7, Figure 7-8 and Figure 7-9, was enhanced by adding in link capacities, speeds and number of lanes. The network link attributes are provides in Table 7-6.

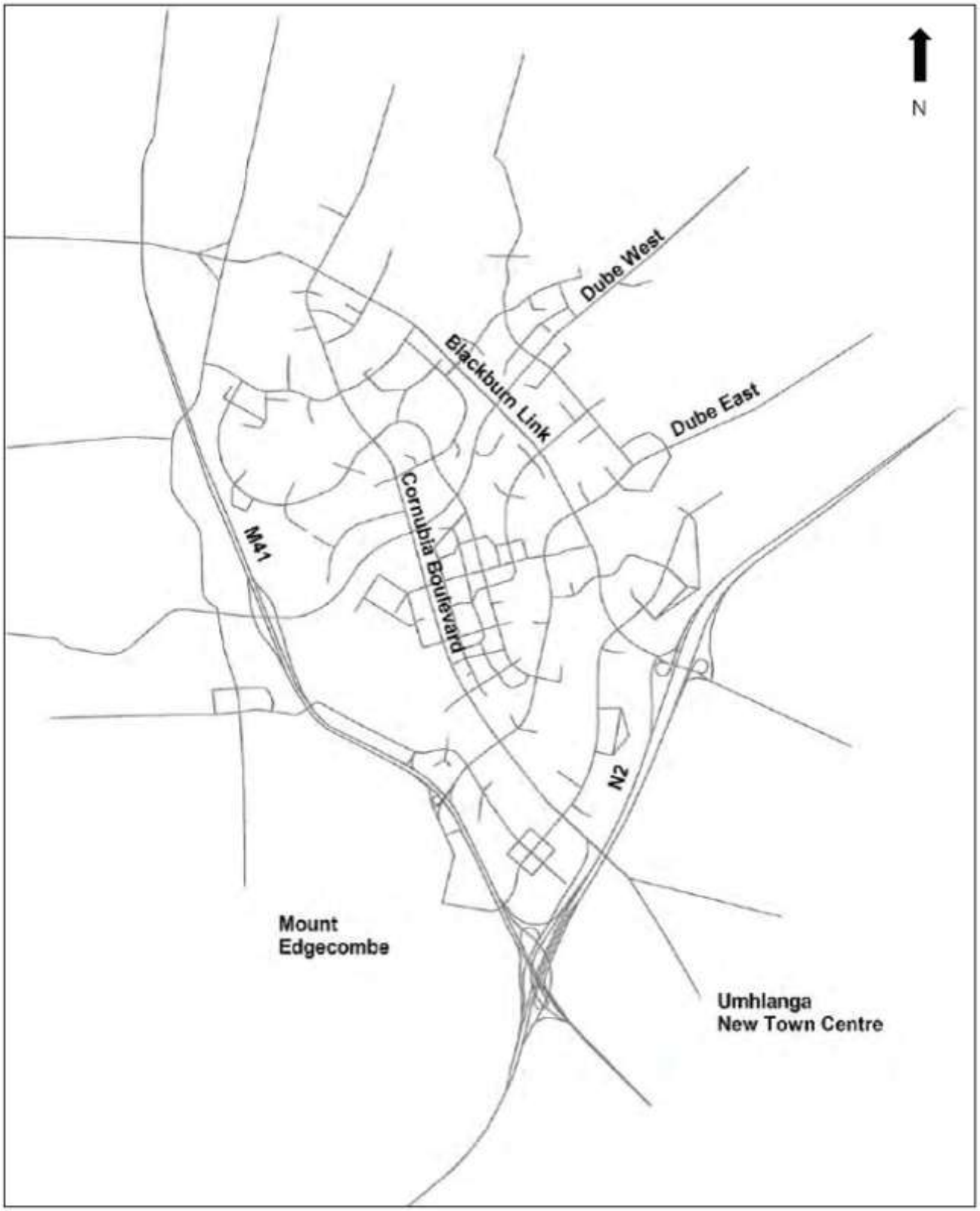
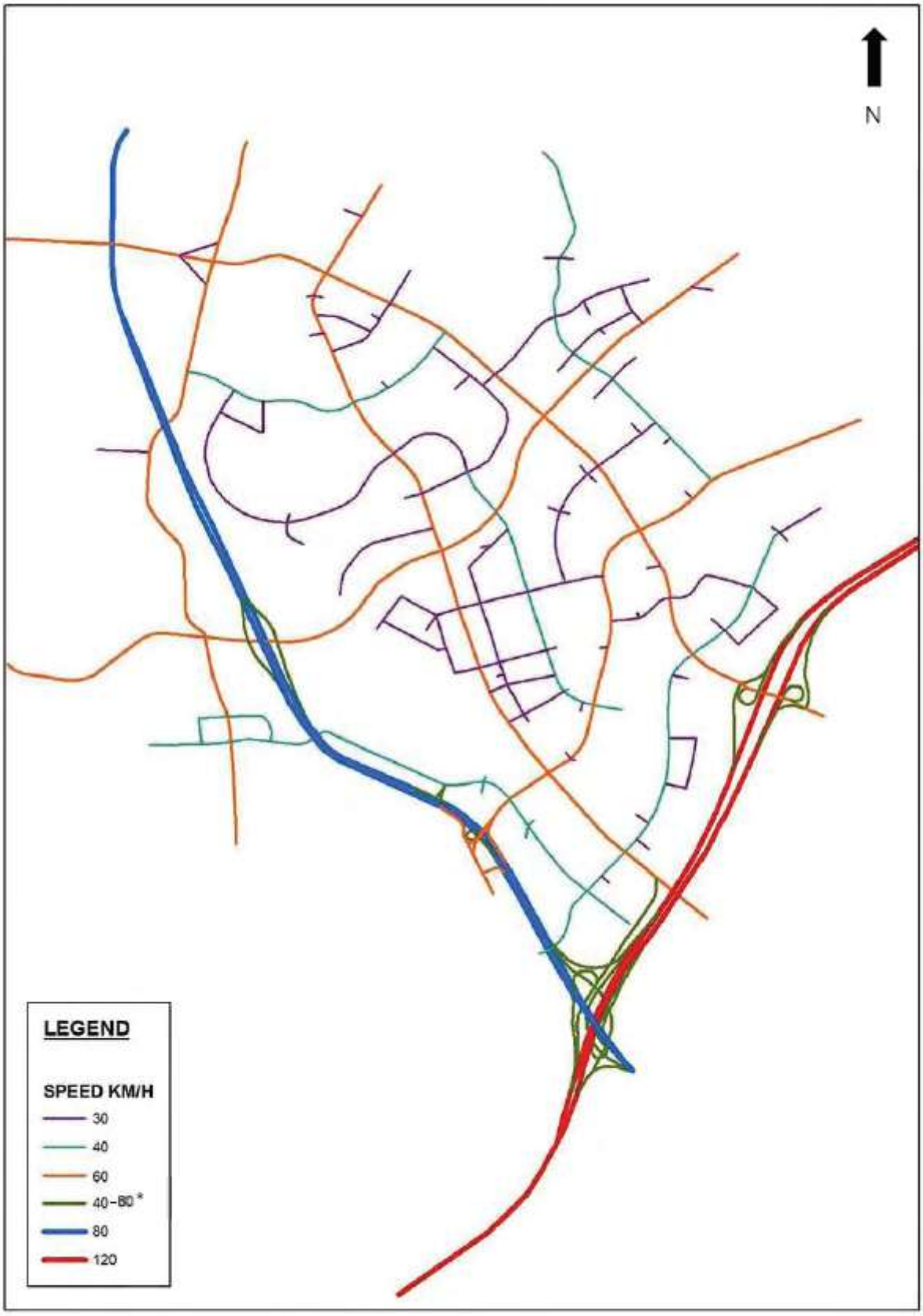


Figure 7-7: Extent of TransCAD road network



- Note: Ramp speed range from 40-80 kph depending on configuration

Figure 7-8: TransCAD road network (speed limit km/h)

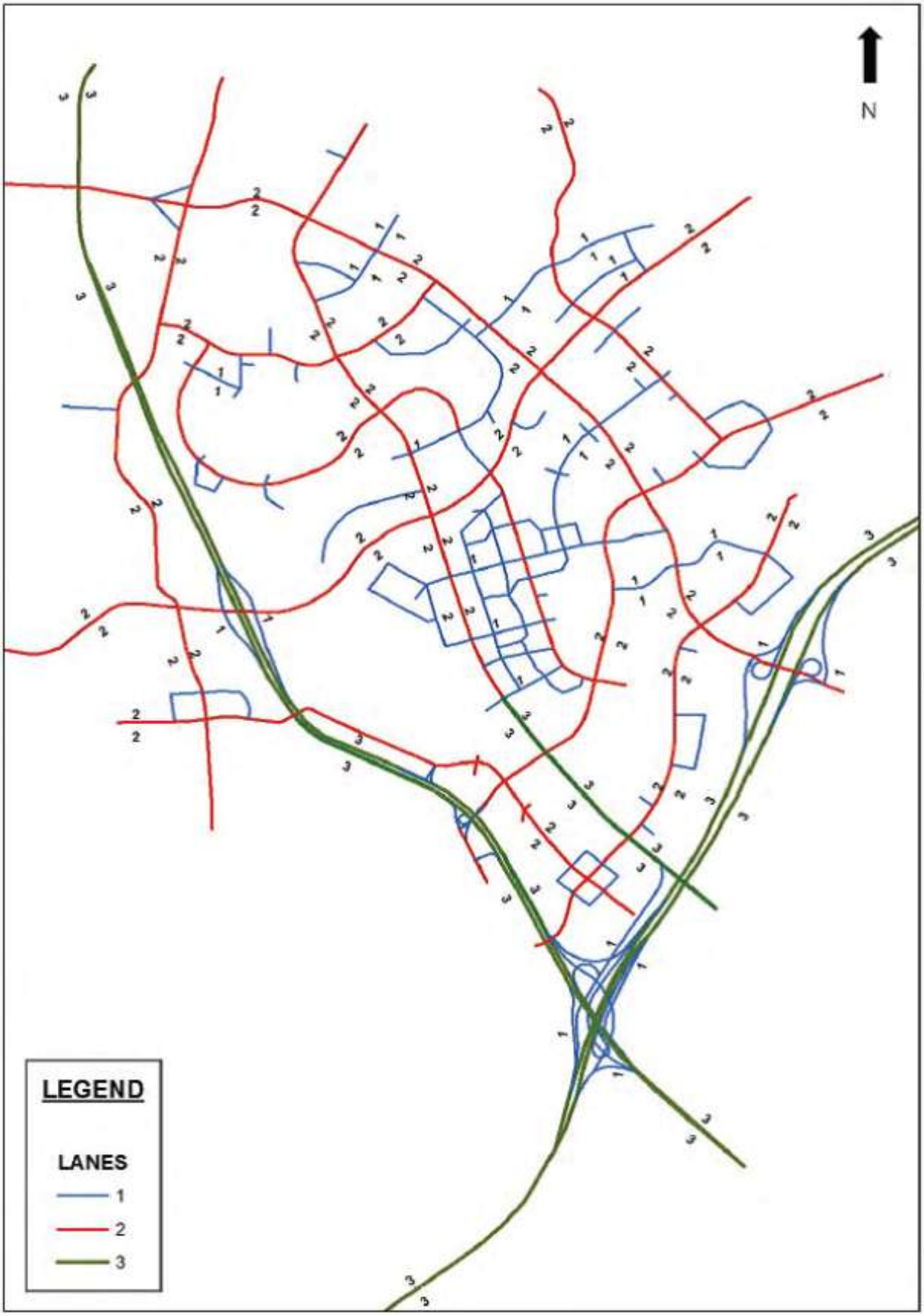


Figure 7-9: TransCAD road network (number of lanes per direction)

Table 7-6: Network link attributes

Road Type	Speed Limit (km/h)	Capacity Per Lane
Freeway	120 km/h	2000
On/Off Ramp	60 km/h	1800
External Arterial	80 km/h	1600
Local Arterial	50 km/h	1500
Collector	40 km/h	1200
Street	30 km/h	1000

7.9.4.1 Public Transport Network

The TransCAD PT Network incorporates the following PT services:

- BRT Services;
- Feeder Services; and
- Quality Bus Services.

7.9.4.1.1 BRT Services

The Cornubia Development supports the C8 and C9 BRT Corridors (Figure 7-10).

- C8 provides a BRT service from King Shaka International Airport to Durban CBD *via* Umhlanga and the return leg.
- C9 provides a BRT service from Bridge City to Umhlanga Ridge New Town Centre and the return leg.

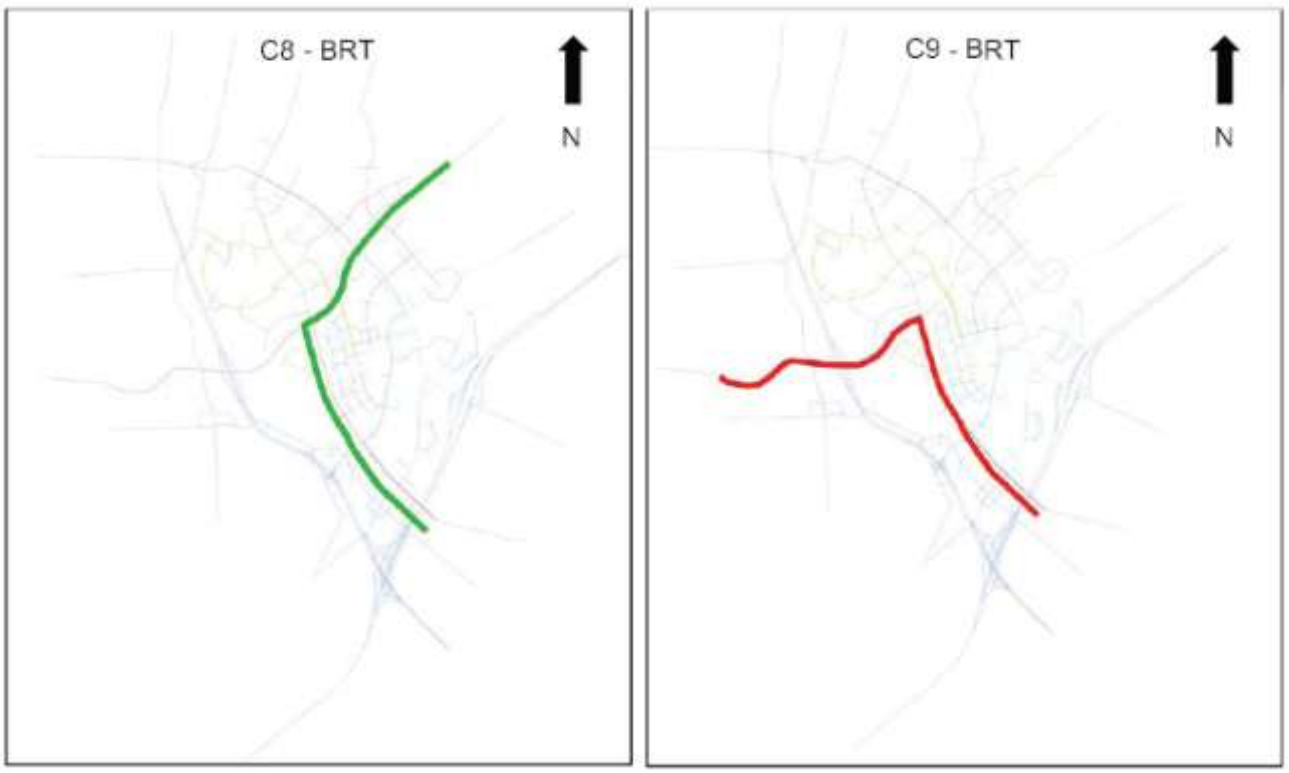


Figure 7-10: C8 and C9 Corridor BRT routes

7.9.4.1.2 Feeder Services

Feeder services provide a dedicated local bus service that primarily support the BRT routes. The feeder routes have been designed to provide comprehensive coverage of the Cornubia network that improves access to the BRT service and local road network. The 3 feeder routes designed are presented in Figure 7-11.

Figure 7-11: Feeder services

The Quality Bus Service (QBS) is to support PT passengers that are not within the catchment area of the BRT routes. Figure 7-12 illustrates the forward and reverse routes.

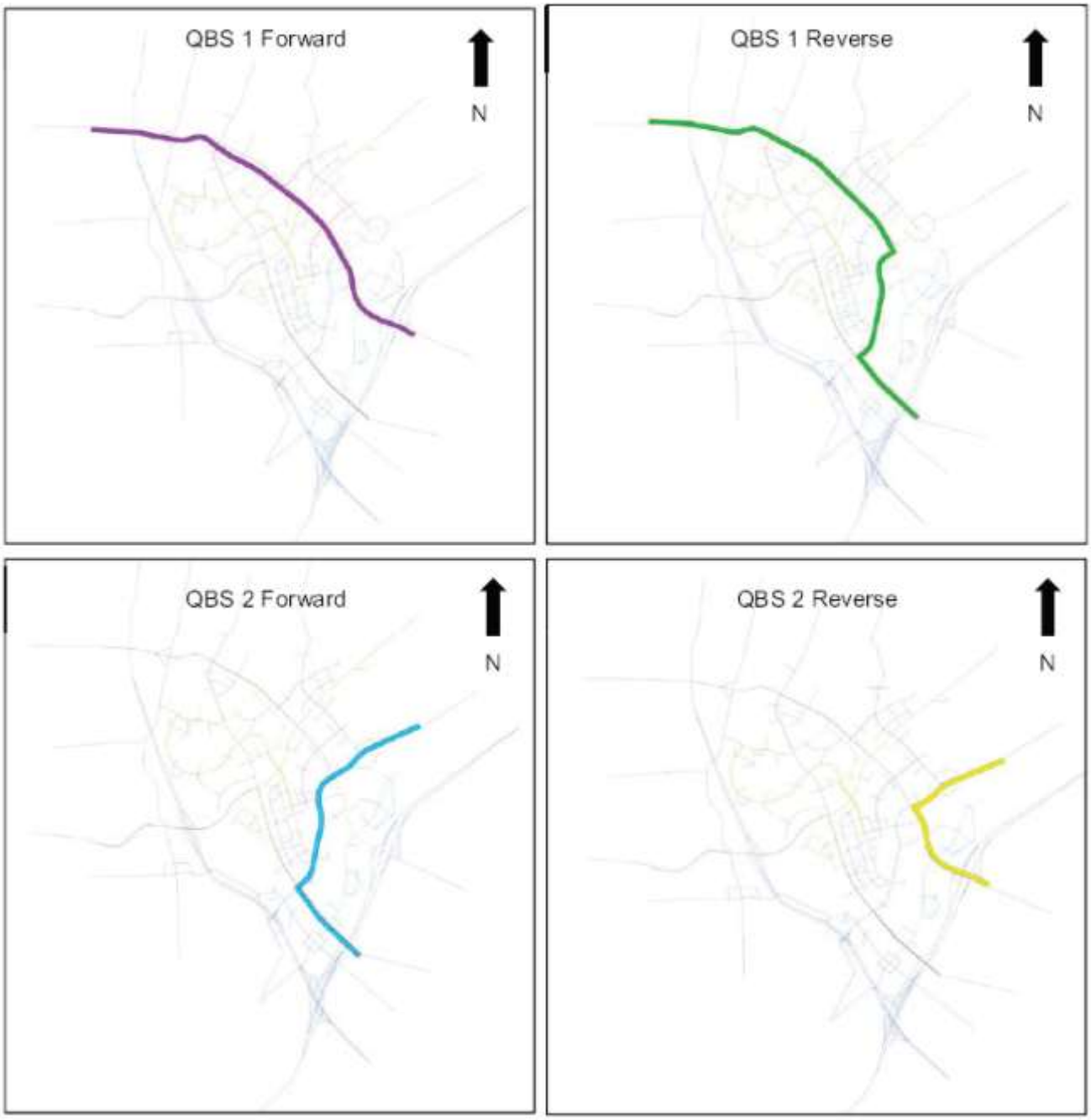


Figure 7-12: Quality bus service

7.9.4.2 Trip Generation

The trip generation stage calculates the person trips that are produced and attracted by the Greater Cornubia Development. Details of the trip generation analysis can be found in the TIA presented in Appendix C 9. Figure 7-13 and Figure 7-14 presents the total private vehicle trips in the morning peak hour and the total public transport vehicle trips in the morning peak hour respectively.

