SEATON THOMSON & ASSOCIATES

IN TOUCH WITH THE AFRICAN LANDSCAPE

Prepared for Hunkydory Investments 201 (Pty) Ltd

DRAFT ENVIRONMENTAL IMPACT REPORT IN TERMS OF SECTION 24 (5) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (NO. 107 OF 1998)

RE-ALIGNMENT OF THE K155 (EXISTING R23) OVER THE SWARTSPRUIT, INCLUDING THE CONSTRUCTION OF RIVERFIELDS BOULEVARD AND NEW BRIDGE OVER THE SWARTSPRUIT, IN THE RIVERFIELDS DEVELOPMENT AREA, KEMPTON PARK, EKURHULENI.

Gauteng Department of Agriculture and Rural Development (GDARD) reference number GAUT 002/16-17/E0016

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RE-ALIGNMENT OF THE K155 (EXISTING R23) OVER THE SWARTSPRUIT, INCLUDING THE CONSTRUCTION OF RIVERFIELDS BOULEVARD AND NEW BRIDGE OVER THE SWARTSPRUIT, IN THE RIVERFIELDS DEVELOPMENT AREA, KEMPTON PARK, EKURHULENI

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Acronyms

Blvd: Boulevard
DEA: Department of Environmental Affairs
DWA: Department of Water Affairs
Ex: Extension (when referring to a township extension number)
EIA: Environmental Impact Assessment
EIR: Environmental Impact Report
EMF: Environmental Management Framework
EMZ: Environmental Management Zone
EMM: Ekurhuleni Metropolitan Municipality
I&APs: Interested and Affected Parties
GDARD: Gauteng Department of Agriculture and Rural Development
GDACE: Former Gauteng Department of Agriculture Conservation and Environment (now known as GDARD)
NEMA: National Environmental Management Act, No. 107 of 1998
NEMA EIA Regulations: Regulations GN R.982, 983, 984 and 985 (8 December 2014). Promulgated in terms of section 24(5) read with section 44, and sections 24 and 24D of the National Environmental Management Act, 1998
SR: Scoping Report
SDF: Spatial Development Framework
IDP: Integrated Development Plan

1. EXECUTIVE SUMMARY

Application is hereby made by *Seaton Thomson and Associates*, on behalf Hunkydory Investments 201 (Pty) Ltd, for environmental authorisation and approval of the re-alignment of the K155 (Existing R23) over the Swartspruit, including the construction of Riverfields Boulevard (Blvd) and new bridge over the Swartspruit, in The Riverfields Development Area, Kempton Park, Ekurhuleni. The proposed roads fall within the city of Ekurhuleni Metropolitan Municipality. The entire development of the farm Witfontein, proposed to take place over the next 10-15 years is referred to as "**Riverfields**". All referenced to Riverfields includes reference to the entire proposed development. This EIA deals only with a main road within the overall envisaged Riverfields Development.

The application for these new roads (and widening existing roads) triggered a number of listed activities in terms of GN 983, 984 and 985 of 2014, published in terms of the National Environmental Management Act (NEMA) (No. 107 of 1998). The Gauteng Department of Agriculture and Rural Development (GDARD) has issued the reference number **GAUT 002/16-17/E0016** to the project. The scoping phase was completed, and the final scoping report was approved by GDARD.

In summary the following conclusions were drawn by the specialist studies undertaken for the Environmental Impact Assessment:

1. Vegetation assessment: much of the natural grassland vegetation on the southern extent of the Riverfields Boulevard alignment is infested with "Bankrotbos" and has been heavily overgrazed. The only grassland in a more natural condition is closer to the Swartspruit and around the rocky ridge areas through which Riverfields Boulevard and the north-western section of the proposed R23/K155 alignment passes. There are patches of wattle and blue gum trees within the rocky ridges that should be cleared. Overgrazing of the entire area has reduced the biodiversity of the natural veld grass. Wetland vegetation exists along the existing R23 road crossing the Swartspruit, but disturbance will be minimal as the road widening will be directly next to the existing road surface (where there is already edge effects), and within what was the old R23 road alignment footprint slightly north of the current alignment.
2. Faunal assessment: Although larger animals such as porcupine and jackal would frequent the area from time to time, most of the larger animals would stay away from the existing residential areas of Glen Erasmia and in all likelihood remain closer to the rocky ridges around the Swartspruit and in the Swartspruit wetland east of the R23 road. Other wild fauna are more likely to be prevalent along the river corridors, moving between feeding areas along this green space, or seeking other habitat. The partial re-alignment and widening of the R23 (Option B alternative) will have less of an impact on Fauna than the full realignment (Option A alternative). Riverfields Boulevard alignment and bridge over the Swartspruit will be built as a span bridge over the river, and as such this will also provide open space below the bridge for the movement of fauna up and down the Swartspruit, thereby not cutting them off from free movement or severe habitat fragmentation.
3. Heritage/ archaeology impact assessment: Of the 13 sites identified in the greater Witfontein area, and more specifically within the rocky ridge area, only

site 10, 11 and 13 are on or right next to the alignment of Riverfields Boulevard and the north-western extension of the R23 realignment. Due to this, only these sites have been discussed in this section of the EIA report. Sites 10, 11 and 13 have all be given a LOW significance rating, with the more significant sites within the general area having higher significance, but will not be impacted by the proposed road alignments.

4. Socio-economic impact assessment: The proposed Riverfields mixed use development is bound to have a positive and far-reaching economic impact on the local, regional, metropolitan and provincial economies, including previously disadvantaged communities such as Tembisa. It would however be important to maximize the potential economic benefits to second economy areas by means of, inter alia, increasing linkages and reducing leakages in the local economy, skills development programmes, preferential procurement, local labour promotion, etc. The upgrade, widening and building of new roads within this area is critical for the development of the area in the longer run and to link main arterial routes between residential, commercial and office park areas.
5. Riverfields Boulevard Bridge over the Swartspruit and impact to watercourse: A span bridge with 2 central support pillars has been considered as the preferred alternative for the Riverfields Boulevard Bridge. The Swartspruit cuts a deep profile through the rocky quartzite ridges in the area where the bridge is proposed to cross, with an elevation change of upward of 11 meters in some cases. It is for this reason that a span bridge has been assessed. The span has been determined to be 60 meters, with the two central pillars 24 meters apart and then a distance of 18 meters between them and the end supports, which will tie into a soil filled road surface. This design is seen to be the most environmentally sensitive design.
6. R23 widening along the current alignment over the Swartspruit and impact on watercourse and wetlands: Two alternatives were assessed for this crossing point, and the Option B alternative was determined to be the preferred alternative from an environmental and economic perspective. Environmentally, widening an existing alignment keeps impact areas contained, rather than a full realignment, which would encroach deeper into the more sensitive wetland areas and grass owl habitat north of the existing alignment. Adding culverts on one side to the existing culverts will mean work can be undertaken from the existing bridge, and no additional damage will be done to more sensitive areas. This widening will also be within what was the old R23 road footprint alignment slightly north of the current alignment, which can still be seen on the ground. This means that already impacted and disturbed areas will be used for the widening.

The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The EMF also encourages development with this area. All of these factors and polices point to the fact that development within this R21 corridor is indeed desirable. The roads will mainly traverse areas identified as a Zone 1 EMZ in the Gauteng EMF of 2014.

Based on the findings, summary and conclusion in the report, the consultant is of the opinion that the full re-alignment of the R23 over the Swartspruit is NOT the preferred alternative, and the R23 should be widened along it current alignment over the Swartspruit, and then straighten to junction with Riverfields Blvd and then Pretoria

road further north-west. The construction of Riverfields Boulevard and new bridge over the Swartspruit should also be considered as part of the preferred alternative, as both the road widening and Riverfields Blvd are critical in the overall roads layout and urban design masterplan for the Riverfields Development Area. Although there will be some negative impacts that range from medium to low in significance (specifically during construction) there are many positive social and economic implications that considerably outweigh the negative implications of building the roads and the positive impact on development within the area.

The consultant is, therefore, of the opinion that the activities as applied for (Riverfields Blvd and bridge as well as the widening of the R23 over the Swartspruit, and the re-alignment of the R23 from west of the Swartspruit to Pretoria road), should be authorised, with the condition that terms, conditions and guidelines contained the EMP be effectively, efficiently and professionally implemented.