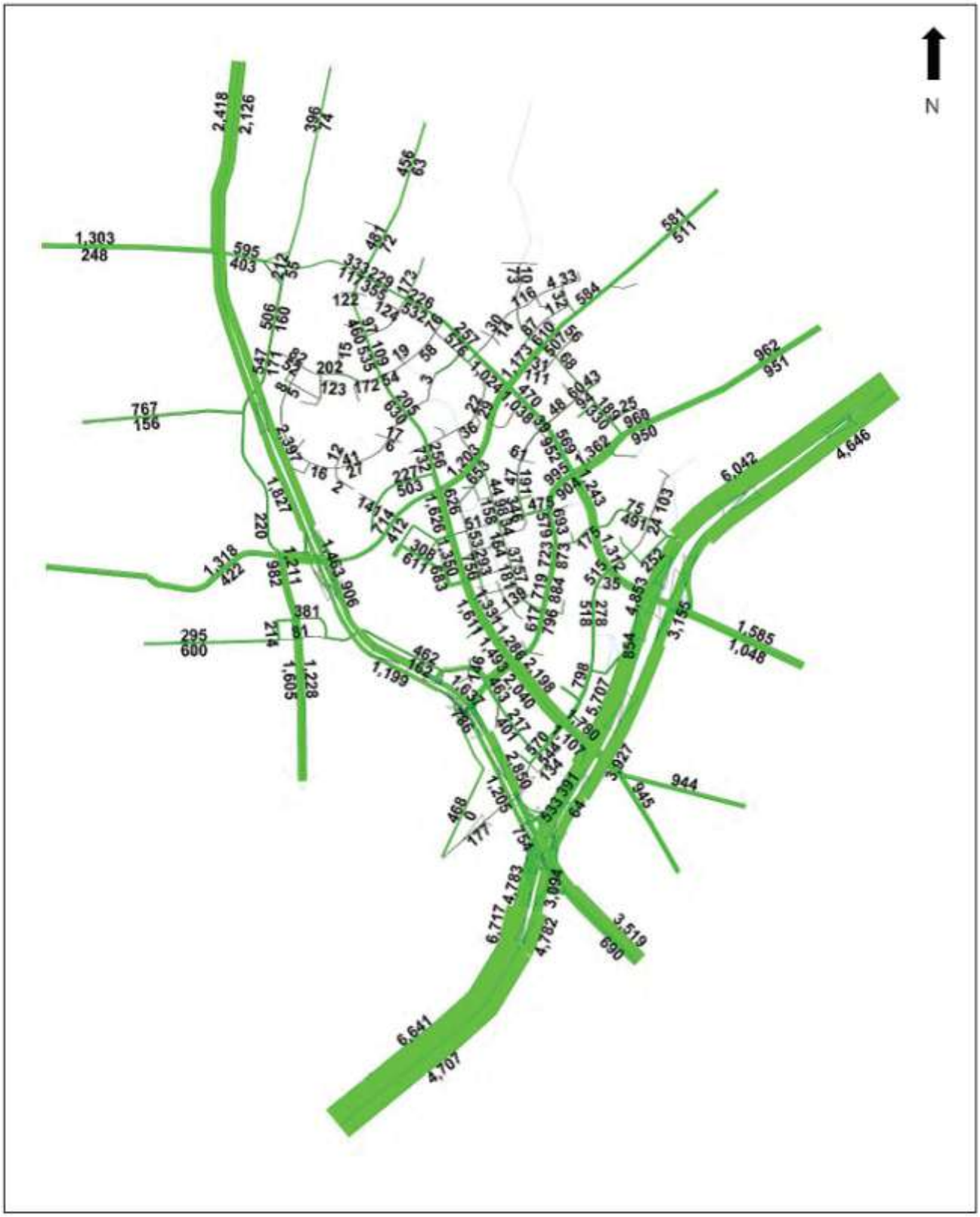


Figure 7-13: Total private vehicle trips (AM peak hour)

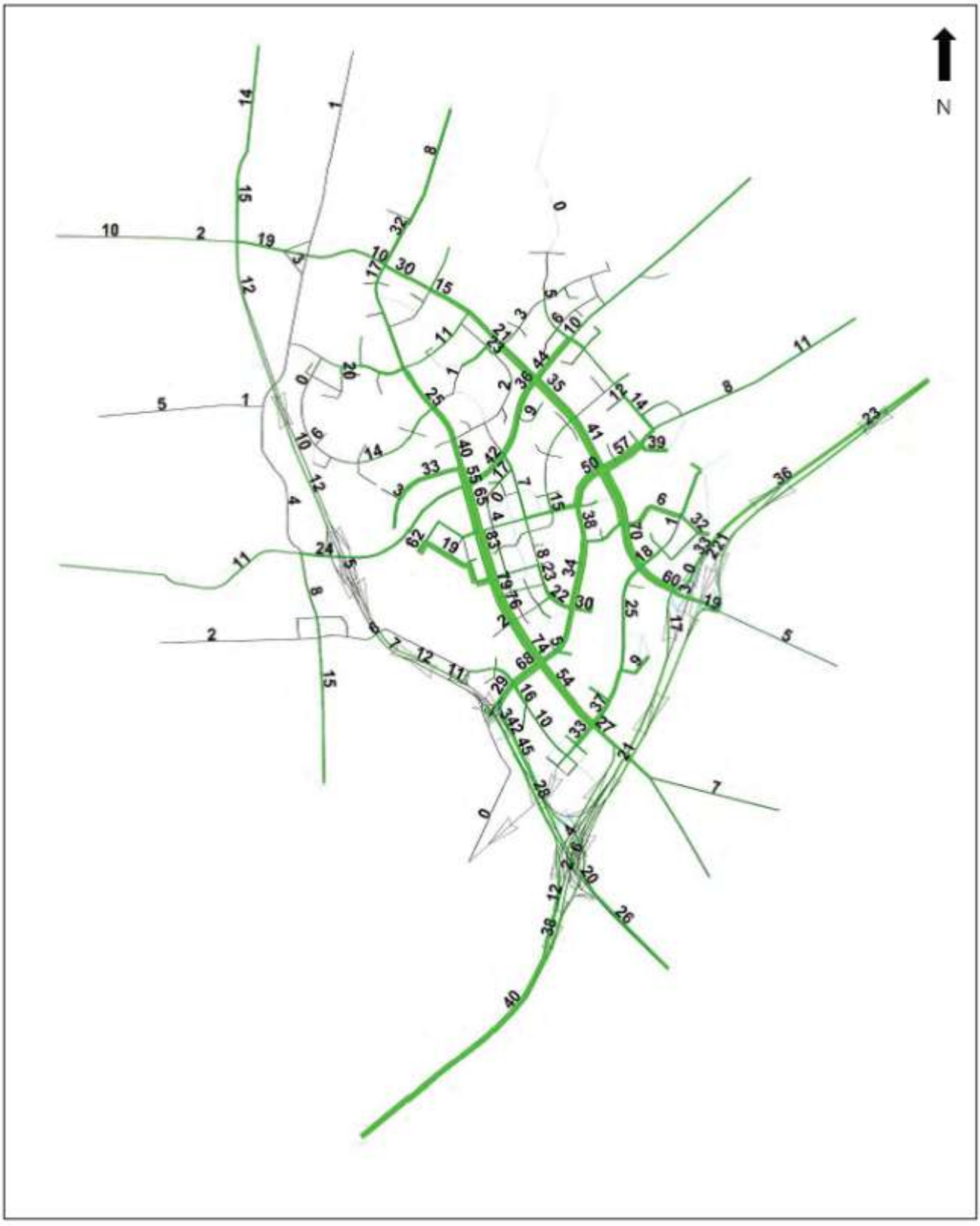


Figure 7-14: Total public transport vehicle trips (AM peak hour)

7.9.4.3 Intersection Analysis

Twenty-eight intersections were selected from the TransCAD model to be analysed within Sidra for the AM and PM peak hour. The intersections were selected as they represent the major intersections along major arterials and local roads within the greater Cornubia Developments. These intersections are presented in Figure 7-15. The results of the analysis can be found in the TIA presented in Appendix C 9.

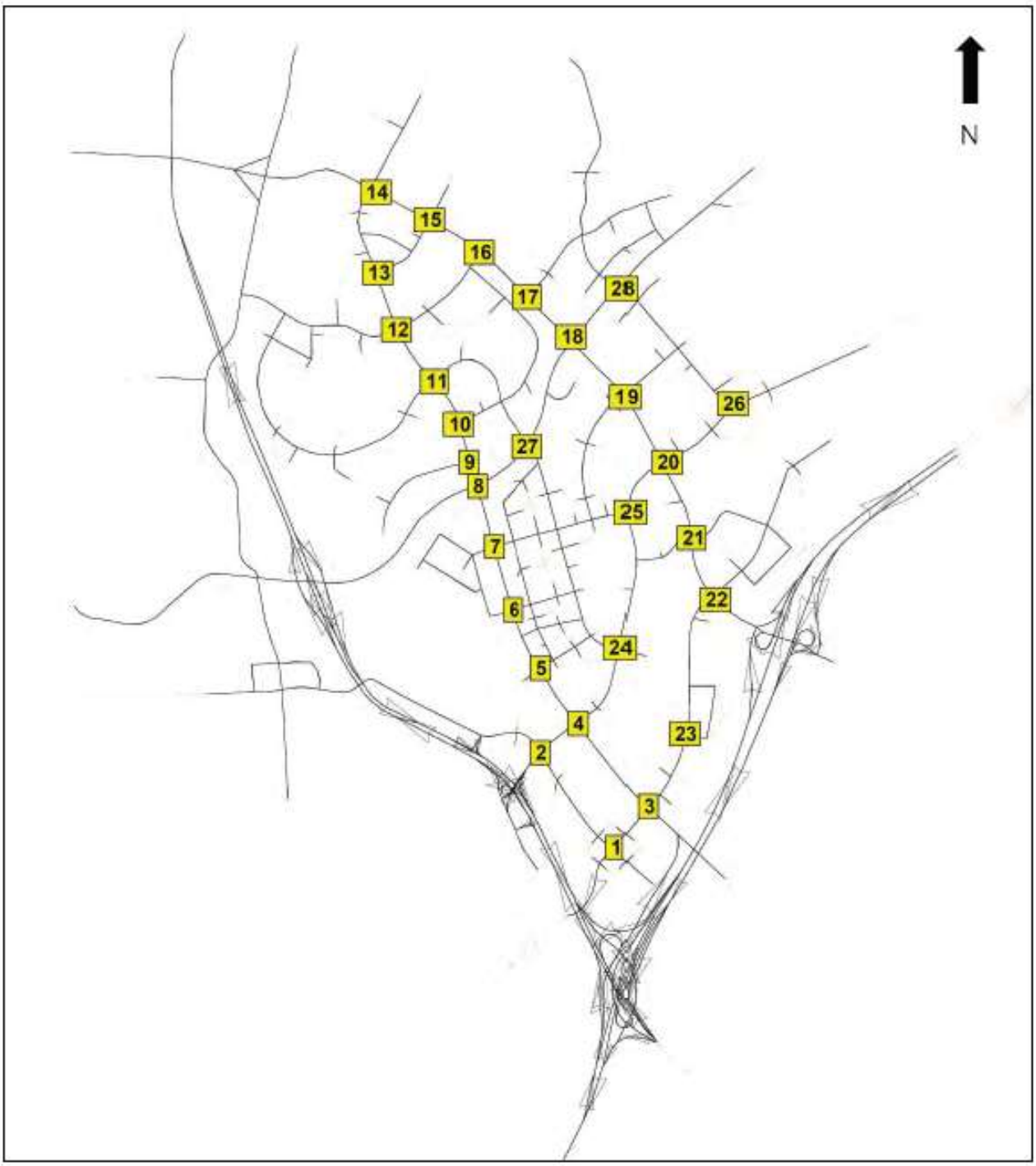


Figure 7-15: Intersections to be analysed with Sidra

7.9.4.3.1 Blackburn Interchange

The Blackburn Interchange layout is proposed to be a partial clover type interchange. Figure 7-16 shows the ramp descriptions as proposed for the Blackburn Interchange. The AIMSUN Model results conducted in the TIA show that this interchange operates well and all movements operate at a LOS A or B, and the volume to capacity ratios for this interchange are also low, showing that this interchange has spare capacity and will be able to cope with additional traffic demands.

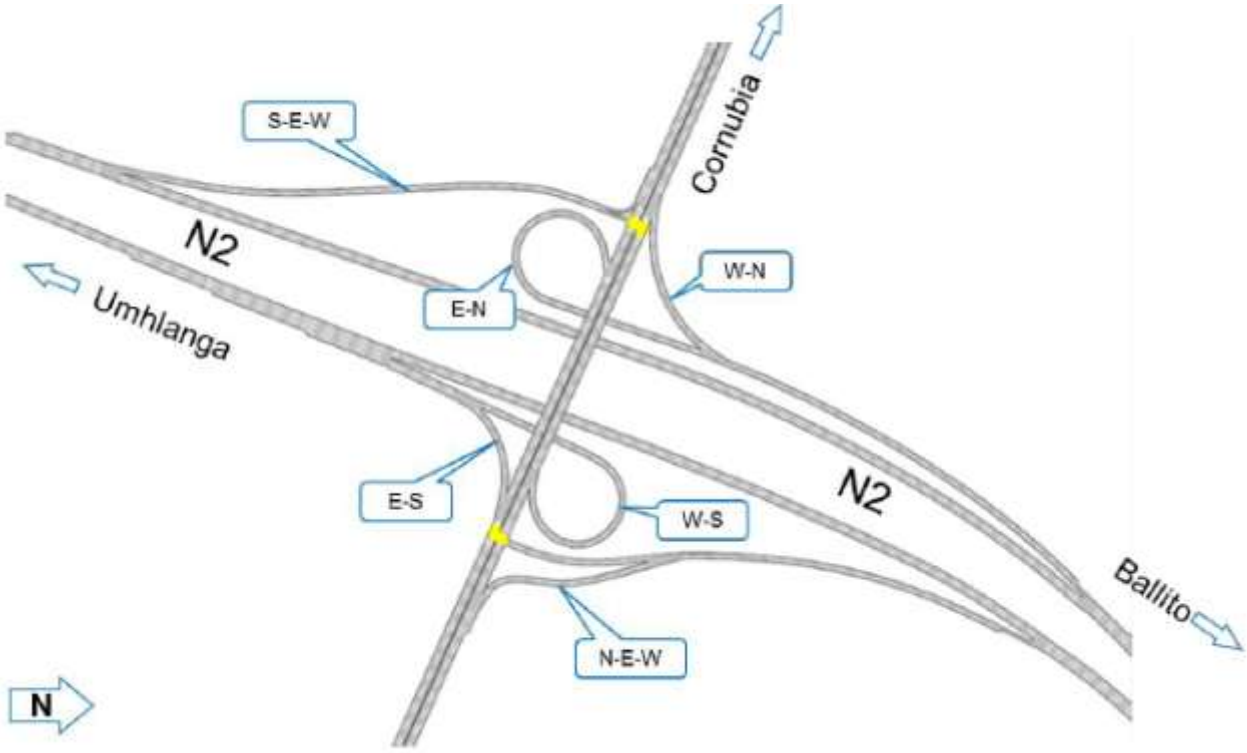


Figure 7-16: Blackburn Interchange layout and ramp descriptions

7.9.4.3.2 Marshall Dam Interchange

This interchange consists of two closely spaced interchanges, the first being the Phoenix Highway and R102 diamond interchange, and the second being the Marshall Dam Interchange which leads into Cornubia and connects the preceding interchange to the M41 towards Umhlanga. The Marshall Dam Interchange has directional ramps including dedicated public transport lanes, however, these lanes were not considered in the TIA analysis as they do not influence the performance of the interchanges due to their dedicated lanes. Figure 7-17 below shows the interchange layout and ramp descriptions.

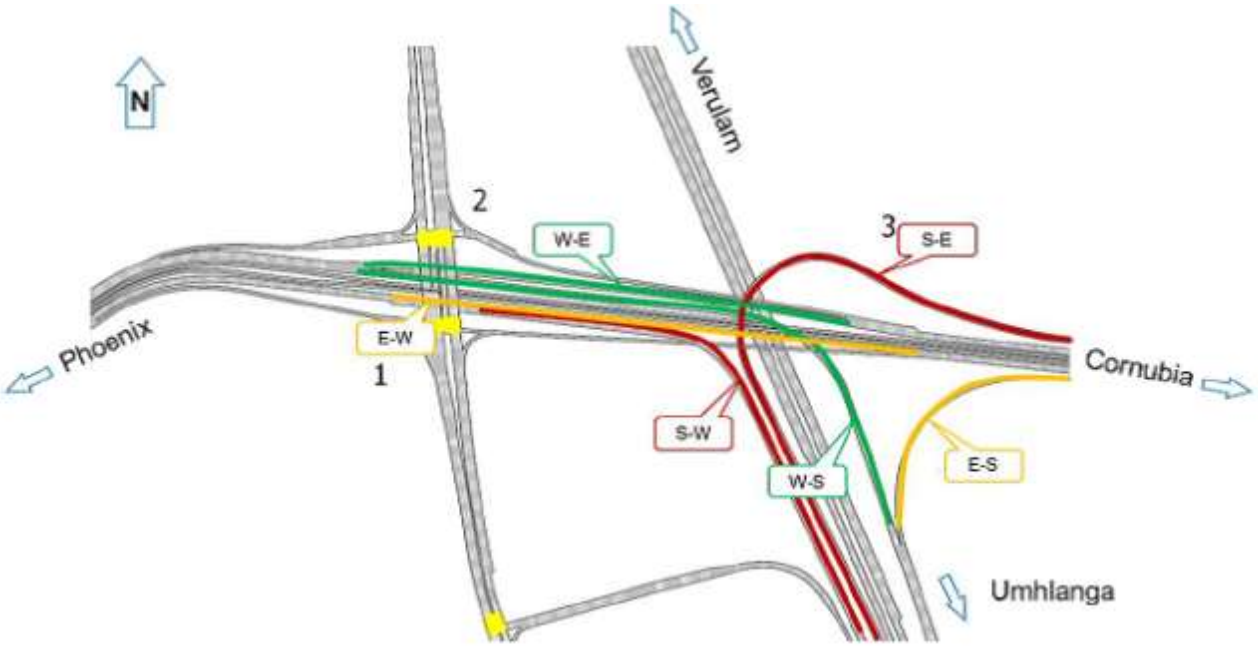


Figure 7-17: Marshall Dam Interchange layout and ramp directions

7.9.4.3.3 Phasing

The Cornubia Phase 2 development is planned to be constructed in further sub-phases, and the purpose of this section is to describe when key infrastructure is required to be constructed. This section is based on

various analysis scenarios that were tested using TransCAD to assess the infrastructure requirement timing based on envisaged the land uses that will be developed (Table 7-7). The Mount Edgecombe Interchange is currently being constructed by SANRAL and is not assessed in this study or the TIA.

Table 7-7: Road infrastructure phasing

Stage	Road Infrastructure	Development Land Use
Stage 1	M41 / Flanders Interchange	Cornubia Phase 1 + Cornubia Retail Park (170 000 m^2) + N2 Business Estate (65 000 m^2) + 2 995 Residential Units
Stage 2	N2 overpass to Umhlanga and N2 slip + Marshall Dam Interchange	Cornubia Phase 2 + 650 000 m^2 commercial (includes Cornubia Retail Park and N2 Business Estate) + 7 740 units + 3 400 m^2 social facilities
Stage 3	Blackburn Boulevard	Cornubia Phase 2 + 840 000 m^2 commercial (includes Cornubia Retail Park and N2 Business estate) + 12 300 m^2 social facilities + industrial 190 000 m^2
Stage 4	Blackburn Interchange + R102/Northern Drive Interchange	Phase 1 + 950 000 commercial (includes Cornubia Retail Park and N2 Business estate) + 23 970 units + 23 970 units + 20 000 m^2 social facilities + industrial 320 000 m^2

7.9.5 Key Findings and Conclusions of the TIA

The TIA undertaken presented the following findings:

- The TransCAD Macro model consists of a detailed network model covering highway and PT systems.
- The overall LOS of the 28 intersections fall between the range A to D in the AM and PM peak hour.
- The aim of the development of the AIMSUN Micro Simulation traffic model was to evaluate the performance of the road network surrounding the Cornubia Phase 2 Development zone. The AIMSUN model was developed with the geometric and traffic volume input from the planning studies and preliminary design drawings of the interchanges and Cornubia Phase 2 road infrastructure.
- The results from the model show that this road network will be able to accommodate the forecasted ultimate traffic demands at a good level of service during both peak hours. The weaving capacities of the connecting roadways were also found to perform well, with acceptable levels of service during both peak hours.
- The interchanges showed sufficient spare capacity beyond the ultimate scenario predicted traffic, however, the N2 freeway between the interchanges proved to be their limiting factor. Upgrading the N2 sufficiently to accommodate any future traffic shows that the interchanges will still function well during both peak hours.

7.10 Stormwater Management[17]

7.10.1 Impacts of Development on Existing Catchments

The impacts of Cornubia Phase 2 on the environment in the affected catchments will vary depending on the degree of planning and design and methods of implementation that contribute to the mitigation of the naturally negative impacts of development.

Expected consequences of unmitigated development include an increase in hardened areas, reduced infiltration areas, loss of vegetation and reduced evapo-transpiration potential. There will be an overall increase in surface run-off, an increase in the speed of run-off and peak flow rates in the watercourses.

[17] *The information in this section has been taken from the Stormwater Management Plan for Cornubia Phase 2 (2014) prepared by SMEC South Africa and can be found in Appendix B 3.*

Given the current poor attitudes of residents of the eTM towards litter and safe disposal of pollutants, the proposed intensity levels of the development may lead to significant increases in the pollution load in the watercourses and more specifically the Ohlanga River, unless measures are built in to reduce the polluting effects of first-flush stormwater run-off as well as blockages in the stormwater drainage system due to litter.

In the Ohlanga River Catchment, the MAR of the catchment is about 160 mm/year, or 36.4 Mℓ/day from 83.1 square kilometres of catchment. Within this catchment, Cornubia Phase 2 covers 10.8 km^2 with a current MAR of about 170 mm/year. Unmitigated development could increase this to about 270 mm/year, resulting in an average increase of 2.92 Mℓ/day additional normal and flood run-off.

The Greater Cornubia Development will import into the Ohlanga Catchment approximately 68 Mℓ/day of alien water through the potable water supply, which will contribute to a further 49 Mℓ/day of sewage flows in the Ohlanga catchment. Any irrigation off the potable water supply would add further to the net catchment run-off.

The Ohlanga River estuary already receives excess flow in the form of wastewater discharges from two sewerage treatment works and it is important therefore that adequate measures are taken to mitigate further impacts.

In the Umgeni Catchment, the Marshall Dam is an important water resource and serves as an intermediate reservoir supplying irrigation water from Umdloti River to Mount Edgecombe when local run-off is unable to meet irrigation demands. It is important that the Greater Cornubia Development and Cornubia Phase 2 specifically does not negatively impact on the water quality in the Marshall Dam and that the dam is maintained in a good and safe condition.

Potential impacts and proposed mitigation measures are elaborated on in Section 9.3.

These mitigation measures presented in the Stormwater Management Plan (SMP) must be carried into the Wetland and Open Space Rehabilitation Plan. The SMP described below lists many practical on site controls to address these fundamentals issues. However, this does not exclude any technology that can be shown to be effective in controlling run-off while supporting the proposed spatial development intensity levels and contributing positively to the environment.

To fully mitigate the negative impacts of development:

- The potential increase in catchment run-off must be balanced against the combined effects of evapo-transpiration from catchment vegetation, evaporation from water bodies plus the retention and re-use of both storm run-off and treated wastewater.
- The potential increase in flood peaks must be mitigated to at least pre-development levels by the provision of sufficient stormwater attenuation facilities at micro and macro levels.
- The potential increase in flood volumes must be mitigated where possible by subsoil infiltration, retention of run-off in on site facilities for irrigation use and unsaturated wetland areas where evaporation and infiltration can help to reduce flood run-off rates.
- Installations must be provided to contain pollution as close to source as possible and in a practical location for servicing by Department of Solid Waste.

7.10.2 Critical Aspects

Preliminary assessment of the catchments has highlighted the vulnerability of the Ohlanga River system to the potentially negative impacts of unmitigated increases in polluted stormwater that would be generated by Cornubia Phase 2. Quantity and quality of stormwater run-off is hence a crucial aspect in the development.

Stormwater attenuation ponds should be designed for the 50-year storm event and should be located at appropriately selected sites in the primary watercourses. Site selection must take into account the relevant geotechnical, environmental and topographical conditions, including wetland conservation.

Micro-stormwater attenuation and filtration measures should be implemented on individual sites to reduce run-off rates and improve water quality. The form of this attenuation will be dependent on a number of factors such as topography (natural and artificial slopes), the zoning of the site and soil conditions present. It is envisaged that in the steeper regions on site, attenuation tanks will be the most suitable form of attenuation with outlets to the municipal stormwater pipe network, where provided, or appropriate flow spreaders.

In the less steep areas where soil conditions are favourable, infiltration measures will be the preferred form of on-site stormwater control and disposal. In certain instances infiltration devices may need to be supplemented with attenuation tanks with overflow outlets to the municipal stormwater pipe network.

A limited stormwater pipe network should be provided for stormwater reticulation to safely convey minor stormwater run-off from properties and roads to and between the attenuation facilities. Hydraulic analysis is required to determine where existing elements of the major stormwater system are inadequate and how these problems can best be addressed.

To improve run-off water quality, silt and trash traps need to be provided within the system. Where conditions permit, open ditches, drains and channels should be used instead of pipes. Attention must be given to the erodibility of channels where flow velocities are high and appropriate lining provided. Forms of lining will vary from natural vegetation to stone pitching and reinforced concrete linings.

While the stormwater management objective of the development should be to minimise the concentration of stormwater and attenuate flows as much as possible, roads and driveways cut into steeper slopes will cause storm run-off to be channelled and focused. Exit points should be located over flat ground, where sheet flow can be re-established or into culverts that convey the flow to a water body, or an energy dissipating device.

In preparing the sub-catchment boundaries, account has been taken of the natural watersheds and the probable impact of proposed roads on the flow of stormwater run-off. Certain sub-catchment boundaries will need to be defined by proposed roadways that are likely to concentrate stormwater run-off in a formalised system.

Within the development area, stormwater servitudes of adequate width will be required over properties straddling a natural watercourse, or where run-off is diverted for a specific reason. Lined conduits, either open channels or pipes, with outfall energy dissipaters must be provided wherever there is an assessed risk of erosion on slopes steeper than 2%.

The proposed development should not adversely impact on the environments of the development node and surrounding areas in terms of erosion and sediment deposition, but the frequency of flooding and the total run-off volume will increase unless adequate provision can be made to maintain the current natural rate of stormwater retention and infiltration in the sub-catchments.

An overall Stormwater Systems Model should be developed to determine peak flood flow rates and flood levels for the main watercourses and assess the collective impacts of developments on run-off patterns. The outputs from the modelling will provide the input data required for the design of culverts, channels and other stormwater infrastructure associated with the proposed developments.

Detailed hydraulic analysis will be required during the design stage to assess storm run-off and flood levels at specific locations, such as bridges, road culverts and where properties are affected by the 100-year flood. It is important to note that although a structure may be designed for a return period of less than 1 in 100 years, the design analysis must still assess the consequences resulting from a 100- year storm event.

For sub-catchments flowing into the development area, potential future development in these sub-catchments should be considered and any requirements for stormwater detention should be identified. Similarly, for sub-catchments flowing out of the development area the impact on the downstream watercourse must be considered and measures taken to ensure any upstream development does not result in an increased flood damage risk downstream.

Sites within the proposed development that bound on stormwater attenuation areas, near road crossings, watercourse confluences and water features could be subject to flooding. In these situations no development should take place below the outfall levels of water detention areas, plus an appropriate freeboard allowance.

The proposed development layouts will impact on storm run-off to varying degrees. Adequate provision will have to be made for the management and disposal of stormwater run-off from the various internal developments as they are planned and this must be done in an integrated and coordinated process to avoid stormwater damage in the future.

Overland flow may be encouraged where possible, but should be avoided in the specific areas identified. These are typically where roads on steep slopes will capture and concentrate cross flows at the local low

points in the roads. Designs must take into account probable impact of flow from these points of concentration on the downstream environment.

Steep watercourses will require protection from erosion through the use of appropriate channel lining, detention dams, or controlled drops to dissipate flow energy.

All natural and unlined channels should be inspected for adequate binding of soil by sustainable ground cover. Stone pitching should be used to reinforce channel inverts on steep slopes. Existing wetlands and stormwater detention areas should be protected from encroachment by the development.

7.10.3 Proposed Stormwater System

Details pertaining to the stormwater management measures proposed are presented in the EMPr (Appendix B) and SMP (Appendix B 3).

At this stage, it is proposed that stormwater is attenuation via dry stormwater attenuation facilities located in wetlands (Figure 7-18); however, an alternative case study for attenuation in a dry stormwater attenuation facility outside of wetlands but within the 30 m wetland buffer is also considered.

The attenuation measures selected will be required to reduce the post-development peak run-offs for the 1 in 10 and 1 in 50 year storms to pre-development levels. With this in mind, it is recommended that the hydraulic characteristics of the stormwater network is analysed (using EPASWMM or similar software) during the detail design phase of the project. This analysis will accurately determine the attenuation volumes required and the outlet configuration required to reduce the peak outflows to pre-development levels.

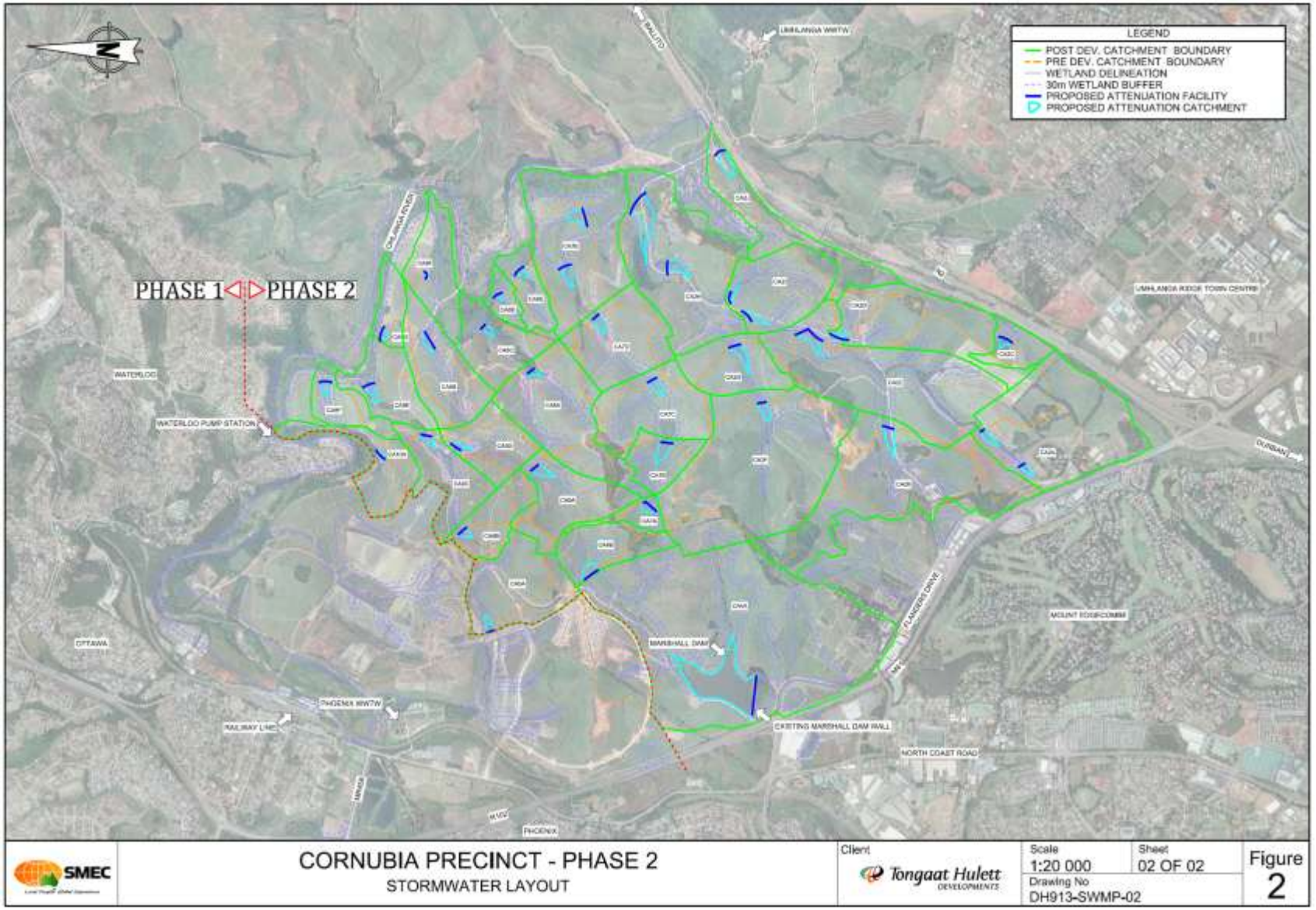


Figure 7-18: Proposed stormwater attenuation facilities

8 PUBLIC PARTICIPATION PROCESS

Public participation is a process that is designed to enable all interested and affected parties (I&APs) to voice their opinion and/ or concerns which enables the practitioner to evaluate all aspects of the proposed development, with the objective of improving the project by maximising its benefits while minimising its adverse effects. I&APs include all interested stakeholders, technical specialists, and the various relevant organs of state who work together to produce better decisions. The primary aims of the public participation process are:

- to inform I&APs and key stakeholders of the proposed application and environmental studies;
- to initiate meaningful and timeous participation of I&APs;
- to identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- to promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- to provide information used for decision-making;
- to provide a structure for liaison and communication with I&APs and key stakeholders;
- to ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);
- to focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders; and
- to provide responses to I&AP queries.

The public participation process must adhere to the requirements of Regulations (GNR 543) under the NEMA. The public participation process for the Cornubia Phase 2 EIA process has been, and continues to be undertaken according to the stages outlined below.

The public participation process for the Cornubia Phase 2 EIA process has been undertaken according to the stages outlined below.

Figure 8-1: Responsibilities of I&APs in the different stages of the project

Real Consulting is working with RHDHV on the Public Participation Process (PPP) for the Cornubia Phase 2 Development. In recent years THD has taken a much more participatory approach to their property development projects, with the understanding that the socio-political and economic context of the times invites this more public approach. Communities that surround the developments are invited to “inform and be informed” about developments through the establishment of forums in order to achieve the most positive impacts possible. It is also noted that engaging stakeholders even before developments are built can achieve the best impacts. It is for this reason that the PPP that forms part of the EIA becomes the basis of a long-term stakeholder engagement process.

For the purposes of the EIA phase, the PPP aims to ensure that the full range of stakeholders is informed about Cornubia Phase 2 and its complex profile throughout the period in question. In order to achieve this, a number of key activities have taken place and will continue to take place. These included the following:

- The identification of stakeholders is a key deliverable at the outset, and it is noted that there are different categories of stakeholders that must be engaged, from the different levels and categories of government, to relevant structures in the NGO sector, to the communities adjacent to the Cornubia Development;
- The development of a living and dynamic database that captures details of stakeholders from all sectors;
- The convening of focussed and general meetings with stakeholders at different times throughout the EIA process (and beyond);
- The engagement of public leaders to whom the public generally turn for information, keeping such individuals well informed about process and progress;
- The fielding of queries from I&APs and others, and providing appropriate information;
- The convening of specific stakeholder groupings/forums as the need arises;
- The preparation of reports (both baseline and impact assessment) based on information gathered throughout the EIA via the PPP and feeding that information to the relevant decision-makers;
- The PPP could include distribution of various types of pamphlets and other information packs; and
- Where appropriate site visits may be organised, as well as targeted coverage by the media.

Specifically the Cornubia Phase 2 PPP has entailed the following activities.

8.1 Authority Consultation

The competent authority which is the KZN EDTEA is required to provide an environmental authorisation (either positive or negative) for the project. The KZN EDTEA was consulted from the outset of this study, and has been engaged throughout the project process.

The competent authorities issuing decisions regarding the project as well as consultation to date are presented in Table 8-1 below.

Table 8-1: Competent authorities and other relevant authorities associated with the project

Authority	Role	Licence/Approval	Consultation to date
KZN Department of Economic Development, Tourism and Environmental Affairs Environmental Impact Assessment Branch	Competent Authority for Environmental Authorisation process	Environmental Authorisation	• Submission of an application for environmental authorisation in terms of Section 26 of the EIA Regulations (2010) on 15 June 2012. • Approval of the application documentation by KZN EDTEA was received on 20 June 2012 with the following reference numbers DM/0030/2012 and KZN/EIA/0000762/2012. • Submission of a final ESR to KZN EDTEA Environmental Impact Assessment Branch on 5 November 2012. • Acceptance of the final ESR by the KZN EDTEA Environmental Impact Assessment Branch on 15 January 2013. • Requests to keep application on file made on the following dates 05 July 2013, 06 November 2013, 12 Match 2014 and 01 August 2014.
Department of Water and Sanitation	Competent Authority for Water Use Licence Application process	Water Use Licence	• Pre-application meeting for the Water Use Licence Application held at the DWS Regional Office on 30 May 2013 • Pre-application workshop with representatives from both

Authority	Role	Licence/Approval	Consultation to date
			national and regional DWS held on 11 June 2013 A further pre-application workshop is to be held with the DWS at the end of November 2014
Department of Agriculture, Forestry and Fisheries	Competent Authority for the licence to remove/relocate protected tree species	Commenting Authority	Site Visit undertaken. Interim comment received on 12 November 2012 (Appendix H)
Ezemvelo KZN Wildlife	Competent Authority for the permit to remove/relocate protected indigenous plants	Commenting Authority	Interim comment received on 29 October 2012 (Appendix H).
Amafa aKwaZulu-Natali	Heritage Authority	Approval indicating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the NHRA, Act 25 of 1999	Interim comment received on 03 December 2012 (Appendix H)

8.2 Consultation with Other Relevant Stakeholders

Consultation with other relevant key stakeholders were and will continue to be undertaken through telephone calls and written correspondence in order to actively engage these stakeholders from the outset and to provide background information about the project. These stakeholders are included in Table 8-2.

Table 8-2: Key stakeholders contacted as part of the public participation process

OWNERS AND OCCUPIERS OF LAND ADJACENT TO THE SITE	
Refer to detailed database in Appendix H	
LOCAL AUTHORITY	
Cllr Mxolisi Ndzimbomvu	Ward 58 Councillor - Waterloo
Cllr Musa Dludla	Ward 102 Councillor – Mount Edgecombe
Cllr Solly Singh	Ward 50 - Phoenix
Cllr Patrick Pillay	Ward 51 – Ottawa and Park Gate
Cllr Heinz de Boer	Ward 35 - Umhlanga
Cllr Chellappen Arunajallam	Ward 60 - Verulam
Diane van Rensburg	eThekwini Municipality
PROVINCIAL AUTHORITY	
Dominic Wieners	Ezemvelo KZN Wildlife
Weziwe Tshabalala	Amafa aKwaZulu-Natali
Carolyn Schwegman	WESSA KZN
Yugeshni Govender	KZN EDTEA
STATE DEPARTMENTS	
Manisha Maharaj	Department of Water and Sanitation
Roy Ryan	Department of Transport
Thobani Vetsheza	Department of Agriculture, Forestry and Fisheries
Nonhlanhla Mnyeni	Department of Agriculture

8.3 Overview of the Scoping Phase PPP

The PPP undertaken during the Scoping Phase is presented in Figure 8-2.