2. THE APPLICATION

2.1 Introduction and Background to process

In 2014 the Minister of Environmental Affairs passed environmental impact assessment regulations in terms of the National Environmental Management Act, 1998 (NEMA). These Regulations replace the Environmental Impact Assessment (EIA) Regulations of 2010, promulgated in terms of the National Environmental Management Act, 1998 (NEMA). Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant environmental authorisation.

The current Environmental impact assessment Regulations became effective on 8 December 2014. In terms of these EIA Regulations, it is required that authority for and approval be obtained from the relevant environment authority, which in this case is the **Gauteng Department of Agriculture and Rural Development (GDARD)** for specific types of activities/ developments.

The objective of the Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the activities that have been identified. The purpose of these procedures is to provide the competent authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorised, and that activities which are authorised, are undertaken in such a manner.

The scoping phase of the Environmental Impact Assessment (EIA) was undertaken in early 2016, and the draft and final scoping report was circulated for comment amongst all the registered Interested and Affected Parties and Government Departments for comment. The final Scoping Report was reviewed by GDARD, and was accepted in a formal letter dated 5 August 2016. Please see letter in Appendix 2: GDARD approval of Scoping report.

This Environmental Impact Report (EIR) has been compiled according the Plan of Study for EIA contained in the Scoping Report, with additional technical and specialist input from a number of natural scientific specialists and engineers.

2.2 The Application

Application is hereby made by *Seaton Thomson and Associates*, on behalf of Hunkydory Investments 201 (Pty) Ltd, the re-alignment of the K155 (Existing R23) over the Swartspruit, including the construction of Riverfields Boulevard and new bridge over the Swartspruit, in The Riverfields Development Area, Kempton Park, Ekurhuleni. The application will involve the following listed activities in terms of GN 983, 984 and 985 of 2014, published in terms of the National Environmental Management Act (NEMA) (No. 107 of 1998). An application form was submitted to GDARD when the draft Scoping report was submitted in April 2016. The final Scoping Report was reviewed by GDARD, and was accepted in a formal letter dated 5 August 2016. Please see letter in Appendix 2: GDARD approval of Scoping report.

The ***actual*** activities associated with each "Listed Activity" in terms Regulations GN 983 and 984 are below and more fully tabulated further in the report.

Number and date of the relevant Government Notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per the wording in the relevant listing notice:
GNR 983, 4 December 2014	12	The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -

		excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.
GNR 983, 4 December 2014	19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater, But excluding where such infilling, depositing , dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.
GNR 983, 4 December 2014	56	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 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.
GNR 984, 4 December 2014	27	The development of - (i) a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); (ii) a road administered by a provincial authority;

		(iii) a road with a reserve wider than 30 metres; or (iv) a road catering for more than one lane of traffic in both directions; but excluding the development and related operation of a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies.
GNR 985, 4 December 2014	12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan: In Gauteng, within critical biodiversity areas identified in bioregional plans
GNR 985, 4 December 2014	18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre: In Gauteng, in Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;
GNR 985, 4 December 2014	14	The development of- (i) canals exceeding 10 square metres in size ; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size; (vi) bulk storm water outlet structures exceeding 10 square metres in size; (vii) marinas exceeding 10 square metres in size; (viii) jetties exceeding 10 square metres in size; (ix) slipways exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs – a) within a watercourse b) in front of a development setback line c) in no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse;

		excluding the development of infrastructure or structures which ports or harbours that will not increase the development footprint of the port or harbour: In Gauteng, in Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;

In terms of these listings, it is required to make application for authorisation for the roads to the Gauteng Department of Agriculture and Rural Development (GDARD).

3. DETAILS AND EXPERTISE OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

Seaton Thomson and Associates have ±30 years' experience in town, regional and environmental planning. This includes environmental impact assessment and environmental management. The Company has undertaken numerous EIA applications for authorisation under the old Environment Conservation Act, as well as new NEMA regulations in all Provinces in South Africa, including diverse land use development applications, various types of bulk and service infrastructure, filling stations and game lodges in conservation areas.

Refer to Appendix 1: Environmental Practitioner: Seaton Thomson and Associates company profile and EAP CV's

3.1 Details of the company and Company address

Seaton Thomson and Associates CC
Company Registration number: CK 95/02499/23
Established 1995

63 St Annes Lane, Irene, 0062
P O Box 936, Irene, 0062
Tel 012 667 2107
Fax 012 667 2109
Cell 082 920 6115

4. DESCRIPTION OF THE PROJECT

4.1 The Site and Location

The realignment of the K155 (existing R23 road) will be between Monument Road and Pretoria Road (M57). Option A proposes that the R23 will be realigned on a straighter alignment, junctioning with Pretoria Road some 450m south of the current Pretoria Road/ R23 intersection. Option B proposes that the re-alignment starts west of the Swartspruit, to Pretoria Road, and is widened on its current alignment over the Swartspruit. A new 4 lane road, Riverfields Boulevard, is proposed to be built between Monument Road and the new R23/ K155 alignment. This road is proposed

for both Options A and B. The Riverfields Boulevard will pass on the eastern corner of the JJ Maritz Quarry and cross the Swartspruit in a roughly north-south alignment.