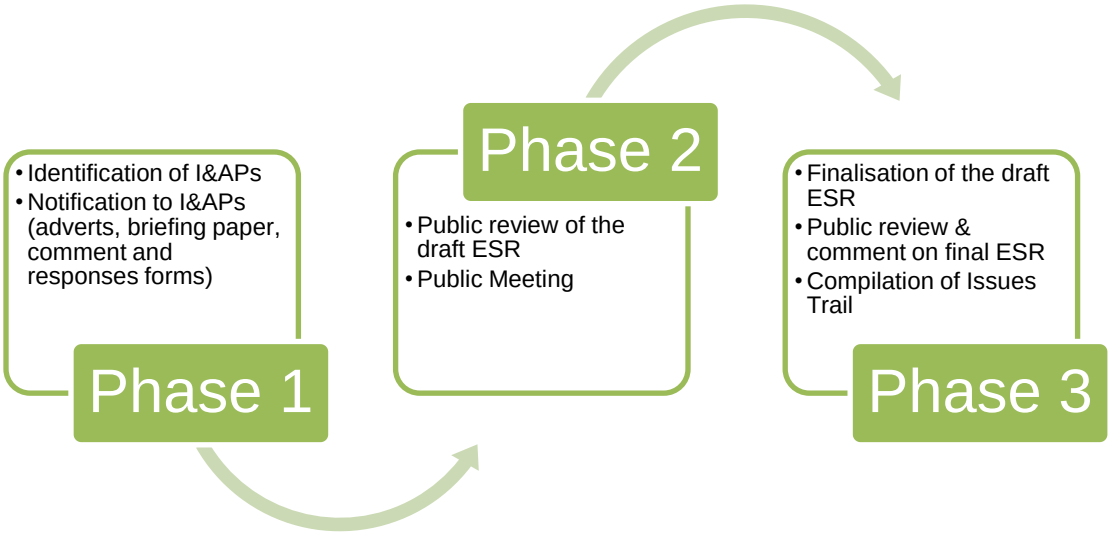


Figure 8-2: Key Phases in the PPP Undertaken During the Scoping Phase

8.3.1 Identification of Interested and Affected Parties

Prior to commencement of the PPP a detailed understanding of the project description was attained from the Applicant. Upon receiving the description a site visit was undertaken, this process was used to identify the following:

- Identify key areas of concern.
- Identify sites for the placing of the site notices.
- Attain a visual understanding of the project.
- Identify possible sites to undertake Focus Group Meeting / Public Meetings.
- Identify areas most impacted by the proposed development.

The first step in the PPP entailed the identification of key I&APs and Stakeholders, including:

- Local and provincial government;
- Local businesses;
- Residents;
- Affected and neighbouring landowners;
- Environmental Non-Governmental Organisations; and
- Community Based Organisations.

An I&AP Database was compiled which has been maintained and updated throughout the duration of the EIA process.

I&APs were identified primarily through an existing database as well as from responses received from the notice boards mentioned above. Electronic notification was sent to key stakeholders and other I&APs on the existing database, informing them of the application for the project, the availability of the draft ESR for review and indicating how they could become involved in the project. The contact details of all identified I&APs are updated on the project database, which is included in Appendix H.

8.3.2 Other Scoping Phase PPP Activities

The following tasks were also undertaken as part of the scoping phase PPP and details pertaining to each task can be found in the PPP Summary report included as Appendix H:

- Site notification;
- Briefing paper / Background Information Document (BID);
- Advertisements;
- Public Meetings;
- Public Review of Draft Environmental Scoping Report;

- Issues Trail; and
- Final Environmental Scoping Report.

8.4 Overview of the EIA Phase PPP

The PPP undertaken / to be undertaken during the Scoping Phase is presented in Figure 8-3.

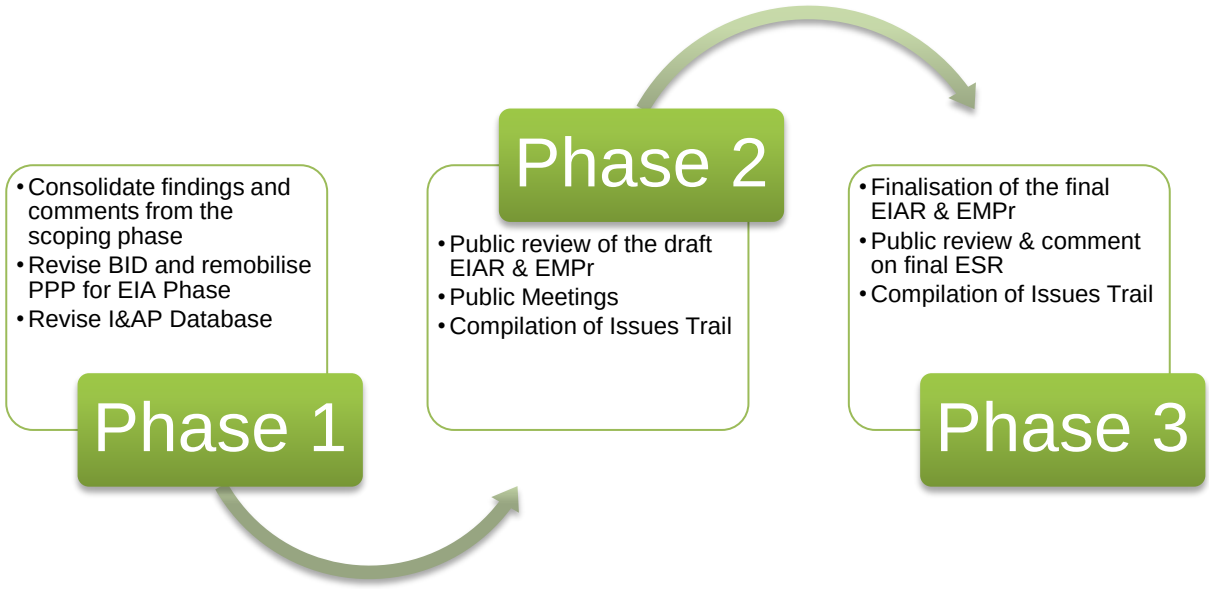


Figure 8-3: Key Phases in the PPP Undertaken During the EIA Phase

8.4.1 Revised BID

Due to the time lag between the scoping and EIA phases and in the interest of ensuring a robust and transparent PPP, the briefing paper / BID for the project was revised in October 2014 and circulated to all registered I&APs, together with a registration/comment sheet inviting I&APs to submit details of any issues, concerns or inputs they might have with regards to the project. The revised BID is presented in Appendix H.

8.4.2 Advertising

In compliance with the EIA Regulations (2010), notification of the EIA Phase public meetings and availability of the draft EIAR was advertised in four newspapers as follows:

- Northglen News Newspaper (04.11.2014);
- Phoenix Rising Sun (05.11.2014);
- The Mercury (05.11.2014); and
- Isolezwe (05.11.2014).

The Umafrika newspaper is no longer in print and therefore, advertisements were not placed in this publication as done in the scoping phase. The isiZulu advertisement will continue to be placed in the Isolezwe. Proof of all advertisements are presented in Appendix H.

8.4.3 Public Meetings

The primary aim of the public meetings was to:

- provide I&APs and stakeholders with information regarding the proposed project and associated infrastructure;
- provide I&APs and stakeholders with information regarding the EIA process;

- provide an opportunity for I&APs and stakeholders to seek clarity on the project;
- record issues and concerns raised; and
- provide a forum for interaction with the project team.

Seven public meetings will be held as follows:

- Cornubia Pilot Phase (18.11.2014 - 18h00);
- Ottawa (19.11.2014 - 18h00);
- Phoenix (20.11.2014 - 18h00);
- Sharper's Town (23.11.2014 - 11h00);
- Waterloo (23.11.2014 - 14h00);
- Mount Edgecombe (25.11.2014 - 18h00); and
- Umhlanga (26.11.2014 - 18h00).

8.4.4 Public and Authority Review of the Draft Environmental Impact Assessment Report

The draft EIAR has been made available for authority and public review for a total of 40 days (the December public participation exclusion period exercised) from 24 November 2014 to 26 January 2015. The report has been made available at the following public locations within the study area, which are all readily accessible to I&APs:

- Libraries
  - Phoenix Library Playpark Place Shastri Park, Phoenix
  - Umhlanga Library, 4 Lagoon Drive, Umhlanga
  - Verulam Library, 8 Groom Street. Verulam
- Councillors' offices
  - Cllr Mxolisi Ndzimbomvu, Ward 58, Support Centre, 187 Woodpecker Rd, Waterloo
  - Cllr Musa Dludla, Ward 102, Room 102, White House Shopping Centre Mount Edgecombe
  - Cllr Solly Singh. Ward 50, Suite 3, 1st Floor, Gem City, 80 Parthenon Street, Phoenix
  - Cllr Patrick Pillay, Ward 61, Suite 3, 1st Floor, Gem City, 80 Parthenon Street, Phoenix
  - Cllr Heinz de Boer, Ward 35, Sizakala Centre327 Umhlanga Rocks Drive, Umhlanga Rocks
- Mount Edgecombe Country Club;
- Tongaat Hulett Developments: 305 Umhlanga Rocks Drive, Umhlanga; and
- RHDHV Website: http://www.rhdhv.co.za/pages/services/environmental/current-projects.php

8.4.5 Issues Trail

Issues and concerns raised during the PPP will continue to be compiled into an Issues Trail. The Issues Trail to date, attached as Appendix H, in which all comments received and responses provided have been captured.

8.5 Environmental Authorisation

On receipt of environmental authorisation (positive or negative) for the project, I&APs registered on the project database will be informed of this authorisation and its associated terms and conditions by correspondence and advertisement.

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 Introduction

Impact assessment must take account of the nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). Each issue/impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimisation of an impact is noted. A brief discussion of the impact and the rationale behind the assessment of its significance is provided in this Section. The EIA of the project activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment is focussed on the following phases of the project namely:

- Construction Phase; and
- Operational Phase.

Due to the nature of the Greater Cornubia Development it is anticipated that the infrastructure would be permanent, thus, not requiring decommissioning or rehabilitation. Maintenance of infrastructure will be addressed under the operational phase.

9.2 Impact Assessment Methodology

The potential environmental impacts associated with the project will be evaluated according to it nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- ***Nature:*** A brief written statement of the environmental aspect being impacted upon by a particular action or activity;
- ***Extent:*** The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- ***Duration:*** Indicates what the lifetime of the impact will be;
- ***Intensity:*** Describes whether an impact is destructive or benign;
- ***Probability:*** Describes the likelihood of an impact actually occurring; and
- ***Cumulative:*** In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Table 9-1: Criteria to be used for the rating of impacts

Criteria	Description			
EXTENT	**National (4)** The whole of South Africa	**Regional (3)** Provincial and parts of neighbouring provinces	**Local (2)** Within a radius of 2 km of the construction site	**Site (1)** Within the construction site
DURATION	**Permanent (4)** Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	**Long-term (3)** The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. The only class of impact which will be non-	**Medium-term (2)** The impact will last for the period of the construction phase, where after it will be entirely negated	**Short-term (1)** The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase

Criteria	Description			
		transitory		
INTENSITY	**Very High (4)** Natural, cultural and social functions and processes are altered to extent that they permanently cease	**High (3)** Natural, cultural and social functions and processes are altered to extent that they temporarily cease	**Moderate (2)** Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way	**Low (1)** Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
PROBABILTY OF OCCURANCE	**Definite (4)** Impact will certainly occur	**Highly Probable (3)** Most likely that the impact will occur	**Possible (2)** The impact may occur	**Improbable (1)** Likelihood of the impact materialising is very low

Significance is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Table 9-2: Criteria for the rating of classified impacts

Class		Description
+	**Any value**	Any positive / beneficial 'impact', i.e. where no harm will occur due to the activity being undertaken.
–	**Low impact (4 -6 points)**	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
	Medium impact (7 -9 points)	Mitigation is possible with additional design and construction inputs.
	High impact (10 -12 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
	Very high impact (12 - 14 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status		Denotes the perceived effect of the impact on the affected area.
Positive (+)		Beneficial impact.
Negative (-)		Deleterious or adverse impact.
Neutral (/)		Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore, not all negative impacts are equally significant.		

The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented. Mitigation measures identified as necessary will be included in an EMPr.

9.3 Potential Impacts and Significance

The following sections will provide a description of the potential impacts as identified by the specialists, EAP and through the PPP as well as the assessment according to the criteria described in Table 9-1 and Table 9-2. All potential impacts associated by the proposed development through the construction and operation of the development life-cycle have been considered and assessed in the following sections. As the infrastructure is expected to be permanent, the decommissioning phase impacts have not been considered.

9.3.1 Soils and Agricultural Potential

Table 9-3: Cornubia Phase 2 earth-works and interchanges soils and agricultural potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing) **Impact:** Physical degradation due to the removal and compaction of soil during construction activities.	**Without**	2	3	3	3	-11	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Strip topsoil prior to any construction activities. ▪ Re-use topsoil as per the options presented in the Soil Management Framework Strategy. ▪ Topsoil must be kept separate from overburden and must not be mixed with other layer of soil and sub-soil.						
	Aspect: Construction activities (site clearing) **Impact:** Physical degradation due to soil erosion as a result of exposed soil and topsoil.	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**
		Mitigation measures: ▪ Soil erosion is related to the water velocity and volume as well as the presence of well-established vegetation. Mitigation measures therefore include the development of velocity barriers for stormwater run-off and ensuring exposed areas are rehabilitated as detailed in the EMPr. ▪ The SMP must be complied with.						
	Aspect: Establishment of contractor laydown area (camp). **Impact:** Impact on land use and land capability - disturbance of soils and/or agricultural land use potential due to the location of the construction camp and associated infrastructure.	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**
		Mitigation measures: ▪ The contractor laydown area must be placed in an area where erven will be developed and not in an area that will be utilised in future as an open space or commercial. ▪ The contractor laydown area may not be placed in or in close proximity to the wetland habitat on-site. ▪ No material may be stored or equipment repaired beyond the boundaries of the contractor laydown area. ▪ The Action Plan for Loss of Agricultural Land must be adhered to.						
Cumulative	Impact on food security due to loss of agricultural land.	**Without**	3	4	3	4	-14	**Very high**
		With	1	1	2	3	-7	**Medium**
		Mitigation measures: ▪ THD have submitted a plan to address loss of agricultural land to the Department of Agriculture and other areas have been identified with good agricultural potential.						

9.3.2 Geology and Topography

Table 9-4: Cornubia Phase 2 earth-works and interchanges geological impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Foundations. **Impact:** Disturbance of surface geology for development foundations resulting in site instability due to inadequate drainage and/or inappropriate engineering planning and interventions.	**Without**	1	2	3	3	-9	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ It is important to allow for on-site inspections and evaluations by an experienced engineering geologist/geotechnical engineer so that stability problems can be timeously identified and remedied. ▪ It is important to ensure that the design of the development promotes stable development. ▪ All earth-works should be carried out in a manner to promote stable development of all infrastructure. It is recommended that earth-works be carried out along the guidelines given in SANS 1200 (current version). ▪ Where necessary, subsoil drains must also be provided particularly if fills are constructed over water logged/marshy areas and drainage courses. ▪ Earth-works and drainage measures should be designed in such a way as to prevent ponding of, or high concentrations of, stormwater or groundwater anywhere on the sites. ▪ The terrace should be shaped to a gradient to prevent water ponding on the surface and should be graded to direct water away from the fill edges and foundations. ▪ Where possible, individual dwelling plots on the steeper slopes should be designed to have their axes orientated in an up-downslope direction, rather than along the contours. Therewith, associated cut and fill slopes can be contained within individual plot boundaries. ▪ Cuts: - Cut slopes in the colluvial and residual clayey materials, should in general be restricted to a slope angle of 1:2 (26°). Steeper slopes may be created individually, at the discretion of the Engineer. The maximum height of any cut slope should not exceed about 3 m without being assessed by the Engineer. - In the weathered sandstone and dolerite bedrock, the cut slopes may be increased to 1:1.5 (30°), or even steeper, up to 1:1 (45°) at the discretion of the Engineer. However, it is essential to understand that the close joint sets in the thinly bedded Vryheid Formation bedrock may cause instability, if cut to unfavourable angles due to adverse dip directions in the bedrock. - The excavation of excessively deep cuts in the recent dune sands should be avoided during the course of any development. Cut embankments in the loose Aeolian sand must be restricted to a slope batter of 1:2 (26°). Where recommended batters cannot be accommodated, a retaining wall should be introduced. It is essential that any wall be properly damped proofed and incorporates suitable surface drainage. - Cuts in the more sandy clays of the Berea Formation may be laid back to a slope batter of no						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)
		more than 1:1.75 (30°) at the discretion of an engineer. Such banks will, however, fail in time as they lose their temporary cohesive strength, either by drying out or by becoming saturated. As such, any excavation deeper than about 1.20 m should, therefore, be suitably battered back or shored to prevent the collapse of sides under adverse conditions. ▪ Fills: - Prior to the placement of any fill, the in-situ subsoil material containing vegetation should be removed. The fills should then be constructed in layers a maximum of 300 mm loose thickness and be compacted to 93% of the materials Max Mod AASHTO Density for clayey materials and 95% of the materials Max Mod AASHTO for sandy materials, prior to the placement of the next layer. The maximum slope angle of any fill should be restricted to 1:1.5 (33°). - Where the natural ground slope exceeds a slope angle of 1:6 (10°), the fills should be constructed on surface benched into a suitable in-situ material. ▪ Founding: - The maximum allowable bearing pressure of foundations, taken through the residual clayey soils into the weathered bedrock, requiring hard hand picking for excavation, should be restricted to 150 kPa. However, where cut platforms are taken into hard slightly weathered sandstone or dolerite bedrock may be increased to 250 kPa, at the discretion of the engineer. Typically, areas where shallow founding will be possible will be areas classified as R, H, H1, C, C1 and S, S1. - Where the depth to suitable founding exceeds the practical and economic depth for normal strip footings, as may occur where deep colluvial and residual soils occur, (H2, H3), the fill portion of the building platforms or alluvial soils (S, S1), as well as in the collapsible loose sands (C2), in the south east, deep founding is required. In this regard, the structures should be supported on ground beams spanning between deep column base foundations, or, piled foundations, taken through all fill, colluvial, alluvial and residual soils, and soft weathered bedrock, to bear into the firmly bedded weathered bedrock at depth below the site. - Due to the likely expansive active clayey, colluvial and residual soils occurring in the area, these materials should not be used as fill beneath the surface bed. Imported hard core or suitable in-situ weathered bedrock material is preferred for this purpose. - The floor slabs for the structures should be isolated from all walls, ground beams, columns and foundations to allow for any differential movements as may occur where expansive soils may underlie the site. Similarly, all structures should incorporate regularly placed expansion joints. - As an alternative founding measure, particularly on the lower portion of the site where the highly active residual clays of the Vryheid Formation bedrock occurs, or where structures span the prick of cut and fill on building platforms, suitably designed reinforced concrete raft foundations are considered the most suitable type of foundation. - On cut fill platforms, the raft foundations should be supported on the fill side of the building platform by short auger piles or pads, also taken down through the fill into competent founding material such as weathered bedrock. This may also apply to the dune sands and the Berea Formation materials in the south eastern corner.					

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Aspect: Construction activities (site clearing). **Impact:** Gully or donga erosion by concentrated, uncontrolled water-flow.	**Without**	1	2	2	2	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Cut embankments must be protected against surface erosion by the establishment of vegetation immediately after construction. ▪ Suitable subsoil drainage, stormwater control and preventable solutions to avoid soil erosion will be essential for most development into the loose sands in the south eastern area. Adequate stormwater surface drainage as per the stormwater management plan must be adopted. ▪ Although not generally prone to erosion, the in-situ soils deriving from the Vryheid Formation and dolerite bedrock as well as weathered bedrock in the northern and eastern parts of the area can nevertheless be gully or donga eroded by concentrated uncontrolled water flow. It will therefore be necessary to provide adequate stormwater surface drainage as part of the infrastructural development of the area. ▪ Due to the clayey nature of the subsoils on the site and taking into consideration the environmental aspects of the partly densely developed surroundings, stormwater disposal by means of soak pits is in general not considered feasible. Stormwater from all roof and paved areas should be piped or collected in surface drains to discharge into a suitably designed stormwater retention system where no efficient stormwater system exists.						
	Aspect: Surplus fill material stockpiles. **Impact:** Large quantities of surplus fill material generated as a result of extensive cutting that cannot be used as back-fill will need to be stockpiled on site thereby altering the topography.	**Without**	2	4	3	4	-13	**Very high**
		With	2	2	2	3	-9	**Medium**
		Mitigation measures: ▪ All temporary stockpiles must be restricted to designated areas. ▪ Stockpiles created during the construction phase are not to remain during the operational phase. ▪ The contractor must be limited to clearly defined access routes to ensure that sensitive and undisturbed areas are not disturbed. ▪ Potential to mix poor quality material with lime and/or good quality material to obtain a suitable quality that can be sandwiched in earth-works between layers of good material (where possible). ▪ It is important to allow for on-site inspections and evaluations by an experienced engineering geologist/geotechnical engineer so that material can be classified and an appropriate use identified timeously. ▪ It is important to ensure material is classified and separated timeously so as to avoid mixing of good quality material with poor quality material. ▪ Suitable erosion control and rehabilitation measures must be implemented at stockpiles and surplus fill material sites as detailed in the EMPr and Soil Management Framework Strategy.						

9.3.3 Geohydrology

Table 9-5: Cornubia Phase 2 earth-works and interchanges geohydrological impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** ▪ Improper storage of fuels, chemical etc. ▪ Construction equipment, vehicles, workshop and wash bay areas ▪ Inadequate ablutions. **Impact:** Groundwater contamination as a result of: ▪ Spillage of fuels, lubricants and other chemicals. ▪ Construction equipment, vehicles, workshop and wash bay areas will be a likely source of pollution as a non-point source. ▪ Lack of provision of ablutions that may lead to the creation of informal ablutions.	**Without**	1	1	3	3	-8	**Medium**
		With	1	2	1	2	-6	**Low**
		Mitigation measures: ▪ Potentially hazardous substances must be stored on an impervious surface in a designated bunded area, able to contain 110% of the total volume of materials stored at any given time. ▪ Material safety data sheets (MSDSs) are to be clearly displayed for all hazardous materials. ▪ The integrity of the impervious surface and bunded area must be inspected regularly and any maintenance work conducted must be recorded in a maintenance report. ▪ Employees should be provided with absorbent spill kits and disposal containers to handle spillages. ▪ Train employees and contractors on the correct handling of spillages and precautionary measures that need to be implemented to minimise potential spillages. ▪ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor laydown area. ▪ Immediate reporting and rectification of any incident that might lead to pollution. Implementation of best practice methods to prevent potential incidents from occurring e.g. an Environmental Management System (EMS) reporting and monitoring system. ▪ An Emergency Preparedness and Response Plan will be developed and implemented should and incident occur. ▪ Access to storage areas on-site must be restricted to authorised employees only. ▪ Contractors will be held liable for any environmental damages caused by spillages. ▪ The construction workforce must have adequate sanitation facilities. ▪ The sanitation facilities should be on-site before the extended workforce is employed to ensure that no unauthorised sanitation practices are implemented on-site. ▪ Potential construction practices that might lead to groundwater contamination should be conducted on areas with impervious surfaces to avoid infiltration of contaminated substances into the groundwater aquifer. ▪ All contaminated stormwater should be treated before being discharged into the surrounding natural environment.						
	Aspect: Construction routes through wetland systems. **Impact:** Compacting of soils may lead to	**Without**	3	3	4	3	-13	**Very high**
		With	2	2	2	2	-8	**Medium**
		Mitigation measures: ▪ Construction routes, through wetland systems should have adequate drainage to avoid the damming of water and the hindering of natural sub-surface water flow.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	changes in subsurface water flow.							
Operational	**Aspect:** Gravitation of sewage to WWTWs. **Impact:** Leaks of untreated water and sewage from pipelines may occur and impact on the shallow groundwater quality.	**Without**	2	1	2	1	-6	**Low**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ All sewage will be gravitated to appropriate WWTWs. Any leaks should be fixed immediately and areas rehabilitated as needed.						

9.3.4 Hydrology

Table 9-6: Cornubia Phase 2 earth-works and interchanges hydrological impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Clearing of vegetation and topsoil. **Impact:** Cleared vegetation and topsoil placed near drainage areas can divert clean water into dirty water areas, cause waterlogging of adjacent areas or pollute water resources.	**Without**	2	3	3	3	-11	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Place all removed / excavated vegetation and topsoil in demarcated overburden stockpile areas to prevent obstruction of natural drainage paths.						
	Aspect: Waste generation during construction. **Impact:** Builders' rubble, packaging and other waste generated in the construction process can contaminate surface water resources.	**Without**	3	3	3	3	-12	**High**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ An adequate number of general waste receptacles, including bins must be arranged around the site to collect all domestic refuse, and to minimise littering. ▪ Bins should be clearly marked and lined for efficient control and safe disposal of waste. ▪ A fenced area must be allocated for waste sorting and disposal on the site. ▪ General waste produced on-site is to be collected in skips for disposal at the Buffelsdraai Landfill Site. Hazardous waste is not to be mixed or combined with general waste. ▪ Under no circumstances is waste to be burnt or buried on-site. ▪ Waste bins should be cleaned out on a regular basis to prevent any windblown waste and/or visual						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
		disturbance. ▪ All general waste must be removed from the site at regular intervals and disposed of in suitable waste receptacle. ▪ Hazardous waste is to be disposed at a Permitted Hazardous Waste Landfill Site. The Environmental Officer (EO) must have as part of his/her records the waste manifest for each batch based disposal. ▪ Hazardous waste bins must be clearly marked, stored in a contained area (or have a drip tray) and covered (either stored under a roof or the top of the container must be covered with a lid). ▪ A hazardous waste disposal certificate must be obtained from the waste removal company as evidence of correct disposal. ▪ In the case of a spill of hydrocarbons, chemicals or bituminous, the spill should be contained and cleaned up and the material together with any contaminated soil collected and bioremediated.						
	Aspects: ▪ Storage of fuels, lubricants and chemicals. ▪ Construction-related activities such as cement batching. ▪ Construction equipment, vehicles and workshop areas. ▪ Inadequate ablutions. **Impact:** Contaminated run-off due to: ▪ Spillage of fuels, lubricants and other chemicals; ▪ Inadequate stormwater management around the site; the dumping of construction material, including fill or excavated material into, or close to surface water features that may then be washed into these features; ▪ Construction equipment, vehicles and workshop areas will be a likely source of pollution as a non-point source; and ▪ Lack of provision of ablutions that may lead to the creation of	**Without**	3	2	3	2	-10	**High**
		With	2	2	2	1	-7	**Medium**
		Mitigation measures: ▪ Appropriate design of facilities to handle fuels and toxic waste. Chemical storage areas to be bunded so that if a spill occurs the chemical will be contained. ▪ Ensure that all spills are immediately cleaned up as per the requirements of the EMPr (Appendix B). ▪ Keep construction activities away from the surface water resources. ▪ Adequate provision of ablutions for construction employees. ▪ Wastewater must not be allowed to come into direct contact with exposed soils or run across the site. Vehicles and machinery may not be washed on-site. All wastewater must be collected in a sealed container and disposed of by an approved waste contractor. Waybills must be retained for inspection.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	'informal ablutions' within or close to a surface water resource.							
	Aspect: Development of hardened surfaces (platforms etc.) **Impact:** Increased stormwater run-off due to hardened surfaces.	**Without**	2	2	2	1	-7	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Land disturbance must be minimised in order to prevent erosion and run-off - this includes leaving exposed soils open for a prolonged period of time. As soon as vegetation is cleared (including alien) the area must be re-vegetated if it is not to be developed on in future. ▪ The SMP must be complied with.						
	Aspect: Land use changes. **Impact:** Destruction of surface water resources due to land use changes.	**Without**	3	2	3	2	-10	**High**
		With	2	2	2	1	-7	**Medium**
		Mitigation measures: ▪ Refer to the EMPr (Appendix B) and Wetland and Open Space Rehabilitation Plan (Appendix B 2) for detailed recommendations regarding offsets and rehabilitation.						
	Aspect: Abstraction of water from the Ohlanga River. **Impact:** Consumption and use of surface water for construction purposes (i.e. water tankers for dust suppression).	**Without**	3	2	1	1	+7	**Medium**
		With	3	2	1	1	+7	**Medium**
		Mitigation measures: ▪ Given that the Ohlanga river currently has concerns with oversupply of water, this is not deemed to be a negative impact provided responsible abstraction methods are employed as required by the DWS.						
Operational	**Aspect:** Gravitation of sewage to WWTWs. **Impact:** Leaks of untreated water and/or sewage from pipelines may occur that will impact on the shallow groundwater quality.	**Without**	2	1	2	1	-6	**Low**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ All sewage will be gravitated to appropriate WWTWs. Any leaks should be fixed immediately and areas rehabilitated as needed.						
Cumulative	Increased stormwater run-off from urban infrastructure and roads and risk of flooding.	**Without**	2	2	3	4	-11	**High**
		With	2	1	1	2	-6	**Low**
		Mitigation measures:						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)
		▪ The SMP must be implemented. ▪ Improved wetland functionality and zero net-loss approach regarding wetland areas. ▪ Protection of the natural watercourses to prevent pollution, erosion and retain run-off. ▪ Promotion of subsoil infiltration where possible. ▪ Provision of indigenous vegetation along watercourses and stabilisation of banks. ▪ Attention to development of on-site use rainfall attenuation and provisions for reducing run-off by in-catchment and on-site evaporation and evapo-transpiration. ▪ Local flood risk reduction by selection of appropriate design standards for road bridges, culverts and stormwater attenuation facilities. ▪ Implementation of adequate on-site and localised stormwater management practices. ▪ Attenuation of flood peaks to predevelopment levels at the 2% (50-year) and the 10% (10-year) risk level. ▪ Providing new impermeable areas with sufficient flood attenuation and evaporation provisions. ▪ Rehabilitation and upgrading of open spaces following conversion from sugarcane.					

9.3.5 River, Estuary and Dam

Table 9-7: Cornubia Phase 2 earth-works and interchanges river, estuarine and dam potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Marshall Dam modification (i.e. installation of pump station). **Impact:** Potential impact on the ecological habitats at the Marshall Dam during the installation of a pump station for irrigation.	**Without**	1	3	3	3	-10	**High**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Installation to be done according to an approved Method Statement and as per the requirements of the EMPr (Appendix B) and Wetland and Open Space Rehabilitation Plan (Appendix B 2).						
	Aspect: Proposed modification to Marshall Dam. **Impact:** Potential impact on the riparian vegetation during the installation of a pump station and/or pipeline for	**Without**	3	2	4	2	-11	**High**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ Installation to be done according to an approved Method Statement and as per the requirements of the EMPr (Appendix B) and Wetland and Open Space Rehabilitation Plan (Appendix B 2).						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	irrigation.							
	Aspect: Establishment of surplus fill material sites. **Impact:** Sedimentation from the Surplus Fill Material Sites impact on water quality and clarity of the system leading to a change in the biotic communities and reducing the functionality and aesthetics of the system leading to an irreversible change in estuarine status.	**Without**	3	3	4	2	-12	**High**
		With	1	2	2	2	-7	**Medium**
		Mitigation measures: ▪ Management of the Surplus Fill Material Site must be done in accordance with the EMPr (Appendix B) and Soil Management Framework Strategy (Appendix B 4). ▪ Rehabilitation of the Surplus Fill Material Sites to be done according to the Wetland and Open Space Rehabilitation Plan (Appendix B 2). ▪ Significant erosion control measures needed and site clearing done in a phased manner. ▪ Monitoring of in situ turbidity and total suspended solids pre-construction, during construction and for life of development.						
	Aspect: Establishment of surplus fill material sites. **Impact:** Impact on water quality and physical characteristics of the estuary resulting in a disruption of ecological function due to construction activities and Surplus Fill Material Sites.	**Without**	3	3	4	3	-13	**Very high**
		With	2	2	2	2	-8	**Medium**
		Mitigation measures: ▪ Reduction of pulsed water returns to the estuary using only essential stormwater attenuation measures. ▪ 'Scrubbing' of excess nutrients and biological filtering of the water prior to it reaching the Ohlanga estuary or any of its tributaries i.e. creative solutions regarding the attenuation of stormwater. ▪ Return water to the estuary post-development should emulate as far as possible the virgin MAR. ▪ The Stormwater Management Plan must be adhered to (Appendix B 3).						
	Aspect: Improper disposal of sewerage and solid waste. **Impact:** Sanitation/sewerage/solid waste disposal into the river influencing water quality, health of biota and the aesthetics of the estuary.	**Without**	3	2	2	2	-9	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Adequate facilities provided to construction staff. ▪ Siting of construction camps far from estuary and tributary catchment areas. ▪ Detailed methods for solid waste disposal are outlined in the EMPr (Appendix B) and must be adhered to.						
Operational	**Aspect:** Improper disposal of sewerage and solid waste.	**Without**	3	2	2	2	-9	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ Adequate facilities to be provided to the community.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Impact: Sanitation/sewerage/solid waste disposal into the river influencing water quality, health of biota and the aesthetics of the estuary.	▪ Community to be educated regarding the ecological importance of the river and estuary.						
Cumulative	Disturbance and utilisation of the riparian area as a result of an increase in the number of people.	**Without**	3	4	4	2	-13	**Very high**
		With	2	2	2	1	-7	**Medium**
		Mitigation measures: ▪ A suitable buffer must be maintained to the Ohlanga River and Estuary. 40 m is suggested unless otherwise authorised. ▪ Corridor and buffer areas need to be designed to facilitate movement and linkages between the open space areas and the upper river catchment and the coast; ▪ Corridor and buffer areas also need to be designed to minimise negative impacts both direct and indirect which may result from run-off and disturbance; and ▪ Methods for restoration of the buffer to be drawn up by a specialist and form part of the EMPr. ▪ No fence should be erected between the development and the estuary.						
	Rehabilitation of riparian edges, wetland and the provision of ecological corridors leading to increased biodiversity value of the river and estuary and protection of the estuary from associated land based activities.	**Without**	2	2	2	2	+8	**Medium**
		With	3	3	3	4	+13	**Very high**
		Mitigation measures: ▪ Corridor areas designed for movement and linkages between the open space areas and the upper river catchment and the coast. ▪ No fences should be erected which will as a barrier to this movement. ▪ Rehabilitation to be done according to the Wetland and Open Space Rehabilitation Plan (Appendix B 2).						

9.3.6 Wetlands

Table 9-8: Cornubia Phase 2 earth-works and interchanges wetland potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction of earth-worked platforms, roads, pipelines and other infrastructure. **Impact:** Loss of 27.59 ha of wetland area.	**Without**	2	4	2	4	-12	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Rehabilitation of 99.25 ha of remaining wetland as required by the Wetland and Open Space Rehabilitation Plan (Appendix B 2) to ensure an offset ratio in excess of 1:3 is maintained and there is no-nett wetland loss within Cornubia Phase 2 or the Greater Cornubia Development.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Aspect: Clearing of vegetation for platforms and infrastructure. **Impact:** Increased erosion, sedimentation and scouring into remaining wetlands.	**Without**	2	2	3	3	-10	**High**
		With	1	1	2	1	-5	**Low**
		Mitigation measures: ▪ Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts. ▪ If possible, construction activities should be scheduled to minimise the duration of exposure to bare soils on site, especially steep slopes. The full extent of works shall not be stripped of vegetation prior to commencing other activities. ▪ A row of silt fences and sandbags must be established along the wetland buffer edge prior to construction commencing. These silt fences and sandbags must be regularly checked and maintained and should only be removed once vegetation has successfully colonised the embankments. ▪ Any steep or large embankments expected to be exposed during the 'rainy' months should either be armoured with fascine like structures/silt fences or grassed immediately with strip sods established at regular intervals (50-100 cm) down the bank with hydro-seeding between the strip sods. ▪ Where the bare surface of platforms slope towards the edge of an embankment, silt fences and sandbags must be established along the crest of the embankment. If preferential flow routes on the sloped platform occur, these flow routes must be intercepted with a series of sandbags. ▪ All platforms above buffer zones must have a slight back-fall to divert run-off away from the fill embankments. Platform run-off must be diverted away from the platforms *via* some sort of diversion structure, preferably a grassed swale or open drain. This run-off must be diverted into the formal stormwater network where possible. If no formal stormwater system is possible, the diverted run-off must be diverted to a temporary detention pond or temporary outlets armoured against erosion. ▪ Once the roads and platform formal stormwater reticulation network are established, silt traps and sand bags should be used throughout the construction site to prevent eroded sediment from being washed into the wetlands from un-grassed, bare/exposed areas. This applies particularly to areas where earth-works occur directly above or in the vicinity of the wetlands. ▪ After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until grass has re-colonised the rehabilitated area. ▪ It is important that all of the above-listed mitigation measures are costed for in the construction phase financial planning and budget so that the contractor and/or developer cannot give financial budget constraints as reasons for non-compliance. Proof of financial provision of these mitigation measures must be submitted to the ECO prior to construction commencing.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Aspect: Pipe and road crossing wetlands. **Impact:** Loss of wetland area as well as: ▪ Compaction and clearing of areas outside of the road fill footprint. ▪ Erosion and sedimentation ▪ Alien plant encroachment into the wetland.	**Without**	2	2	3	3	-10	**High**
		With	1	1	2	2	-6	**Low**
		Mitigation measures: ▪ Construction should ideally be undertaken between the months of April and August. ▪ The wetland boundaries either side of the road and pipe crossings must be demarcated using shade cloth or snow fencing prior to the construction commencing. ▪ Disturbance to the wetland soils along the crossing footprint should be restricted to an established construction right-of-way (ROW) corridor. The ROW corridor within the wetland should be as narrow as practically possible and should be demarcated and fenced off during the site setup phase to the satisfaction of the ECO. ▪ The construction ROW should comprise the road and embankment footprint, and the pipe routing only. ▪ All wetland areas outside of the demarcated ROW must be considered 'no-go' areas. ▪ Disturbed and bare soils resulting from the construction must be prepared and re-vegetated to the satisfaction of the ECO.						
Operational	**Aspect:** Stormwater run-off as a result of hardened infrastructure. **Impact:** Siltation of wetland as a result of stormwater attenuation facilities proposed.	**Without**	2	3	3	3	-11	**High**
		With	2	3	2	2	-9	**Medium**
		Mitigation measures: ▪ The SMP must be implemented. The stormwater engineers should investigate the option of some (maximum of 4.12 ha) 'within' wetland facilities, and some 'outside' wetland facilities, in an attempt to balance costs and wetland losses. The stormwater engineers should investigate the cost impacts of on-site attenuation through the use of alternative materials, such as porous paving systems, and onsite tank attenuation facilities. In addition, given the irrigation requirements of the vegetated areas of the overall development, the diversion of stormwater to storage structures such as Marshall Dam, and using this water for irrigation, thus returning it to the hydrological system at ameliorated rates (refer to Section 9.3.14) should be investigated.						
	Aspect: Road infrastructure within wetlands. **Impact:** ▪ The concentration of wetland flow through culverts and the erosion and scouring of the wetland below the culvert(s); and ▪ The fragmentation of the wetland by the road, which	**Without**	2	3	2	3	-10	**High**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ With regards to the wetland crossing only, the road fill foundation and base should be permeable to water flow to ensure low flow seepage is maintained and that water does not dam up behind the road during heavy rainfall. ▪ Erosion protection measures (e.g. Reno-mattresses) must be established below any box culverts. ▪ The final design for the wetland crossing must be approved by the wetland specialist prior to construction commencing.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	represents a serious barrier to faunal movement along the wetland.							
Cumulative	Improvement in the health of wetlands as a result of rehabilitation of the wetland and buffer zones.	**Without**	2	1	1	2	+6	**Low**
		With	2	3	3	4	+12	**Very high**
		Mitigation measures: ▪ The Wetland and Open Space Rehabilitation Plan must be adhered to at all times. ▪ The public must be educated on the importance of wetland preservation.						