Figure 4-1: Regional road network plan

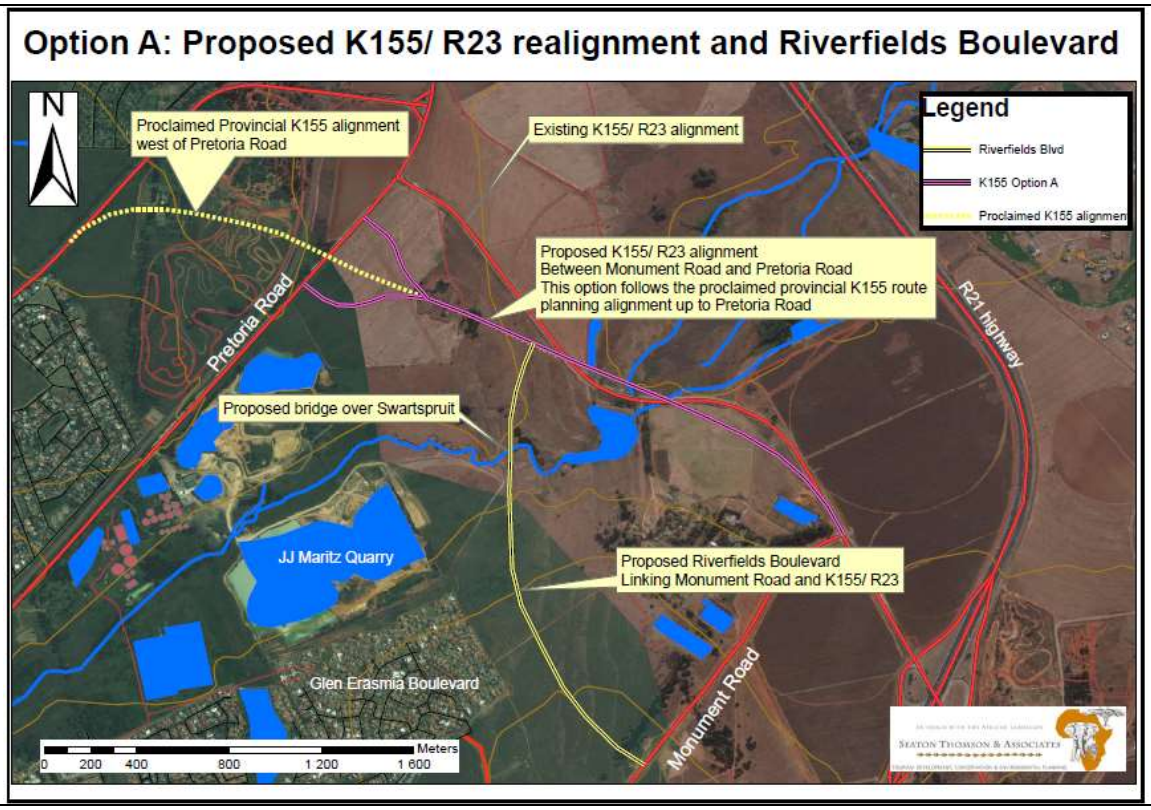

Figure 4-2: Option A of the proposed R23 realignment and Riverfields Boulevard

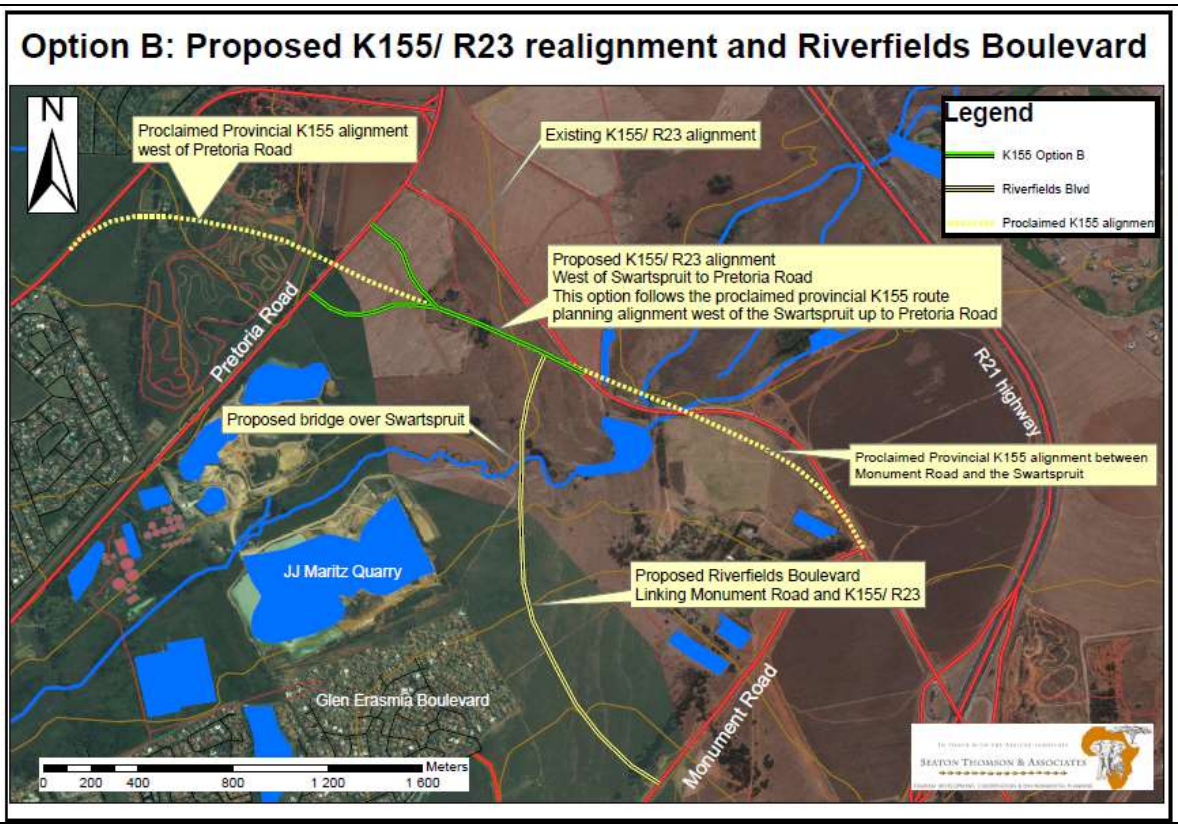

Figure 4-3: Option B of the proposed R23 realignment and Riverfields Boulevard

Figure 4-4: Riverfields Development area in a regional context

4.2 Vision of Witfontein Farm – Riverfields Development and Ekurhuleni Development Policies

It is the intention of the applicant to establish formal development on the entire Riverfields site, which will comprise of mixed uses, including residential, retail, commercial, recreational, new roads and services and institutional uses. All bulk and service internal and external infrastructure and roads will be included.

The entire development of the farm Witfontein, proposed to take place over the next 10-15 years is referred to as "**Riverfields**". All reference to Riverfields includes reference to the entire proposed development. This EIA deals only with a new road and road upgrades of the overall envisaged Riverfields Development.

A vision and urban design framework has been prepared for the long term development of this area, which aims to meet the social and economic needs of the area, as well as of the wider Gauteng region. This vision is aimed at the provision of a mixed used development that will comprise of residential, retail, commercial, recreational, industrial, institutional uses, as well as open space and conservation areas. The vision further aims to address national priorities in terms of the optimisation of valuable land within the urban edge through densification and optimal use of bulk and service infrastructure.

Due to the extensive area of the Witfontein Farm, being ± 1000 hectares, the development will be phased over many years, part of which has already commenced on this land owners property. The current application forms a further phase of the

long term development of the land. The “Riverfields” development area is the area as shown in Red in Figure 4-4: Riverfields Development area in a regional context.

Figure 4-5: Proposed Riverfields master road layout plan

The following map in Figure 4-6 shows the urban design layout of the proposed Riverfields development area with various portions of land which has already been developed and those parcels which are proposed for future development.

Figure 4-6: Riverfields Development urban design framework

4.2.1 Regional Context and Long Term Vision

The applicant and land owners of The Farm Witfontein 15-IR are in the process of planning for the long term use and development of their property, as shown on Figure 4-7: Witfontein Farm Land Holdings. This entire area is proposed to be built up over a long term 10-15 year plan, and will be known as Riverfields Development. The property is located in Kempton Park, Ekurhuleni, to the north east of the various suburbs of Glen Erasmia, north of the Pomona/ Bredell Agricultural Holdings and to the west of the Serengeti Residential Golf Estate.

The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The EMF also encourages development with this area.

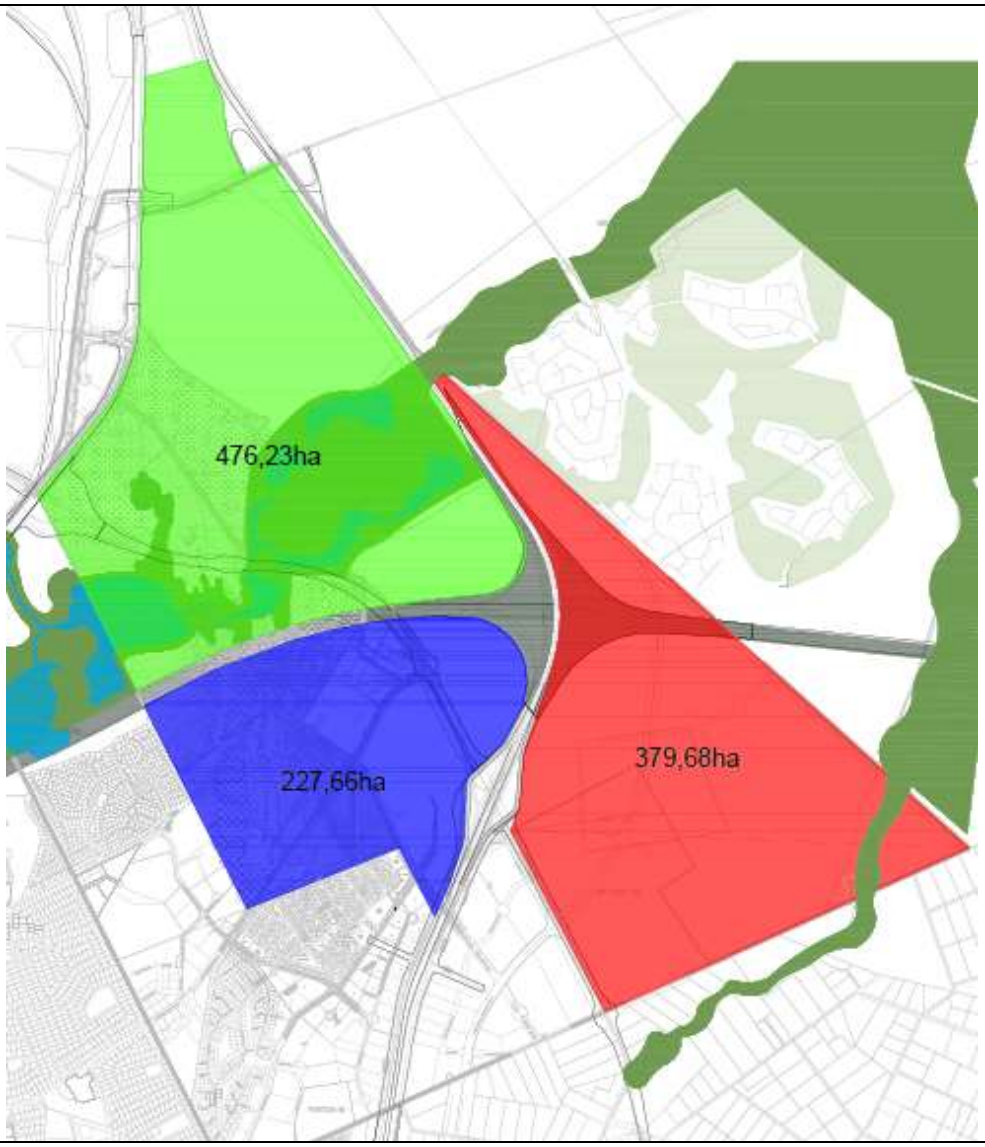

Figure 4-7: Witfontein Farm Land Holdings

This land holding, which is in a single private ownership, is approximately 1 085 hectares in extent. It comprises of three large portions, which have been created by

various constraints around its location, which straddles the R21 motorway and the west- east alignment of the proposed PWV-3 freeway.