9.3.7 Biodiversity

Table 9-9: Cornubia Phase 2 earth-works and interchanges biodiversity potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction of roads and development of fill embankments. **Impact:** Loss of vegetation being lost. The embankments and construction will result in the vegetation being removed (grubbing), and the land form buried under layers of soils which will thereafter be compacted. In essence the opportunity for vegetation to persist in its current form is not available.	**Without**	1	1	1	4	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ The loss of the indigenous vegetation, which for the most part only forms a small component of the entire biomass of the individual areas, must be off-set and mitigated by the planting of indigenous woody vegetation that is commonly occurring in the area into the open space network that is proposed for Cornubia Phase 2 as per the requirements of the Cornubia Phase 2 Wetland and Open Space Rehabilitation Plan.						
	Aspect: Construction of roads and development of fill embankments and site clearing. **Impact:** Proliferation of alien invasive species, as there are many areas surrounding Cornubia that have	**Without**	1	1	1	3	-6	**Low**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ Continued control of alien invasive species during the construction phase as per the requirements of the EMPr. ▪ Planting of “desirable” plant species immediately after the construction phase so that these species can establish and thus prevent large stands of infestations which become difficult to control and manage.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	high infestations of alien plant species, and will provide seed for dispersal by the various vectors, such as birds, bats and small mammals.							
	Aspect: Construction of road interchanges. **Impact:** There are a number of *Dracaena aletriformis* individuals that will require permits for their relocation out of the construction footprint into the surrounding open space network. The potential exists that there may also be a number of *Scadoxus puniceus* will also require a permit however, a permit currently exists for the relocation of 50 individuals of Scadoxus puniceus. The *Ficus polita* that may be impacted upon will also require relocation however, a permit will not be required for said relocation. This impact only applies to the Cornubia Boulevard Interchange on N2.	**Without**	1	1	1	4	-7	**Medium**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ A suitably qualified botanist must be present during the relocation of the *Ficus polita*. ▪ All *Dracaena aletriformis* individuals must be identified by a suitably qualified botanist and thereafter removed and relocated, following the granting and receipt of a permit from Ezemvelo KZN Wildlife.						
	Aspect: Deposition of fill into ‘no-go’ areas. **Impact:** The potential impacts are as follows: ▪ The earthen fill will cover and smother the under-storey vegetation. In addition, should the quantities be considerable in terms of volumes, the	**Without**	1	2	2	3	-8	**Medium**
		With	1	1	2	1	-5	**Low**
		Mitigation measures: ▪ Clearly demarcate and protect ‘no-go’ areas. ▪ The earth-works contractor must be made aware of the potential damage that may ensue as a result of the earthen fill being deposited within the area to the east (lower) side of the contour road that passes through the forest patch. ▪ Erection of silt fencing on the western road embankment, which has been cut to create the contour road historically. ▪ The need may arise to re-enforce the embankment further with gabion structures to prevent the toe of the embankment "sliding" further down the hill.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	deposition of the fill will build up around the base of the tree trunks and may result in the tree trunks starting to rot and eventually succumb to wind, termites or other natural forces. ▪ The deposition of earth may also create preferential flow paths for stormwater which may impact on the forest patch. The disturbance to the under-storey and the varying earthen material may also contain alien invasive plant species which will proliferate as a result of the disturbance, which will significantly reduce the biodiversity and functional integrity of the forest patch.	▪ On completion of the earth-works the area must be immediately rehabilitated with suitable plant species, both woody and herbaceous that mirror the species assemblage on the easterly side of the road. ▪ In addition, depending on the steepness of the embankment pegged sod (*Cynodon dactylon*) should be placed in rows horizontally across the slope with the trees and herbaceous shrubs planted between the rows to ensure that any silt is captured and to slow the velocity of stormwater generated during large rainfall events. ▪ This area proposed to receive earth-works must be undertaken during the "winter "period to ensure that rainfall events are not transporting fill into the existing forest patch, on the eastern side of the contour road.						
Operational	**Aspect:** Establishment and maintenance of Nursery/Community Garden/s **Impact:** As part of the Cornubia SSIP, it is proposed that nurseries and/or community gardens are established in which indigenous vegetation will be relocated to. The advantages of having an on-site nursery are numerous, with the single most significant factor being that the plants grown in the nursery are already acclimatised to the area in which they will be utilised. The nursery site will also ensure that the species that are utilised are the correct species for the	**Without**	2	4	3	4	+13	**Very High**
		With						
		Mitigation measures: ▪ The design and management of the nursery will need to account for the fact that a portion of the nursery site is within the 1:100 year floodline.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	function that they are to perform, and will ensure that only indigenous species are utilised.							

9.3.8 Air Quality and Odour

Table 9-10: Cornubia Phase 2 earth-works and interchanges air quality and odour potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Fugitive dust emissions from debris handling and debris piles; bulldozers and general construction activities.	**Without**	2	2	2	3	-9	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Dust must be suppressed on the construction-site during dry periods by the regular application of water. ▪ Water used for this purpose must be used in quantities that will not result in the generation of run-off. ▪ Dust dispersion from construction activities, roads, spoil dumps and other construction locations will be limited and suppressed to the maximum extent practical. Surplus fill material sites and stockpiles will be positioned such that they are not vulnerable to wind erosion. ▪ Cover skips and trucks which are loaded with construction materials. All piles should be maintained for as short a time as possible and should be enclosed by wind-breaking enclosures of similar height to the pile. ▪ Stockpiles should be situated away from the site boundary, watercourses and nearby receptors and should take into account the predominant wind direction. ▪ A speed limit of 40 km/hr should be set for all vehicles travelling over exposed areas or near stockpiles. ▪ Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.						
	Aspect: Construction activities (site clearing; operation of vehicles, equipment etc.). **Impact:** Generation of fumes from vehicle emissions may pollute the air.	**Without**	2	1	3	3	-9	**Medium**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ All earth moving vehicles and equipment must be in good working order.						
	Aspect:	**Without**	1	2	3	2	-8	**Medium**

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Chemical toilets. **Impact:** Release of odours as a result of the chemical toilets on-site.	**With**	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Chemical toilets must be provided and cleaned on a regular (weekly) basis.						
Cumulative	As construction activities increase at various phases of the Greater Cornubia Development, emissions from construction vehicles may cause a nuisance.	**Without**	3	2	3	3	-11	**High**
		With	3	1	1	2	-7	**Medium**
		Mitigation measures: ▪ All earth moving vehicles and equipment must be in good working order.						

9.3.9 Noise

Table 9-11: Cornubia Phase 2 earth-works and interchanges noise potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Constructions staff, vehicles and equipment. **Impact:** Increase in noise pollution from construction vehicles and construction staff.	**Without**	1	1	3	3	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ All construction activities should be undertaken according to daylight working hours. ▪ Provide all equipment with standard silencers. Maintain silencer units in vehicles and equipment in good working order. ▪ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. ▪ Construction staff working in area where the 8-hour ambient noise levels exceed 85 dBA must have the appropriate Personal Protective Equipment (PPE). ▪ All operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993). ▪ Surrounding communities and adjacent landowners are to be notified upfront of noisy construction activities (blasting and excavations). ▪ A Complaints Register is to be kept at the Site Office at all times.						
Cumulative	As construction activities increase at various phases of the Greater Cornubia Development, noise pollution will increase.	**Without**	2	2	3	3	-10	**High**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Mitigation measures as per construction phase above.						

9.3.10 Heritage

Table 9-12: Cornubia Phase 2 earth-works and interchanges heritage resources potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities (site clearing etc.) **Impact:** Disturbance of sites of archaeological, historical and cultural significance.	**Without**	1	1	3	3	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ There are no sites or objects of archaeological, historical and cultural significance identified, however, if during construction any possible finds are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. ▪ Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site. ▪ Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51 (1). ▪ It is advisable that an information section on cultural resources be included in the Environmental Induction training given to contractors involved in surface earthmoving activities. These sections must include basic information on: - Heritage; - Graves; - Archaeological finds; and - Historical Structures. - The archaeologist needs to evaluate the finds on-site and make recommendations towards possible mitigation measures.						

9.3.11 Visual

Table 9-13: Cornubia Phase 2 earth-works and interchanges visual potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Construction activities may result in visual pollution as cranes and other machinery are utilised for	**Without**	1	2	1	2	-6	**Low**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Limited clearing of vegetation on the development site. This will retain the screening function of natural vegetation.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	construction.							
Operational	**Aspect:** Permanent structures. **Impact:** Permanent structures associated with the proposed development could create temporary un-vegetated areas in the landscape that could create a visual contrast with the natural vegetation.	**Without**	1	1	1	2	-5	**Low**
		With	1	1	1	1	-4	**Low**
		Mitigation measures: ▪ The ultimate development of Cornubia will see the entire area developed and the proposal falls within the accepted Cornubia Development Framework Plan for the area.						
Cumulative	The ultimate development of Cornubia will alter the visual landscape.	**Without**	2	4	1	2	+9	**Medium**
		With	2	4	1	2	+9	**Medium**
		Mitigation measures: ▪ Once complete, the Greater Cornubia Development will align to the visual landscape of the surrounding areas.						

9.3.12 Traffic

Table 9-14: Cornubia Phase 2 earth-works and interchanges traffic potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Increase in traffic from construction vehicles.	**Without**	1	2	2	3	-8	**Medium**
		With	1	1	1	2	-5	**Low**
		Mitigation measures: ▪ Construction vehicles are to avoid main roads during peak traffic hours. ▪ All vehicles entering the site are to be roadworthy. ▪ Seatbelts are to be worn at all times. ▪ When using heavy or large vehicles / equipment, "spotters" are to be present to assist the driver with his blind spots. ▪ Any incident or damage to a vehicle must be reported immediately.						
	Aspect: Construction of the three interchanges. **Impact:**	**Without**	2	2	4	4	-12	**High**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ A Traffic Management Plan should be developed by the Contractor for existing traffic during the construction phase.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Increase in traffic congestion during the construction of the three interchanges.							
Operational	**Aspect:** Day-to-day traffic. **Impact:** Traffic congestion.	**Without**	2	3	3	4	-12	**High**
		With	2	3	2	2	+9	**Medium**
		Mitigation measures: ▪ All future proposals for road networks as outlined in the TIA must be implemented for existing and new roads. ▪ The recommendations in the TIA is expected to reduce traffic congestion in the area through the IRPTN C9 Corridor which runs through the Cornubia, BRT depots and the proposal for non-motorised transport initiatives. Therefore, the long-term strategy is a shift towards public transport and through strategic planning, traffic is expected to be reduced significantly.						
Cumulative	Traffic in the region will increase as the residential portion of Cornubia is developed.	**Without**	2	3	3	4	-12	**High**
		With	2	3	2	2	+9	**Medium**
		Mitigation measures: ▪ Same mitigation measures as proposed for the Operational Phase above.						

9.3.13 Socio-economic and Health

Table 9-15: Cornubia Phase 2 earth-works and interchanges socio-economic and health potential impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Construction activities. **Impact:** Expected to provide in excess of 35 000 jobs sustained over a 15 year horizon.	**Without**	2	3	3	3	+11	**High**
		With	2	3	3	4	+12	**High**
		Mitigation measures: ▪ All labour (skilled and unskilled) and Contractors should be sourced locally where possible. ▪ A labour and recruitment policy will be developed, displayed and implemented by the contractor. ▪ Recruitment at the construction site will not be allowed. ▪ Where possible, labour intensive practices (as opposed to mechanised) should be practiced. ▪ The principles of equality, BEE, gender equality and non-discrimination will be implemented.						
	Aspect: Construction activities. **Impact:** Job creation during the construction phase could result in	**Without**	2	2	2	2	-8	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ If possible all labour should be sourced locally. ▪ Contractors and their families may not stay on-site.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	the influx of people to the area.	▪ No informal settlements will be allowed.						
	Aspect: Construction activities. **Impact:** Contractors, the influx of people and potential job creation will result in the proliferation of social ills and issues such as crime, prostitution, the spread of HIV/AIDS, informal settlements etc. Lack of provision of ablutions that may lead to the creation of 'informal ablutions' within or close to a surface water resource.	**Without**	2	2	3	2	-9	**Medium**
		With	2	2	1	1	-6	**Medium**
		Mitigation measures: ▪ The developers need to be actively involved in the prevention of social ills associated with contractors. ▪ If possible all labour should be sourced locally. ▪ Contractors and their families may not stay on-site. ▪ No informal settlements will be allowed. ▪ Contractors must be educated about the risk of prostitution and spread of HIV and AIDS. ▪ Strict penalties will be built into tenders to deal with issues such as petty crime, stock theft, fence cutting, trespassing etc. ▪ No poaching of wildlife or selling of firewood will be allowed.						
	Aspect: Construction activities. **Impact:** Public safety during construction.	**Without**	2	2	2	1	-7	**Medium**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Members of the public adjacent to the construction-site should be notified of construction activities in order to limit unnecessary disturbance or interference. ▪ Construction activities will be undertaken during daylight hours.						
	Aspect: Construction activities. **Impact:** Contractor's staff safety during construction.	**Without**	1	2	3	2	-8	**Medium**
		With	1	2	1	1	-5	**Low**
		Mitigation measures: ▪ Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction. ▪ All construction staff must have the appropriate PPE. ▪ The construction staff handling chemicals or hazardous materials must be trained in the use of the substances and the environmental, health and safety consequences of incidents. ▪ Report and record any environmental, health and safety incidents to the responsible person.						
Operational	**Aspect:** Access to housing, social facilities, job opportunities etc. **Impact:** Improved standard of living to beneficiaries of houses and/or as a	**Without**	2	3	3	2	+10	**Medium**
		With						
		Mitigation measures: ▪ No mitigation measures.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	result of social facilities and access to job opportunities.							
	Aspect: Cornubia SSIP. **Impact:** The development will result in job creation and provision of employment during the operational phase.	**Without**	2	3	3	3	+11	**High**
		With	2	3	3	4	+12	**High**
		Mitigation measures: ▪ The principles of gender equality, maximising local employment should be implemented in the provision and establishment of jobs. ▪ Jobs for the maintenance of infrastructure and services will be created following the completion of the development. These jobs might be made available to existing labour there creating long-term employment. ▪ Service contractors could have access to other developments or projects in the area thereby creating long-term employment. ▪ All stakeholders must work together to enhance the Cornubia SSIP.						
	Aspect: Establishment of the different land uses (i.e. residential, retail, social facilities etc.) **Impact:** Increased energy consumption.	**Without**	3	4	3	3	-13	**Very high**
		With	2	2	1	1	-6	**Low**
		Mitigation measures: ▪ It is recommended that renewable energy options and/or alternative energy sources be listed as the preferred options under the conditions of establishment.						
	Aspect: Provision of basic services (i.e. water, sanitation, electricity etc) **Impact:** Increased access to services (water, sanitation, electricity) to previously disadvantaged communities.	**Without**	2	3	3	3	+11	**High**
		With	2	3	3	4	+12	**High**
		Mitigation measures: ▪ eTM to ensure service infrastructure is maintained.						
	Aspect: Housing densities. **Impact:** Communicable diseases linked to housing design and close contact.	**Without**	2	3	3	1	-9	**Medium**
		With	2	2	1	1	-6	**Low**
		Mitigation measures: ▪ eTM to ensure provision of Clinics and other healthcare facilities. ▪ The Developers to commit to health care educational programmes.						
Cumulative	Substantial increase in housing which will assist with the eTM's	**Without**	3	4	4	4	+15	**Very high**

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	backlog and transformation agenda.	**Mitigation measures:** ▪ No mitigation measures.						
	Influx of people to surrounding informal settlements in the hope of acquiring a house.	**Without**	2	2	2	2	-8	**Medium**
		With	2	1	1	1	-5	**Low**
		Mitigation measures: ▪ No new informal settlements will be allowed. ▪ Housing policy guidelines to be clearly articulated.						
	Increase in VAT and rates.	**Without**	3	4	4	4	+15	**Very high**
		Mitigation measures: ▪ No mitigation measures.						
	Increased crime and social ills due to the establishment of a new community.	**Without**	2	3	3	2	-10	**High**
		With	2	1	1	2	-6	**Low**
		Mitigation measures: ▪ Police stations to be established.						
	Improved access to social facilities such as education, public transport, play grounds, clinics and so forth.	**Without**	2	3	3	2	+10	**High**
		With	2	3	3	2	+10	**High**
		Mitigation measures: ▪ eTM to commit finances to the provision of social facilities.						
	Increased sense of place due to social facilities and community court yards.	**Without**	2	3	3	2	+10	**High**
		With	2	3	3	2	+10	**High**
		Mitigation measures: ▪ eTM to commit finances to the provision of social facilities.						
	The physical nature of and the design ethic behind the Cornubia Development lends itself to contributing significantly to the provision of recreation and leisure to the community.	**Without**	2	3	3	2	+10	**High**
		With	2	3	3	2	+10	**High**
		Mitigation measures: ▪ eTM to commit finances to the provision of social facilities.						
	Cornubia SSIP: Education Community gardens Urban agriculture Open space management Nurseries Job creation	**Without**	2	4	4	4	+14	**Very high**
		With	2	4	4	4	+14	**Very high**
		Mitigation measures: ▪ All stakeholders to work together to ensure the continued success of the Cornubia SSIP.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	Opportunities for new business and/or business expansion.	**Without**	3	4	2	3	+12	**Very high**
		Mitigation measures: ▪ Not mitigation measures.						

9.3.14 Stormwater Attenuation Facilities

Table 9-16: Cornubia Phase 2 earth-works and interchanges stormwater attenuation facilities impacts – Option A (within wetlands)

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Development of attenuation features within wetlands. **Impact:** Lower ratio of area to be disturbed (in wetlands) and quantities of earth-works and consequently surplus fill material are less resulting in lower capital costs. Loss of 4.12 ha of wetland area to accommodate attenuation facilities within wetland.	**Without**	2	3	3	3	-11	**High**
		With	1	2	2	1	-6	**Low**
		Mitigation measures: ▪ Stormwater attenuation facility infrastructure to be installed according to the requirements of the Cornubia Phase 2 Wetland and Open Space Rehabilitation Programme (Appendix B 2). ▪ The stormwater engineers should investigate the option of some (maximum of 4.12 ha) 'within' wetland facilities, and some 'outside' wetland facilities, in an attempt to balance costs and wetland losses. ▪ The stormwater engineers should investigate the cost impacts of on-site attenuation through the use of alternative materials, such as porous paving systems, and onsite tank attenuation facilities. ▪ In addition, given the irrigation requirements of the vegetated areas of the overall development, we would recommend the investigation of diverting stormwater to storage structures such as Marshall Dam, and using this water for irrigation, thus returning it to the hydrological system at ameliorated rates. ▪ Wetland loss to be offset according to the Cornubia Phase 2 Wetland and Open Space Rehabilitation Programme (Appendix B 2).						

Table 9-17: Cornubia Phase 2 earth-works and interchanges stormwater attenuation facilities impacts – Option B (outside wetlands)

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Development of attenuation facilities within wetland buffers. **Impact:** High ratio of area to be disturbed	**Without**	3	3	3	4	-13	**Very high**
		With	3	2	3	4	-12	**High**
		Mitigation measures: ▪ To be installed according to the requirements of the Cornubia Phase 2 Wetland and Open Space Rehabilitation Programme (Appendix B 2).						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	(outside wetlands but in wetland buffers) and quantities of earth-works and consequently surplus fill material leading to higher capital costs. Siltation of wetland as a result of stormwater attenuation facilities proposed.							

9.3.15 Wetland Rehabilitation Options

Table 9-18: Cornubia Phase 2 open space wetland rehabilitation impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Operational	**Aspect:** Urban agriculture/linear parks within wetland buffers. **Impact:** Increased siltation of the wetland system through the creation of bare surfaces between crop plantings, as well as the potential for increased nutrient levels if fertilisers are used. In addition, the use of herbicides and pesticides on crops has the potential to impact on fauna and flora within the wetland systems.	**Without**	2	3	2	3	-10	**High**
		With	1	2	2	2	-7	**Medium**
		Mitigation measures: ▪ It is proposed that there will be a minimum buffer of 10 m around all wetland systems that will be planted with indigenous plant species. ▪ All linear parks will be planted using indigenous species, and will include seating areas and recreational trails. ▪ All agricultural areas must be operated on a subsistence / community garden / small scale market system. ▪ The use of pesticides and herbicides must be minimised, and all such chemicals must be carefully selected to ensure that biodegradable and wetland friendly variants are used. ▪ Crops within wetland buffer areas must be selected for their longevity e.g. long intercrop periods must be discouraged. ▪ It has been proposed that planting areas be filled slightly to ensure flatter planting areas, with gentle banks (1:3) falling towards the wetland. These banks can then be planted with indigenous vegetation to ensure that erosion is controlled and minimised. ▪ The final zonation must be approved by the eThekwini Municipalities Environmental Protection and Climate Change Branch prior to construction commencing.						
	Aspect: Urban agriculture/linear parks within wetland buffers. **Impact:** Increased socio-economic benefits	**Without**	2	3	3	3	+11	**High**
		With						
		Mitigation measures: ▪ No mitigation provided.						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	such as employment opportunities and sense of place through the Cornubia SSIP as well as increased food security and offset against loss of agricultural land.							

9.3.16 Surplus Fill Material Sites

Table 9-19: Cornubia Phase 2 earth-works and interchanges surplus fill material site impacts

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
Construction	**Aspect:** Location of surplus fill material sites within the 1:100 year floodline. **Impact:** Flooding potential due to sites located within the 1:100 year floodline.	**Without**	2	2	3	4	-11	**High**
		With	2	1	1	2	-6	**Low**
		Mitigation measures: ▪ The SMP (Appendix B 3) must be implemented. ▪ Improved wetland functionality and zero net-loss approach regarding wetland areas. ▪ Protection of the natural watercourses to prevent pollution, erosion and retain run-off. ▪ Promotion of subsoil infiltration where possible. ▪ Provision of indigenous vegetation along watercourses and stabilisation of banks. ▪ Attention to development of on-site use rainfall attenuation and provisions for reducing run-off by in-catchment and on-site evaporation and evapo-transpiration. ▪ Local flood risk reduction by selection of appropriate design standards for the sites. ▪ Implementation of adequate on-site and localised stormwater management practices. ▪ Attenuation of flood peaks to predevelopment levels at the 2% (50-year) and the 10% (10-year) risk level. ▪ Providing new impermeable areas with sufficient flood attenuation and evaporation provisions. ▪ Rehabilitation and upgrading of open spaces following closure of the site.						
	Aspect: Establishment of surplus fill material sites. **Impact:** Sedimentation from the Surplus Fill Material Sites may impact on water quality and clarity of the system leading to a change in the biotic communities and reducing the	**Without**	3	3	4	2	-12	**Very high**
		With	1	2	2	2	-7	**Medium**
		Mitigation measures: ▪ Management of the Surplus Fill Material Site must be done in accordance with the EMPr (Appendix B) and Soil Management Framework Strategy (Appendix B 4). ▪ Rehabilitation of the Surplus Fill Material Sites to be done according to the Wetland and Open Space Rehabilitation Plan (Appendix B 2). ▪ Significant erosion control measures needed and site clearing done in a phased manner. ▪ Monitoring of in situ turbidity and total suspended solids pre-construction, during construction and for						

Phase	Potential Aspect and/or Impact	Mitigation	Extent	Duration	Intensity	Probability	Significance (E+D+I+P)	
	functionality and aesthetics of the system leading to an irreversible change in estuarine status.	life of development.						
	Aspect: Establishment of surplus fill material sites. **Impact:** Potential impact on the riparian vegetation during the haulage of surplus material.	**Without**	3	2	4	2	-1	**High**
		With	2	1	2	2	-7	**Medium**
		Mitigation measures: ▪ Haulage to be done according to an approved Method Statement and as per the requirements of the EMPr (Appendix B) and Wetland and Open Space Rehabilitation Plan (Appendix B 2). ▪ Haulage vehicles to only use existing sugarcane tracks. Labour to be educated on the penalties of transgressing off these roads. ▪ The remainder of the open space network to be a strict 'no-go' area.						
Operational	Rehabilitation of riparian edges, wetland and the provision of ecological corridors leading to increased biodiversity value of the river and estuary and protection of the estuary from associated land based activities.	**Without**	2	2	2	2	+8	**Medium**
		With	3	3	3	4	+13	**Very high**
		Mitigation measures: ▪ Corridor areas designed for movement and linkages between the open space areas and the upper river catchment and the coast. ▪ No fences should be erected which as a barrier to this movement. ▪ Rehabilitation to be done according to the Wetland and Open Space Rehabilitation Plan (Appendix B 2).						
Cumulative	Beneficial end-use to the surplus fill material as opposed to being hauled off-site to a landfill as a 'waste'.	**Without**	3	4	3	3	-13	**Very high**
		With	2	2	2	2	+8	**Medium**
		Mitigation measures: ▪ Alternative uses to be investigated as per the Soil Management Framework Strategy (Appendix B 4).						

10 ENVIRONMENTAL IMPACT STATEMENT

10.1 Comparative Assessment of Alternatives and Implications of the Proposed Activity

10.1.1 Cornubia Phase 2 Precinct Plan and Associated Interchanges and the 'No-Go' Alternative

Based on the Impact Assessment, a number of potentially negative and positive impacts have been identified and assessed across the life-cycle of the project. The Comparative Assessment of Alternatives presented in Table 10-1 further provides the advantages and disadvantages of the Cornubia Phase 2 and Interchanges in comparison to the No-Go Alternative.

Table 10-1: Advantages and disadvantages of the Cornubia Phase 2 Precinct Plan in relation to the 'No-Go' alternative

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Agricultural Potential and Land use	▪ The Cornubia site and its soils do offer good agricultural potential but the context and location of the development within the broader region necessitates the transformation of the land use for the greater societal good. ▪ As part of the Cornubia SSIP, urban agriculture is being proposed to support and sustain the recently established community at Cornubia. Community growers are presently being trained/mentored to participate in urban agricultural activities.	▪ Loss of land with good agricultural potential. ▪ Tongaat Hulett have committed to an action plan to address the loss of agricultural land. ▪ DAFF have released the land from agriculture.	▪ The agricultural land capability of the Greater Cornubia Development can be classed as good land for agriculture.	▪ The Status Quo land use (i.e. sugarcane farming) is not in alignment with the surrounding areas as well as the accepted Cornubia Development Framework Plan. ▪ The ability to operate as a working sugarcane farm is compromised by earlier phases of Cornubia (Cornubia Phase 1 and Cornubia Retail Park) presently under construction and as development increases there will be increasing pressures and the associated difficulties of farming land that is surrounded by development.
Soils	▪ A Soil Management Framework Strategy for Cornubia Phase 2 (refer to EMPr) has been developed that will look at	▪ The impact on soils due to construction is deemed an impact of medium significance after mitigation.	▪ The Status Quo will remain.	▪ Whilst the challenge of surplus fill material will not be encountered, it is also noted that the employment

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	potential alternatives for the re-use and recycling of surplus soil generated by construction activities. This to an extent will prevent the disposal of soil at landfills and the sustainable beneficiation of soil resources. ▪ The formulation of a Soil Management Framework Strategy is as a response to lessons learnt from challenges encountered at earlier Phases at Cornubia. This indicates that the Developers and their professional team, including RHDHV who act as ECO are building on the lessons learnt from previous phases and pro-actively responding as necessary. ▪ Options presented in the Soil Management Framework Strategy contribute to the Cornubia SSIP by allowing for the establishment of community/market gardens and/or nurseries to provide employment opportunities for the Cornubia Community.	The mitigation measures proposed in the EMPr in response to the physical disturbance to soils, erosion control, location of laydown areas, and site clearing activities are to be adhered. ▪ Significant quantities of surplus soil material (i.e. otherwise surplus fill material) are expected to be produced during construction activities for Cornubia Phase 2, due to a number of factors. These factors include, *inter alia*, the topography and poor soil quality (for construction purposes) within the area.		and beneficiation opportunities considered for surplus soil (fill) material will not be realised.
Geology and Topography	▪ The proposed development will see the changes in the topography of the area with extensive cut and fill activities. This however, will allow the Greater Cornubia Development (once complete) to align with the visual landscape of the surrounding areas. As the Pilot Phase, Cornubia Phase 1 and	▪ Developing the site will result in disturbance to surface geology for the development foundations. Platforms will be created by cutting the hill tops and spurs and creating fill embankments on the lower slopes. ▪ Slope stability, subsoil seepage, excavatability and	▪ The Status Quo will remain.	▪ Not applicable.

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	Cornubia Retail Park are complete and/or presently under construction, it is necessary for Cornubia Phase 2 to align with the surrounding land transformation. ▪ Practical lessons learnt as ECOs at Cornubia Phase 1 and Cornubia Retail Park have been incorporated into the EMPr to minimise geological and topographical impacts, most specifically those pertaining to erosion control.	founding conditions may present challenges during construction.		
Geohydrology and Hydrology	▪ The maintenance of the open space network as well as the on-going rehabilitation activities of riparian areas will ensure that the Ohlanga River and its buffer are indicated 'no-go' area unless approved for specific and controlled uses (e.g. surplus fill material sites and/or community gardens, etc.). ▪ The implementation of the Wetland and Open Space Rehabilitation Plan could have a positive impact on the Ohlanga River and Estuary in the long-term. It is noted that the rehabilitation of the open space areas at Cornubia Phase 1 has recently commenced. Abstraction of water from the Ohlanga River for fugitive dust suppression during the construction phase and/or irrigation of public open spaces will assist with the present	▪ Shallow groundwater contamination through the spillage of fuels, lubricants, lack of provision of ablutions and other aspects such as construction equipment, vehicles and workshop and wash bay areas exist and the mitigation measures listed in the EMPr, needs to complied with to reduce the impact on groundwater resources. ▪ Run-off from the construction area into groundwater or surface water resources will need to be managed. Potential impacts during operations include discharge of run-off from dirty areas such as workshop areas, roads and chemical storage areas as well as potential flooding and sedimentation affecting water quality of the	▪ The Status Quo will remain.	▪ The Ohlanga River and Estuary is presently under strain. Not only is the river in oversupply, there are two WWTWs which directly impact on the quality of water within the Ohlanga River and Estuary.

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	concerns regarding the oversupply of water within the Ohlanga River. ▪ At present, quarterly water quality assessments are undertaken by GroundTruth upstream and downstream of construction activities at Cornubia Phase 1. The results of these water quality assessments suggest that the construction activities are having limited, if any, effects on the Ohlanga River due to controlled and well managed construction practices.	Ohlanga River and Estuary. ▪ The establishment of a stormwater management system will ensure that all surface water run-off from the site is managed appropriately and directed to the natural wetlands on site. ▪ The SMP must be adhered to and the open space network preserved as far as possible.		
Vegetation	▪ An extensive alien invasive eradication programme is presently underway at Cornubia Phase 1 as part of the Cornubia SSIP. ▪ As part of the Cornubia SSIP, it is proposed that nurseries and/or community gardens are established in which indigenous vegetation will be relocated to. The advantages of having an on-site nursery are numerous, with the single most significant factor being that the plants grown in the nursery are already acclimatised to the area in which they will be utilised. The nursery site will also ensure that the species that are utilised are the correct species for the function that they are to perform, and will ensure that only indigenous species are	▪ Construction of roads and development of fill embankments will result in a minor loss of vegetation deemed to be of low significance post mitigation. The loss of the indigenous vegetation, which for the most part only forms a small component of the entire biomass of the individual areas, will be off-set and mitigated by the planting of indigenous woody vegetation that is commonly occurring in the area into the open space network that is proposed for Cornubia Phase 2.	▪ Status quo will remain.	▪ Much of the land is presently degraded due to extensive sugarcane farming. ▪ Most of Cornubia, especially the riparian zone which will make up the open space network is presently infested with alien invasive vegetation.

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	utilised in the rehabilitation of the open space network. ▪ Rehabilitation of over 300 ha of public open space with indigenous vegetation.			
Wetlands	▪ The loss of wetland area to accommodate the development of Cornubia Phase 2 is being offset at a minimum ratio of 1:3. Furthermore, a no-nett loss policy has been adopted which means there will be a nett functional gain in wetland health and functionality once all remaining wetlands have been rehabilitated. ▪ Given the extremely degraded state of most of the wetland units across the site, it is envisaged that the rehabilitation of the remaining wetlands on site will lead to a significant improvement in the ecological goods and services being provided by the wetlands in the long-term. The loss of some degraded wetland, in order to unlock the development potential of the site and thus the funding for rehabilitation of the greater proportion of wetland, is considered acceptable in this instance, and the offset required by Ezemvelo KZN Wildlife (1:3) will be maintained. ▪ Lessons learnt from earlier phases have culminated in more detailed management	▪ Significant permanent loss of wetland units due to infilling of wetlands for the construction of the platforms, stormwater attenuation, roads, pipelines and sewer crossings. ▪ Potential increase in siltation of the remaining wetlands due to the proposed urban agriculture and linear parks within the wetland buffers. However, provided a 10 m indigenous vegetation buffer is maintained, this impact should be minimal.	▪ No foreseen advantages.	▪ The general present ecological state of the channelled valley bottom wetlands and un-channelled valley bottom wetlands are presently greatly modified (Category E). The general present ecological state of the valley head seep wetlands are presently a Category F (Greatly modified). Lastly, the general present ecological status of the floodplain wetlands are presently a Category D (Largely modified). Therefore, the majority of wetlands and drainage lines at Cornubia Phase 2 are presently in a degraded state and offering limited functionality. The poor functionality of all the wetlands (to a greater or lesser extent) is primarily affected by current impacts relating to the transformation of the wetlands for sugarcane production.

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	plans for Cornubia Phase 2 (e.g. SMP, EMPr, etc.) which seek to reduce the negative impacts of stormwater run-off and by implication erosion and sedimentation.			
Air Quality, Noise and Odours	▪ No advantages are imminent, although the measures proposed in the EMPr will help mitigate the negative impacts associated with construction and decommissioning activities.	▪ During construction and decommissioning, the pollutants likely to be emitted are particulate matter generated by vehicle movement and exposed soil to wind erosion. This is most likely to be a nuisance. ▪ The construction will see an increase in noise in the study area. ▪ The mitigation measures included in the EMPr must be adhered to.	▪ The Status Quo will remain.	▪ Not applicable.
Heritage	▪ Not applicable - No areas of heritage significance have been identified on the properties to be developed.		▪ Not applicable.	▪ Four heritage sites have been identified on adjacent properties with Cornubia Phase 1 and/or Cornubia North.
Visual	▪ The proposed development will see the changes in the topography of the area. This however, will allow the Greater Cornubia Development (once complete) to align with the visual landscape of the surrounding areas.	▪ Temporary visual pollution during the construction period. ▪ Permanent structures associated with the proposed development could create temporary un-vegetated areas in the landscape that could create a visual contrast with the natural vegetation.	▪ No foreseen advantages.	▪ With the development taking place already at Cornubia as well as the surrounding region, the current land use (i.e. sugarcane farming) does not align with the surrounding land use.
Social and Socio-economic	▪ From an economic viewpoint, Cornubia Phase 2 will respond	▪ As could be expected, the construction phase is	▪ No foreseen advantages.	▪ The Cornubia land is strategically situated within a

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	Disadvantages and Responding Mitigation	Advantages	Disadvantages and Responding Mitigation
	powerfully to the housing backlog within the city and will further create a substantial number of construction and operational phase jobs, sustained over many years. ▪ Cornubia Phase 2 will further provide social amenities and facilities to previously disadvantaged communities and will contribute to a sense of place. Moreover, Cornubia Phase 2 will offer substantial commercial and retail opportunities and will contribute significantly to the rates base of the City. ▪ The location of the study area is in prime position to promote and foster economic opportunity, social and physical integration, being in close proximity to the King Shaka International Airport and Dube TradePort. ▪ The Cornubia Social Sustainability and Innovation Programme (SSIP) will become the overarching programme post-construction at Cornubia Phase 2 and is presently formalised within Cornubia Phase 1. Through the Cornubia SSIP it is envisaged that Cornubia will be a zero unemployment development, where the beneficiaries will play a pivotal role in driving sustainable development as	characterised by a number of negative social impacts (viz. arrival of construction workers; inflow of job seekers, additional demand on services, crime, etc.) which is mainly due to the nature of the activities that take place during this phase. Although the expected social impacts associated with the construction phase are mostly negative, these impacts are for the most part only temporary in nature and as such are expected to only last over the construction period. Even though all of the identified social impacts can be mitigated or enhanced successfully, it can only be done if THD and the eTM, or their appointed contractor(s), commit to the responsibility of ensuring that the level of disturbance brought about to the social environment by the more negative aspects of the project, is minimised as far as possible. It is noted that present construction activities at Cornubia Phase 1 and Cornubia Retail Park are well managed with limited social ills experienced to date. This is primarily due to the Developers establishing educational programmes and community outreach activities.		number of development corridors or growth areas identified in provincial and local government plans and strategies in recent years. Therefore, the Status Quo does not fit in with the accepted Cornubia Development Framework Plan and other policies such as the IDP, SDF, NUDC and so forth. As a result the direct benefits from the proposed development (i.e. housing provision, employment, basic services provision, upgrading of current road networks etc.) as well as the indirect benefits will not be met. ▪ The Greater Cornubia Development has already started delivering on its objectives of providing for integrated housing with the construction of the first 482 units at the CIHD Phase 1 (a), and some 2 200 units at the CIHD Phase 1 (b) where construction has commenced. There is currently a local community establishing itself at Cornubia. The public are eager for additional housing units to become available and Government must respond to this demand. Cornubia is the largest existing parcel of land within

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	entrenched in the three pillars of the programme i.e. Open Space (Environmental) Management, Social Development and Economic Participation.			the City to achieve this.
Traffic Accommodation	▪ There will be significant upgrading of the current road network as well as proposed new roads and interchanges. This will create critical linkages east-west and north-south and truly integrate Cornubia into the existing fabric of the City. ▪ The promotion of non-motorised transport through Cornubia is expected to reduce the carbon footprint and promote a shift towards green mobility. ▪ The alignment of the roads within Cornubia to the City's IRPTN and BRT routes serves to increase public transport opportunities within Cornubia. These networks and depots are expected to promote efficient, safe and reliable public transport in a shift towards reducing the carbon footprint on the City. ▪ The extensive road network and access points through the interchanges proposed are expected to (in the long-term) alleviate traffic impacts in the north.	▪ Due to construction activities there is the possibility of disruptions to traffic flow in the area, especially along existing routes when the proposed interchanges are constructed. ▪ Furthermore, the proposed development will see an increase in traffic in an already congested area, although it is noted that this congestion is in the short-term until the ultimate development of all transport networks in and around Cornubia.	▪ The Status Quo will remain.	▪ The current haulage sugarcane roads or tracks will remain within Cornubia. Current infrastructure on site i.e. culverts, low level bridges etc. are not maintained and are highly impacted by erosion and sedimentation into existing wetlands and drainage lines. Furthermore, these roads are prone to stormwater flooding. ▪ Existing traffic congestion in the North, especially around Umhlanga and Mount Edgecombe. The proposed interchanges and road networks are expected to alleviate much of this congestion, once fully developed.