4.2.2 Ekurhuleni Aerotropolis

The entire Witfontein Farm (future Riverfields Development) falls well within the identified Aerotropolis, which is a major long-term development node for Ekurhuleni Metropolitan Municipality. As can be seen in Figure 4-8, the site (yellow star) is within this Aerotropolis area.

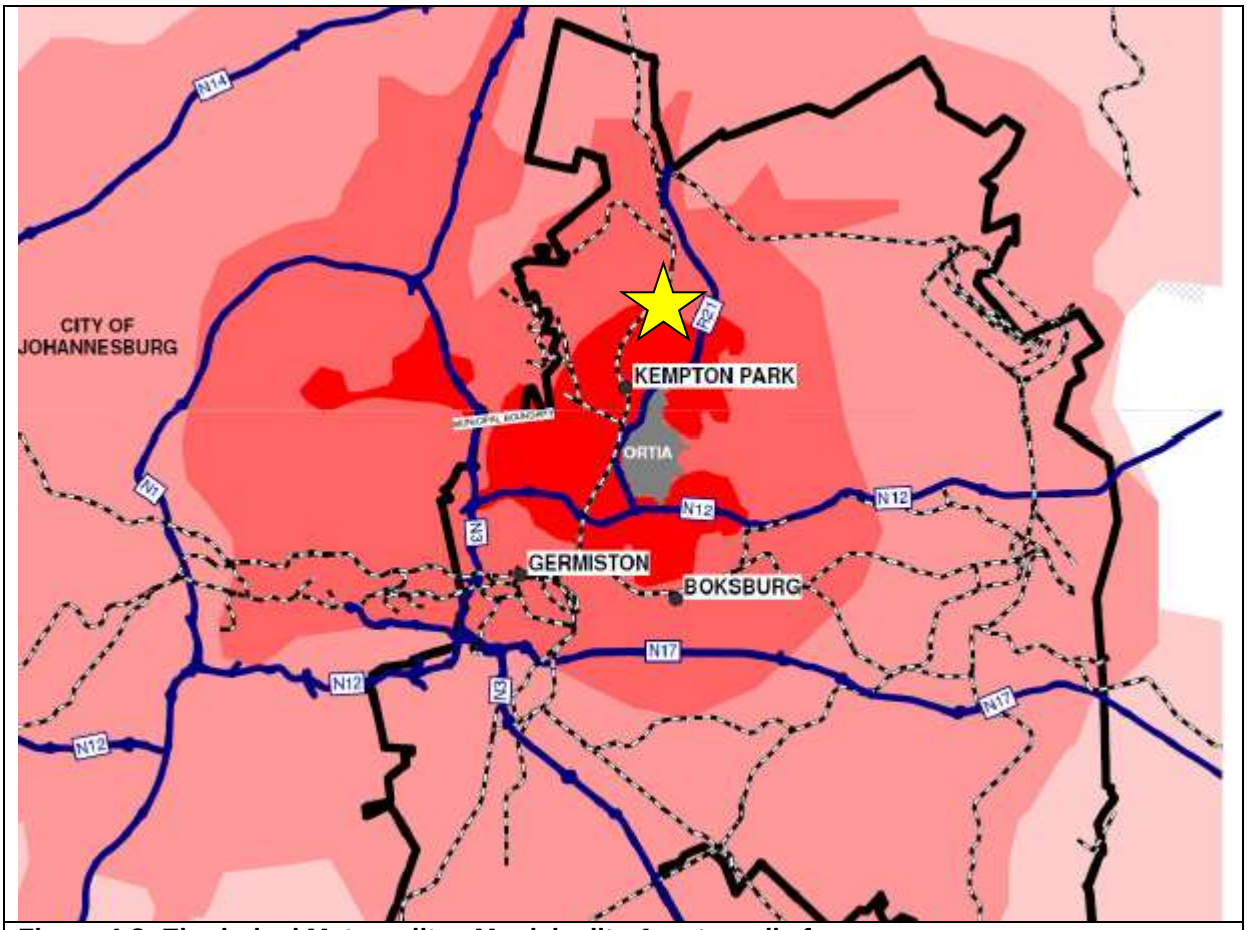

Figure 4-8: Ekurhuleni Metropolitan Municipality Aerotropolis focus areas

Taken from Wikipedia, July 2013: *In September 2011, the Ekurhuleni Metropolitan Municipality in South Africa officially announced its intention to transform the municipality into a functioning Aerotropolis. Prof. John D. Kasarda was consulted to define roadmap for the preparation of the planning guidelines. Ekurhuleni also appointed METROPLAN Town and Regional Planners in order to prepare a Regional Spatial Development Framework - which is to be the primary planning document of the municipality in facilitating the transformation of Ekurhuleni into the first African Aerotropolis. Pieter Swanepoel, the manager of the Aerotropolis Project, insists that the South African Aerotropolis will be formed on the basis of the strength of the OR Tambo International Airport, and that it will be the long awaited restructuring tool that will put South Africa on the world map, and transform Ekurhuleni into the "gateway to Africa". Dr. Marinda Schoonraad, the consultant town planner and urban designer for the project stresses the importance that regardless of the positive examples in*

Europe, Asia and Americas, a strong accent should be put on effort to create a unique identity which will put the concept of the Aerotropolis into the African context.

The Aerotropolis was also noted in "The State of The City Address" By Councillor Mondli Gungubele, Executive Mayor of The Ekurhuleni Metropolitan Municipality on 26 March 2014. Councillor Gungubele stated the following (amongst many others) regarding the Aerotropolis:

… "*In this regard, we are confident that the Aerotropolis programme that we have adopted as our key economic growth trajectory continues to gain momentum by strengthening our Metro's value proposition to investors. This programme itself integrates a range of other flagship interventions, such as the revitalization of the manufacturing sector, the regeneration of CBDs and townships and their respective local economies, the revitalization and harnessing of open spaces and precincts around lakes and wetlands, the building of connectivity of the City through an integrated rapid transit system, and the building of a smart city through investing in digital infrastructure for both municipal and citizen use.*

At the centre of the Aerotropolis development programme, lays our ability to attract greenfield and brownfield investments. In this regard, our strategic land parcels programme presents enormous potential to crowd-in and channel investments in strategic areas of the city. I am grateful to this Council for having granted permission to activate this land release programme by targeting the first 41 strategic land parcels"…

4.2.3 The Route 21 Development Corridor

The R21 has been identified as a development corridor for future development in the form of residential, retail, commercial and other mixed uses.

In terms of the R21 Development Corridor document, the following is noted: *"The listed activities as defined in Tables 6 and 7 as well as the relevant national lists in terms of the EIA Regulations, 2006, will also apply in the R 21 Development Corridor as defined in paragraph 2.5.9 of the Environmental Management Framework of the Northern Service Delivery Region of the Ekurhuleni Metropolitan Municipality and the R21 Corridor Local Spatial Development Framework (LSDF). The evaluation of applications should however take cognisance of the planning precincts defined in the LSDF".*

Furthermore, it must be noted that the R21 Development Corridor document indicates that as part of the negotiations between GDACE (now GDARD) and the EMM during the compilation of the EMF and the determination of the Urban Development Boundary, it was agreed that the agricultural potential within the R21 Corridor area will not be solely used as the basis for granting negative decision for development proposals.

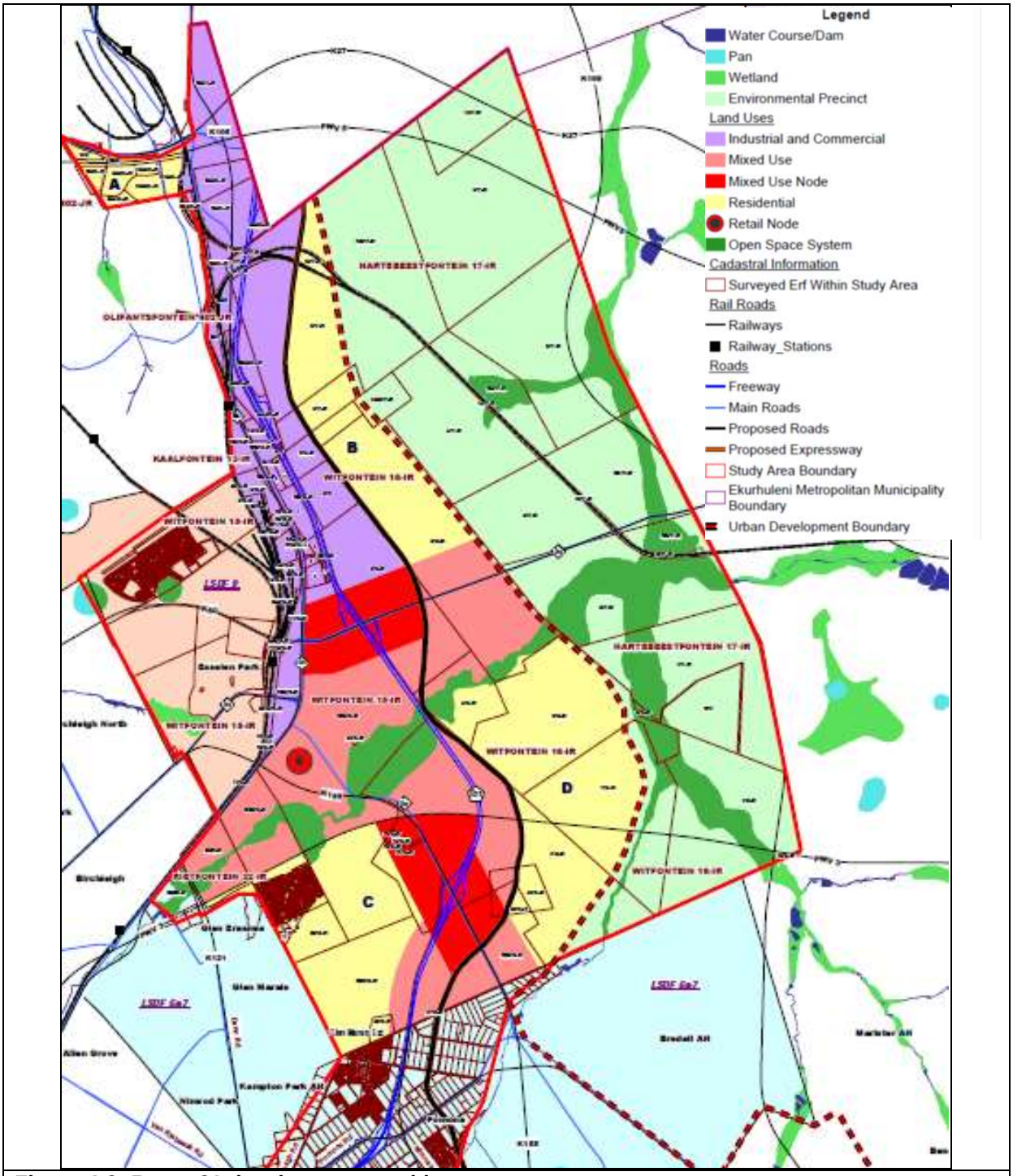

Figure 4-9: Route 21 development corridor

4.2.4 The Ekurhuleni Spatial Development Framework

The Ekurhuleni Metropolitan Spatial Development Framework, April 2011; identifies the area between OR Tambo International Airport, Tembisa and north along the R21 highway as a major development corridor. The Riverfields Development area falls well within the development corridor.

The site forms an integrally important area of land within the greater Gauteng Spatial Development Framework, as well as being strategically located with the R21

Development Corridor, which is part of the Ekurhuleni Spatial Development Framework. See Figure 4-10: Ekurhuleni Metro Spatial Development Framework – Map 1 and Figure 4-11: Ekurhuleni Metro Spatial Development Framework – Map 2 below which indicated the SDF areas, and the proposed land uses for these areas. This application site is indicated by the yellow star in each figure.