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Roads Master Planning	▪ The refinement of the Cornubia Phase 2 LUM Precinct Plan has seen the realignment of network roads to optimise land use and to integrate/enhance the mobility network between the project area and the surrounding areas. The realignments include: Blackburn Link; Cornubia Boulevard; Dube East and Dube West. Three new interchanges have also been proposed i.e. Blackburn Interchange; Marshall Dam Interchange; and R102 / Northern Drive Interchange. ▪ Furthermore, the following public transport services have been incorporated into the Precinct Plan: – Bus Rapid Transit (BRT) Services - two main BRT services will be provided within Cornubia, namely King Shaka International Airport to Durban CBD *via* Umhlanga (IRPTN C8 Corridor) and Bridge City to Umhlanga Ridge Town Centre (IRPTN C9 Corridor). – Feeder Services - feeder services will provide local bus services that will support the BRT routes. This will improve the access to the BRT service and local road networks.	▪ Congestion whilst the roads are being constructed and upgraded. ▪ Currently as it stands if the proposed Cornubia Development Framework Plan roads are not realigned, two existing live trunk sewers mains will be crossed by the Dube East and West Roads, and the Blackburn Link and Cornubia Boulevard are geometrically challenged. ▪ *Dracaena aletriformis* will be required to be removed and transplanted elsewhere in the open space network. This species will require a permit from Ezemvelo KZN Wildlife for its relocation. There are some large indigenous *Ficus natalensis* trees occurring within the proposed footprint of the interchange that will be lost as a result of the proposed interchange.	▪ The Status Quo will remain.	▪ The current haulage sugarcane roads or tracks will remain within Cornubia. Current infrastructure on site i.e. culverts, low level bridges etc. are not maintained and are highly prone to erosion and sedimentation into existing wetlands and drainage lines. Furthermore, these roads are prone to stormwater flooding. ▪ Existing traffic congestion in the North, especially around Umhlanga and Mount Edgecombe. The proposed interchanges and road networks are expected to alleviate much of this congestion, once fully developed.

	Cornubia Phase 2 LUM Precinct Plan		No-Go (Status Quo)	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
	– Quality Bus Services (QBS) - the QBS will transport passengers not within the catchment areas of the BRT routes. The QBS routes will be located outside of Cornubia. ▪ Specific non-motorised transport lanes such as walking and bike trails are also proposed within the open space network.			

10.1.2 Stormwater Attenuation Facilities

Table 10-2 provides a comparative assessment of the stormwater attenuation facilities alternatives presented – i.e. **Option A** (preferred alternative) which is attenuation facilities within wetlands and **Option B** which is attenuation facilities outside wetlands but within the 30 m wetland buffers. The comparative assessment below takes into account the impact assessment provided in Section 9.3.14. The table further provides a summary of the positive and negative impacts.

Table 10-2: Advantages and disadvantages of the stormwater attenuation facilities alternatives

	Attenuation Facilities Within Wetlands – Option A		Attenuation Facilities Outside Wetlands – Option B	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Location of stormwater attenuation facilities	**-8 after mitigation**		**-9 after mitigation**	
	▪ Lower ratio of area to be disturbed (in wetlands) and quantities of earth-works and consequently surplus fill material are less resulting in lower capital costs.	▪ Loss of wetland area to accommodate the installation of stormwater attenuation facilities within wetlands.	▪ High ratio of area to be disturbed (outside wetlands but in wetland buffers) and quantities of earth-works and consequently surplus fill material leading to higher capital costs.	▪ Long-term the health of the wetland is considered to be preserved offering better functionality due to no loss of wetland area.

10.1.3 Wetland Rehabilitation Options

Table 10-3 provides a comparative assessment of the wetland rehabilitation options presented – i.e. urban agriculture and linear parks as compared to the 'no-go' option of maintaining the 30 m buffer using only indigenous vegetation for rehabilitation. The comparative assessment below takes into account the impact assessment provided in Section 9.3.15. The table further provides a summary of the positive and negative impacts.

Table 10-3: Advantages and disadvantages of the wetland rehabilitation alternatives

	Urban Agriculture and Linear Parks within Wetland Buffers		Only Indigenous Vegetation within the Entire 30 m buffer	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Rehabilitation of wetland buffers.	**+4 after mitigation**			
	▪ Increase food security through market garden opportunities and further offset against loss of agricultural land at Cornubia. ▪ Additional beneficial use and functionality of the wetland buffers which will enable employment opportunities for the local community and allow the community to become custodians of the open space network, thereby promoting long-term maintenance and sustainability.	▪ Potential siltation of the wetland due to fertilisers and activity in the wetland buffer.	▪ Wetland rehabilitation.	▪ Loss of socio-economic benefits and long-term ecological benefits associated with having community support and integration within the open space network.

10.1.4 Surplus Fill Material Sites

Table 10-4 provides a comparative assessment of the surplus fill material alternatives presented – three surplus fill material sites within the open space network as opposed to the alternative which involves haulage of surplus material off-site and disposal at a landfill site. The comparative assessment below takes into account the impact assessment provided in Section 9.3.16. The table further provides a summary of the positive and negative impacts.

Table 10-4: Advantages and disadvantages of the three (3) surplus fill material sites in relation to the disposal of surplus fill material off-site

	Three Surplus Fill Material Sites		Haulage Off-site for Disposal	
	Advantages	**Disadvantages and Responding Mitigation**	**Advantages**	**Disadvantages and Responding Mitigation**
Establishing three surplus fill material sites	**-8 after mitigation**		**-13 after mitigation**	
	▪ Beneficial end-use to surplus fill material – upon closure of the Surplus Fill Material Sites, they will be rehabilitated and integrated into the open space network according to the Cornubia Phase 2 Wetland and Open Space Rehabilitation Plan. The rehabilitation of these sites is expected to increase the functional value of the riparian habitat and be a nett positive gain of very high significance.	▪ The potential exists for flooding due to sites located within the 1:100 year floodline should it not be established in an appropriate manner. However, should the protocols presented in the EMPr and SMP be adhered to, the potential is deemed to be of low to medium significance. ▪ Sedimentation potential from the Surplus Fill Material Sites impact on water quality of the Ohlanga River and Estuary. ▪ Disturbance to the riparian vegetation during the establishment of the Surplus Fill Material Sites is deemed to be a negative impact of medium significance post-mitigation.	▪ Protection of the Ohlanga River and Estuary as well as preservation of the open space network.	▪ Due to the magnitude of surplus fill material at Cornubia, not all material can be accommodated for alternate uses and should they not be accommodated within surplus fill material sites, the material will need to be hauled off-site for disposal to a landfill site that is willing and able to accept the material. Not only are haulage costs prohibitive, this alternative would not be appropriate in terms of the waste hierarchy as it involved disposal instead of identifying a beneficial end-use on-site.

10.2 Key Findings of the EIA

A considerable amount of planning has gone into the formulation of the Cornubia Phase 2 LUM Precinct Plan which has been informed by rigorous scientific assessments, strategic discussions with many stakeholders and lessons learnt from earlier phases of Cornubia presently under occupation or construction.

The most notable impact as a result of the proposed development is the loss to wetland habitat. It is proposed that 27.59 ha of degraded wetland area (which includes Cornubia Phase, Cornubia Retail Park and the N2 Cornubia Bridge and Interchange) be infilled in order to enable the creation of a sufficiently large platform area and service infrastructure that will accommodate the extensive development proposed. Given the extremely degraded state of most of the wetland units across the site, it is proposed that the rehabilitation of the remaining wetlands on site will lead to a significant improvement in the ecological goods and services being provided by the wetlands in the long-term. To this end, 99.25 ha of wetland area is earmarked for rehabilitation as part of the Cornubia Phase 2 Wetland and Open Space Rehabilitation Plan. This as a result, exceeds the 1:3 offset requirements as proposed by Ezemvelo KZN Wildlife.

Stormwater management and attenuation also remains a high priority for a development of this nature. The specialist studies have shown that mitigation of the potentially negative effects of the proposed development with regard to storm events can be successfully mitigated through the implementation of the policy, regulations and guidelines contained in the Stormwater Management Plan, as well as the specific recommendations given in the specialist reports. The case for the placement of stormwater attenuation measures within wetlands or within the wetland buffers have been assessed. Whilst the location of stormwater attenuation facilities within wetland units are more viable in terms of reduced earth-works and lower capital costs, it has been found that this option would result in a loss of wetland area. All stormwater attenuation facilities presently proposed to be located within wetland units therefore cannot be accommodated as the required wetland offset ratio of 1:3 will not be maintained. Therefore, only 4.12 ha of wetland loss can be accommodated for the stormwater attenuation facilities. Consequently, the stormwater engineers must investigate the option of some (maximum of 4.12 ha) ‘within’ wetland facilities, and some ‘outside’ wetland facilities, in an attempt to balance costs and wetland losses. Furthermore, additional investigation is required by the stormwater engineers to investigate the cost impacts of on-site attenuation through the use of alternative materials, such as porous paving systems and on-site tank attenuation facilities.

From an ecological perspective, to ensure the long-term sustainability and integrity of the open space network, it is important to ensure the local community at Cornubia can utilise this space in a responsible and resilient manner. Therefore, as part of the Cornubia SSIP, it has been proposed that the wetland buffers be used for market gardening opportunities by the local community as well as for green linear walkways and trails. The Developers have committed to maintaining a 10 m ecological buffer directly adjacent to the wetland, however, the remaining 20 m buffer will be utilised for communal benefit. Whilst some concerns pertaining to possible siltation of the wetland have been noted, it has been found that with appropriate mitigation measures, this impact is of medium significance. Moreover, the overwhelming positive impact of utilising this space for communal benefit in the long-term necessitates the use of these buffers.

An additional challenge for the project will be the re-use and recycling of surplus fill material. In an effort to address the matter in a strategic and practical manner, the Developers, together with their specialist team, have embarked on the formulation of a management plan for the surplus fill material for the Greater Cornubia Development. Whilst the level of detail required for such a plan is not available at the pre-construction phase, the formulation of the Soil Management Framework Strategy presented in this EIA is a positive step towards this. Whilst many options have been presented in the Strategy, to ensure the beneficial end-use of surplus fill material, surplus fill material sites are required – three sites have been proposed and assessed in this study. Whilst there are negative implications for the establishment of such sites, upon decommissioning they will be rehabilitated and integrated into the open space network according to the Cornubia Phase 2 Wetland and Open Space Rehabilitation Plan.

From a biodiversity point of view, it is envisaged that the construction of roads and development of fill embankments will result in a minor loss of vegetation deemed to be of low significance post mitigation. The loss of the indigenous vegetation, which for the most part only forms a small component of the entire biomass of the individual areas, will be offset and mitigated by the planting of indigenous woody vegetation that is

commonly occurring in the area into the open space network that is proposed for Cornubia Phase 2. Furthermore, the applications for necessary DAFF licence and Ezemvelo KZN Wildlife Permits have been initiated.

This EIA study has also been cognisant of the Greater Cornubia Development and the subsequent alignment of the Cornubia Phase 2 LUM Precinct Plan with the accepted Cornubia Development Framework Plan. The proposed Cornubia Phase 2 development, therefore, cannot be viewed in isolation and the cumulative impacts have been identified and addressed.

10.3 EAP Opinion

The results of the impact assessment indicate that the most significant impacts as a result of the proposed project would include impacts on the open space network (including wetland and vegetation pockets), impacts related to stormwater run-off, generation of surplus fill material and to an extent the loss of vegetation and land with good agricultural potential. It is however noted that the majority of Cornubia is dominated by alien invasive vegetation and that the DAFF have released Cornubia from its agricultural land use. Therefore, these impacts can be successfully mitigated through the measures and recommendations proposed by the various specialist disciplines, lessons learnt from the EIA studies conducted for the subsequent phases making up the Greater Cornubia Development as well as key stakeholders including various Departments with the eThekwini Municipality.

The EMPr including the various plans presented (Wetland and Open Space Rehabilitation Plan, Stormwater Management Plan and the Soil Management Framework Strategy) thus becomes the overarching implementation document during the project life-cycle ensuring that the environmental sensitivities highlighted in this report are afforded protection and where not possible to avoid, undergo the appropriate licensing process.

The findings therefore, conclude that the proposed Cornubia Phase 2 development and the associated interchanges should go ahead provided that the recommended mitigation and management measures contained in the preceding chapter and EMPr are implemented. Should the proposed mitigation measures be implemented correctly, Cornubia Phase 2 will be a viable development. Furthermore, both proposed typologies for Cornubia Boulevard as well as the proposal for urban agriculture and linear parks within wetland buffers and the surplus fill material sites should be authorised. However, the EAP notes that the proposal to locate facilities for the attenuation of stormwater within wetlands required further investigation.

The above is the view and recommendation of the EAP based on the findings of this EIA.

11 CONCLUSION AND CONDITIONS OF AUTHORISATION

The EIA process for Cornubia Phase 2 and associated infrastructural requirements for the three interchanges has been undertaken in accordance with the EIA Regulations published in Government Notice No. R. 543, R.544 and R. 545 of 2010 in terms of Section 24 (5) of the National Environmental Management Act (Act No 107 of 1998) (as amended).

In order to protect the environment and ensure that Cornubia Phase 2 and associated interchanges are constructed and operate in an environmentally responsible manner, there are a number of significant pieces of environmental legislation that have been taken into account during this study. These include:

APPLICABLE NATIONAL LEGISLATION
The Constitution of South Africa (No. 108 of 1996)
National Environmental Management Act (Act No. 107 of 1998)(as amended)
National Environmental Management: Waste Act (No. 59 of 2008)(as amended)
National Water Act (Act No. 36 of 1998)(as amended)
Conservation of Agricultural Resources Act (Act No.43 of 1983)
National Environmental Management Biodiversity Act (Act No. 10 of 2004)
KZN Nature Conservation Ordinance (15 of 1974)
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
National Heritage Resources Act (No. 25 of 1999)
National Environmental Management: Air Quality Act (No. 39 of 2004)
National Veld and Forest Act (Act 101 of 1998)
Hazardous Substance Act (No. 15 of 1973) and Regulations
National Building Regulations and Building Standards Act (Act No. 103 of 1997)
Occupational Health and Safety Act (No. 85 of 1993)

This relevant legislation has informed the identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project.

The conclusions of this draft EIAR including comments and concerns from I&APs are as a result of a comprehensive EIA study. These studies are based on issues identified in the Environmental Scoping Study and the parallel process of public participation through to the EIA phase. The public consultation process has been inclusive, and every effort has been made to include representatives of all stakeholders within the process.

11.1 Concluding Remarks

This draft EIAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the project. It further provides a description of the affected environment and alternatives proposed for the stormwater attenuation facilities and management of surplus fill material.

Cornubia has evolved over the years and programmes and strategies have been put into place to address concerns as they come to light to ensure Cornubia lives up to the ideals and strategic vision articulated to I&APs in previous assessments. To this end, the Cornubia SSIP is the first step towards ensuring the commitment from the Developers in promoting a progressive, resilient and truly sustainable development. It is further noted that the Cornubia Management Association has recently been formalised which promotes a governing body for all end-use developers and to manage and maintain Cornubia at large and the rehabilitation and maintenance of public open space areas specifically.

Furthermore, the Cornubia Strategic Environmental Forum has also been formalised. The intention of this Forum is to strategically and timeously address environmental challenges and concerns with the relevant Competent Authorities and stakeholders to ensure Cornubia continues to develop in a responsible and compliant manner.

The promises of Cornubia are starting to emerge as a reality. The Greater Cornubia Development has already started delivering on its objectives of providing integrated housing with the construction of the first 482 units at the CIHD Phase 1 *(a),* and some 2 200 units at the CIHD Phase 1 *(b)* where construction has commenced. There is currently a local community establishing itself at Cornubia.

Employment and economic opportunity is being developed in tandem with the housing. The CIBE is currently being developed and an EIA process for the Cornubia Retail Park has been approved where a new retail centre is planned to be operational by 2016. The objective of an integrated human settlement is starting to materialise.

Cornubia Phase 2 will add further housing and economic opportunity once approved and therefore plays a significant role in ensuring the development impetus continues within Cornubia once Cornubia Phase 1 has been fully developed.

Since the Medium Density residential development is already under construction with approximately 2 500 units envisaged in the short-term, the development of the study area may contribute in creating much needed employment opportunities in the area.

Furthermore, the rehabilitation of the extensive open space area at Cornubia Phase 1 has recently commenced. Whilst there is an unavoidable loss to certain wetland and biodiversity pockets, it is re-iterated that what has been destroyed is starting and will continue to be established elsewhere to ensure that there is no-nett functional loss within the Greater Cornubia Development and the promise of improved ecological services becomes a reality.

It is emphasised that the work does not stop at this juncture. Whilst Cornubia has come a long way, there is still a long way to travel and the Developers must continue to respond to challenges in a transparent and inclusive manner. As the development progresses, further initiatives, forums and programmes will be implemented as required to ensure the development of Cornubia lives up to the promise of sustainable development and the best use of the land for the greater societal good.

As a point of departure, it should be stressed that whilst there are some unavoidable impacts to the receiving environment, the option to proceed with Cornubia Phase 2 as proposed in the Cornubia Phase 2 LUM Precinct Plan far outweighs the ‘no-go’ option which would prevent the City from meeting its strategic objectives as outlined in the plethora of planning documents (IDP, SPF, NUDC etc.) and whilst the Cornubia LUM Precinct Plan that has been through many iterations it will still be refined further as various sub-phases of Cornubia Phase 2 reach fruition.

11.2 Assumptions, Uncertainties or Gaps in Knowledge

- All information provided by THD, the eTM and their specialist consultants to the EAP was correct and valid at the time it was provided.
- The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process.
- All data from unpublished research is valid and accurate.
- The scope of this investigation is limited to assessing the potential environmental impacts associated with Cornubia Phase 2 and the associated interchanges.

In addition to the assumptions above, the following assumptions and limitations were noted by the specialist team:

11.2.1 Wetland Assessment

The study only focused on the functional, ecological importance and sensitivity, and ecosystem services assessment of wetlands. A wetland delineation study has previously been conducted and did not fall within the scope of the assessment. Aquatic studies of fish, invertebrates, amphibians etc. have not been included in this report. Hydrological or groundwater studies have also not been included.

All shapefiles of the previous wetland assessment were provided. The classification exercise of the wetland HGM units was undertaken based on the wetland shapefiles that were provided.

As the study was limited to the study area (boundaries of the property), some wetlands may have extended further than the boundary of the study site where delineation did not take place, and therefore did not form part of the functional assessment.

A thorough vegetation identification exercise was not undertaken. Recorded vegetation species was based on general observation during the field survey and can be found as an annexure to the report.

With regards to the assessment of the importance of the wetland unit, it is important to note that the WET-EcoServices tool utilised in the assessment is a rapid assessment that gives a general indication of the level of ecosystem services provided by wetland.

The assessment is considered satisfactory for the level of assessment required for inclusion in the EIA Process and for the purposes of feeding into an application brought for obtaining a Water Use Licence.

Similarly, the WET-Health assessment tool utilised to determine the present state of the wetland units is also a rapid assessment tool. The assessment is also considered satisfactory for the purposes of the assessment particularly as the wetland units are in a moderate to poor state.

11.3 Conditions

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA study are included within an EMPr (refer to Appendix B). The EMPr must be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for the life cycle phases of the project is considered to be vital in achieving the appropriate environmental management standards as detailed for this project.

In addition, the following key conditions should be included as part of the authorisation:

a) The Developers are not negated from complying with any other statutory requirements that is applicable to the undertaking of the activity. Relevant key legislation that must be complied with by the proponent includes *inter alia*:
   - Provisions of the National Environmental Management Waste Act (No. 59 of 2008)(as amended)
   - Provisions of the National Water Act, 1998 (Act No 36 of 1998)(as amended)
   - Provisions of the National Forests Act (Act No 84 of 1998)
   - KZN Nature Conservation Ordinance (15 of 1974)
   - Provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)
   - SANS 10103

b) The Developers must appoint, on their respective properties, a suitably experienced (independent) Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr.

c) The Stormwater Management Plan must be complied with.

d) The Cornubia Phase 2 Wetland and Open Space and Rehabilitation Plan must be complied with.

e) All necessary permits, licences and approvals must be obtained prior to the commencement of construction.

Appendix A

Acceptance of ESR

Appendix B

Environmental Management Programme

Appendix C

Specialist Studies

Appendix D

Memorandum of Understanding

Appendix E

RHDHV Service Line Profile and EAP CVs

Appendix F

Layout Plans

Appendix G

Service Level Agreements

Appendix H

Public Participation Summary Report and Comments & Responses Report

Royal HaskoningDHV

Enhancing Society Together