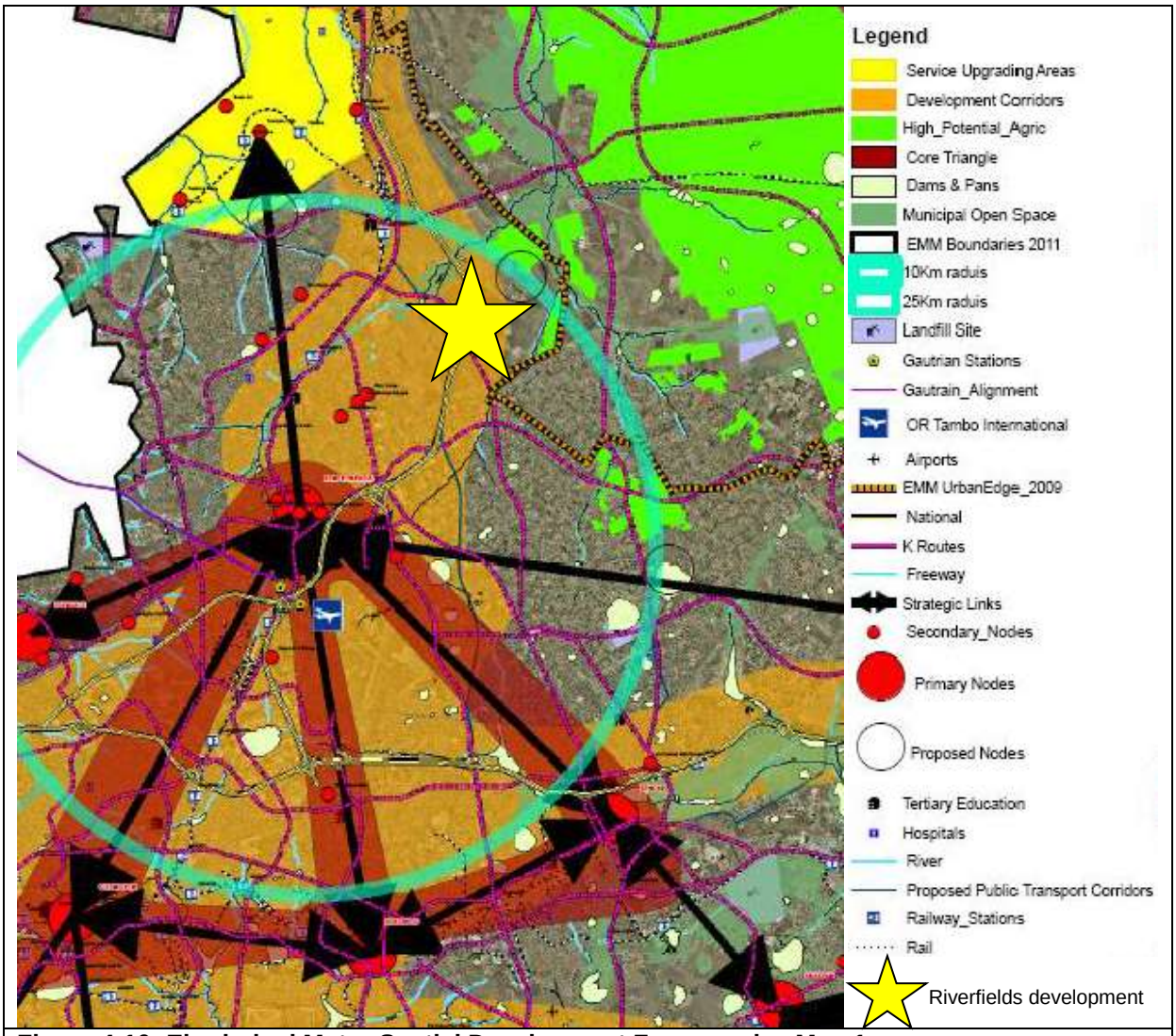

Figure 4-10: Ekurhuleni Metro Spatial Development Framework – Map 1

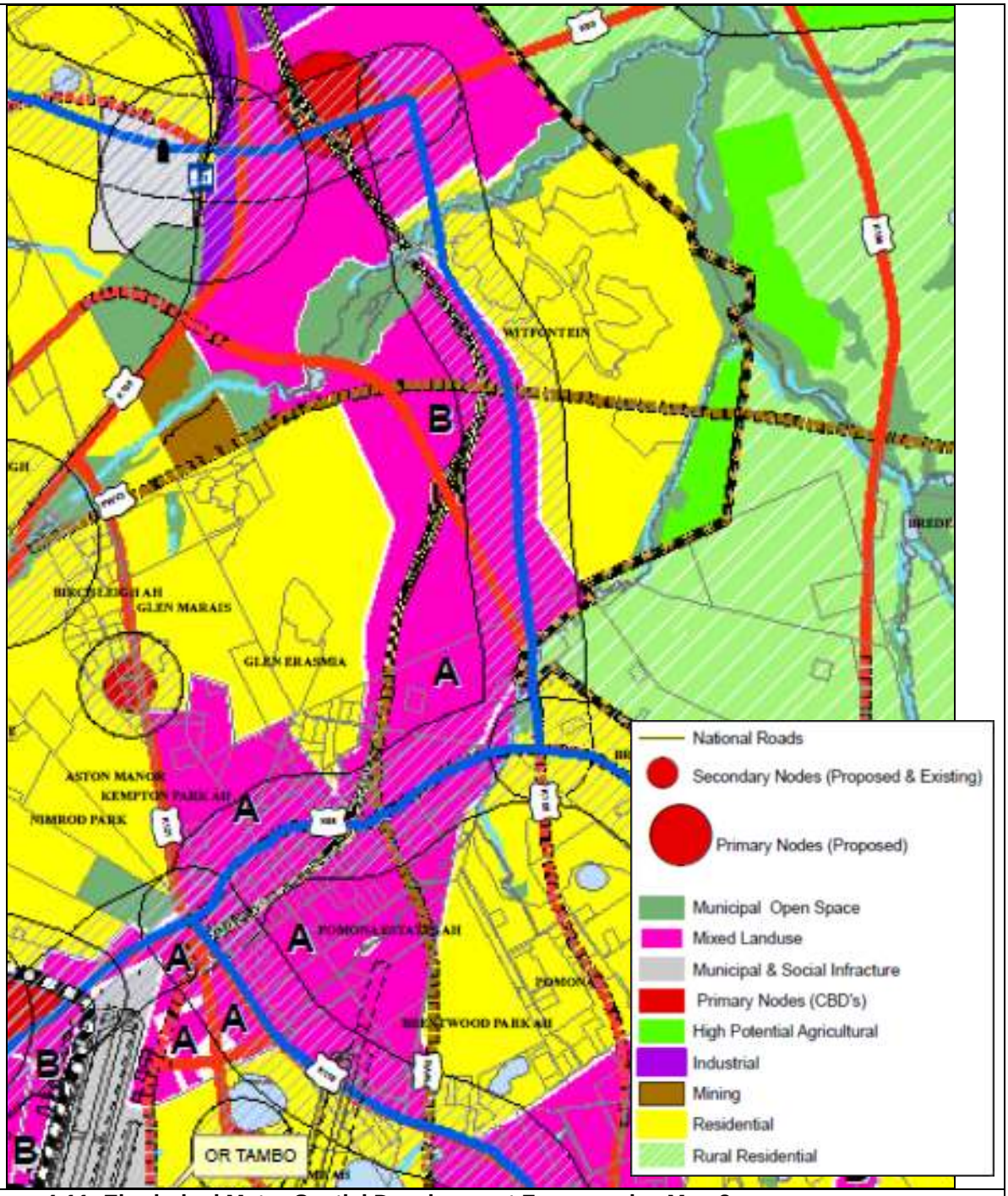

Figure 4-11: Ekurhuleni Metro Spatial Development Framework – Map 2

With reference to the figures above, and as states in the Ekurhuleni Metropolitan Spatial Development Framework, April 2011, an "**Activity corridor"** is defined as: *An activity corridor is defined as a linear strip of land or area, connecting primary activity nodes, traversing urban or inter-urban areas, surrounding a major transport facility or facilities, providing an appropriate regional level of mobility and accessibility to adjacent areas, and should contain a high concentration of population and mixed land uses (job opportunities). Activity corridors normally incorporate Activity Spines, Nodes and Activity Streets to accommodate the accessibility need, without sacrificing the mobility and regional accessibility function of the higher order transportation facilities in the corridor.*

4.2.5 The Ekurhuleni Environmental Management Framework (EMF)

The Ekurhuleni Metro Municipality (EMM) Environmental Management Framework (EMF) was gazetted and adopted by the MEC of GDARD on 17 June 2008 (Notice 2339 of 2008 Provincial Gazette 17 June 2008).

The EMF fully supports development within this R21 Corridor area, and supports all council plans for integrated and mixed development within this area. The EMF further confirms that: *"All land identified and classified as high potential agricultural land but incorporated completely within the boundaries of the urban edge will not be regarded as viable land for future agricultural development*." Therefore, as this application site is within the Urban Edge, it is supported for development, despite the fact that there are high potential agricultural soils.

Furthermore, the following is noted: "*As part of the negotiations between GDACE (Now GDARD) and the EMM during the compilation of the EMF and the determination of the Urban Development Boundary, it was agreed that the agricultural potential within the R21 Corridor area will not be solely used as the basis for granting negative RODs for development proposals*"

4.2.6 The Gauteng Environmental Management Framework

The Gauteng Provincial Environmental Management Framework was completed in November 2014 and has identified a number of "Environmental Management Zones" (EMZs) as part of the overall EMF.

Five EMZs were identified and overlaying those a further six Special Management Areas (see section 6 of the EMF document) were identified where specific planning and policy measures are necessary to achieve the development objective of those areas. One of the Special Management Areas is the Cradle of Humankind World Heritage Site (CoHWHS) for which a recent EMF has been completed. It was decided to incorporate that EMF within the GPEMF (the only other EMF to be incorporated as a whole) (EMF, 2014).

The five EMZs are:

1. **Zone 1: Urban development zone**
2. **Zone 2: High control zone (within the urban development zone)**
3. **Zone 3: High control zone (outside the urban development zone)**
4. **Zone 4: Normal control zone**
5. **Zone 5: Industrial and large commercial focus zone**

The entire area which is subject to the road alignments is within Zone 1, with the Swartspruit designated as Zone 2. The existing Plumbago Office park to the south of the road alignment area is Zone 5 area according the EMF. The map below shows that the proposed roads are within Zone 1, crossing Zone 2 (Swartspruit).

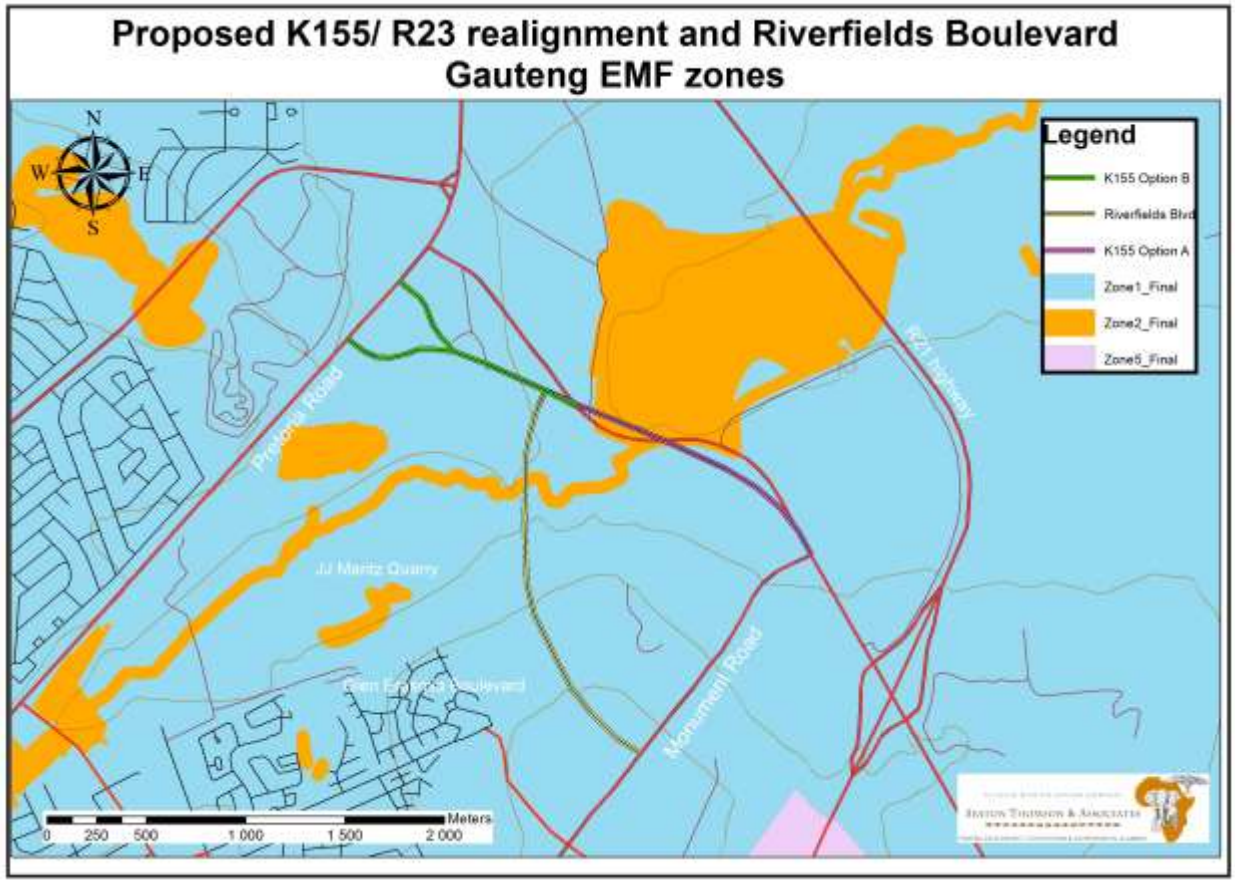

Figure 4-12: Gauteng EMF zones and Riverfields Blvd alignment

The intention with Zone 1 is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development within the urban development zones as defined in the Gauteng Spatial Development Framework (GSDF), in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas. Certain currently listed activities (see section 5 of EMF document) may be exempted from environmental assessment requirements at the discretion of the competent authority. (EMF, 2014).

4.3 Activities listed in terms of the 2010 EIA regulations

As the application is for a new road bridge and widening/ realignment of the R23, there are a number of listed activities which are triggered in terms of Regulations R983, 984 and 985. These are elaborated below.

Number and date of the relevant Government Notice:	Activity No (s)	Describe each listed activity as per the wording in the relevant listing notice:	Relevance to this application
GNR 983, 4 December 2014	12	The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size;	Riverfields Boulevard is a proposed bridge over the Swartspruit. The building of this bridge will trigger this listed activity, as the bridge is far

		(iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or	greater than 100 square meters in size. Even though the bridge is within an Urban Area (which the Urban Edge), this activity has been included for formality. Furthermore, the widening of the R23 culvert bridge along its' current alignment will also trigger this activity. The Option A alternative alignment would mean that a new culvert bridge is to be built over the Swartspruit directly north of the existing crossing point. The building of this bridge will trigger this listed activity, as the bridge is far greater than 100 square meters in size. Even though the bridge is within an Urban Area (which the Urban Edge), this activity has been included for formality.

		harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	
GNR 983, 4 December 2014	19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater, But excluding where such infilling, depositing , dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	As this application involves the building of bridges and earthmoving works that will need to be undertaken in watercourse (Swartspruit), the activity will be triggered. The laying of culverts for the R23 widening and the digging and placement of foundations for the Riverfields Blvd supports will mean that soil will be dredged from the watercourse.
GNR 983, 4 December 2014	56	The widening of a road by more than 6 metres, or the lengthening of a road by more	The R23 is proposed to be widened (Option B alternative alignment) by approximately 8 meters between

		than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	Monument Road, and then west of the R23 Swartspruit crossing point.
GNR 984, 4 December 2014	27	The development of - (i) a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); **(ii) a road administered by a provincial authority;** **(iii) a road with a reserve wider than 30 metres; or** **(iv) a road catering for more than one lane of traffic in both directions;** but excluding the development and related operation of a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies.	This is the activity which triggers the need for a full Scoping and EIA process to be undertaken. Riverfields Boulevard is proposed to be a 4 lane road (2 lanes in each direction), and it will be a road administered by a provincial authority (Gautrans). Due to the above, this activity will be triggered. There was no route determination authorization obtained under the 2006 or 2010 EIA regulations.
GNR 985, 4 December 2014	12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan: In Gauteng, within critical biodiversity areas identified in	A part of the new proposed road re-alignment of the R23/ K155, as well as the building of Riverfields Blvd which will traverse areas that are identified as CBA, this activity will be triggered. The rocky ridge areas and Swartspruit river system area are considered CBAs. The clearance of natural grassveld vegetation will be

		bioregional plans	necessary within the road servitudes to build the roads.
GNR 985, 4 December 2014	18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre: In Gauteng, in Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans;	A part of the new road re-alignment and widening of the existing road will traverse areas that are identified as CBA, and as such this activity will be triggered.
GNR 985, 4 December 2014	14	The development of- (i) canals exceeding 10 square metres in size ; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size; (vi) bulk storm water outlet structures exceeding 10 square metres in size; (vii) marinas exceeding 10 square metres in size; (viii) jetties exceeding 10 square metres in size; (ix) slipways exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs – a) within a watercourse b) in front of a development setback line c) in no development	Riverfields Boulevard is a proposed bridge over the Swartspruit. The building of this bridge will trigger this listed activity, as the bridge is far greater than 10 square meters in size and will cross areas that are considered as CBA or ESA areas Furthermore, the widening of the R23 culvert bridge along its' current alignment will also trigger this activity. The Option A alternative alignment would mean that a new culvert bridge is to be built over the Swartspruit directly north of the existing crossing point. The building of this bridge will trigger this listed activity, as the bridge is far greater than 10 square meters in size and will cross areas that are considered as CBA or ESA areas.

		setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures which ports or harbours that will not increase the development footprint of the port or harbour: In Gauteng, in Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng C-Plan or in bioregional plans;	

4.4 Evaluation of Alternatives

Alternatives were discussed in detail in the Scoping report. In summary, there are 2 alternatives that were proposed:

Option A: This will include the re-alignment/ straightening of the R23 road over the Swartspruit, to essentially remove the S-bend that currently exists. The road will also be widened to allow for 2 lanes of traffic in each direction. The existing road surface will be removed and the area rehabilitated. This option also includes the construction of Riverfields Blvd and bridge over the Swartspruit. Option A shown in map below:

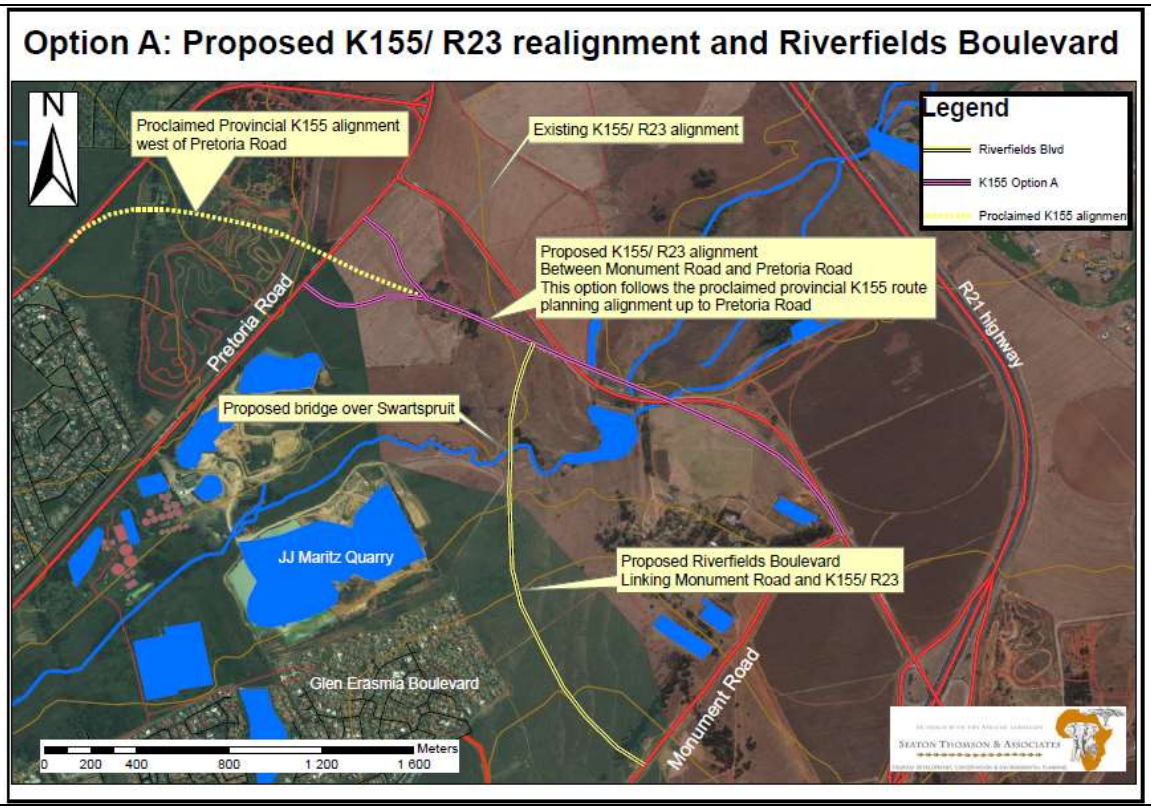

Figure 4-13: Option A of the proposed R23 realignment and Riverfields Boulevard

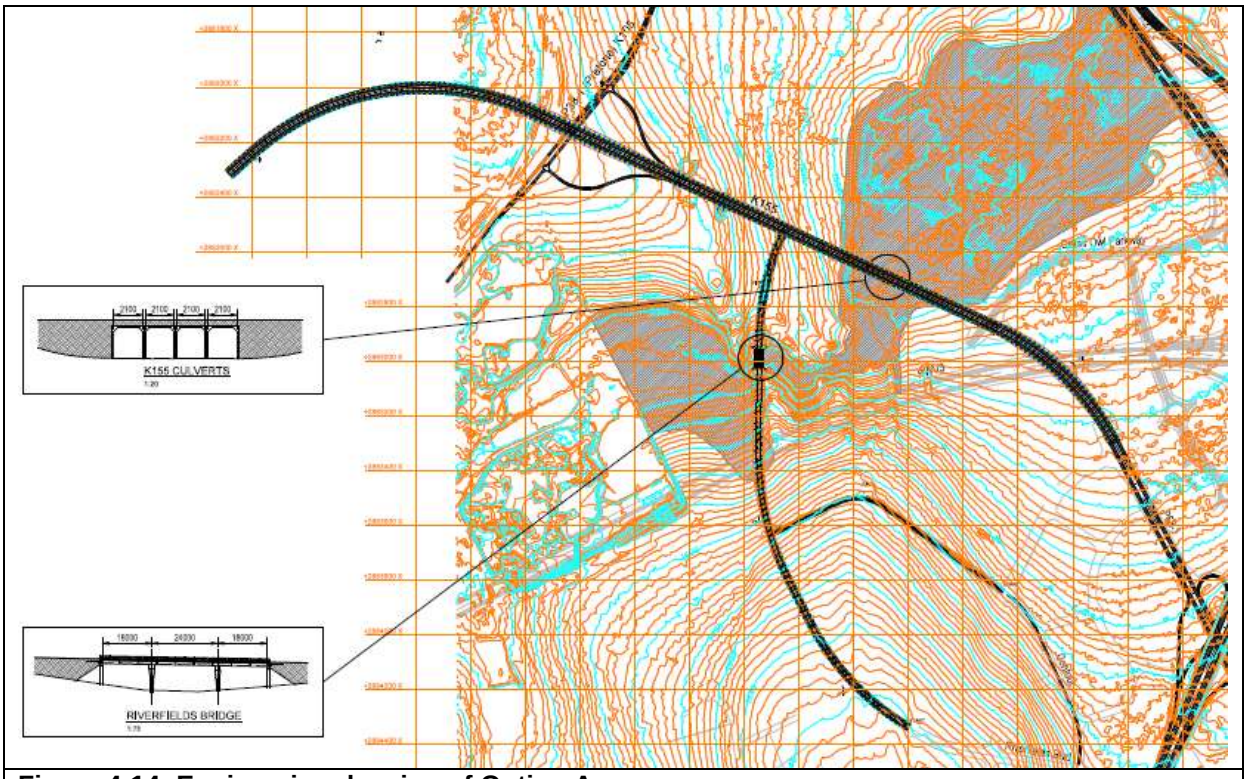

Figure 4-14: Engineering drawing of Option A

The 2 lanes of traffic in each direction would be spaced 15 meters apart, and, with a 10,6 meter wide road surface for eastern and western lanes, the entire road footprint width would be close to 40 meters wide. This is shown in the figure below.

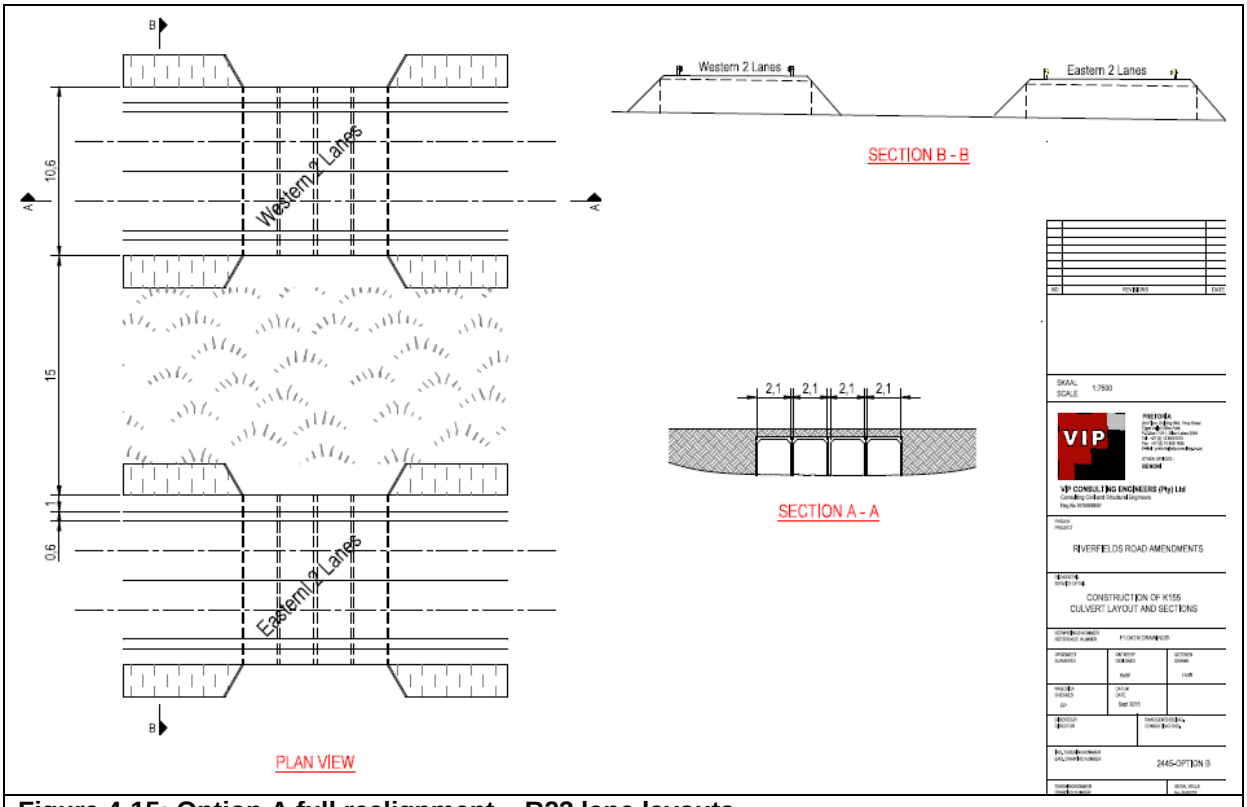

Figure 4-15: Option A full realignment – R23 lane layouts

Option B: This option proposes that the S-bend in the existing R23 road over the Swartspruit crossing stays in its current alignment, and new the re-alignment only starts west of the Swartspruit, up to Pretoria Road. This option would however also include the widening of the existing road (i.e. S-bends over the Swartspruit) to accommodate for 2 lanes of traffic in each direction. The existing road surface between the new re-alignment and Pretoria Road will be removed and the area rehabilitated. This option also includes the construction of Riverfields Blvd and bridge over the Swartspruit. This proposal is shown in the map below:

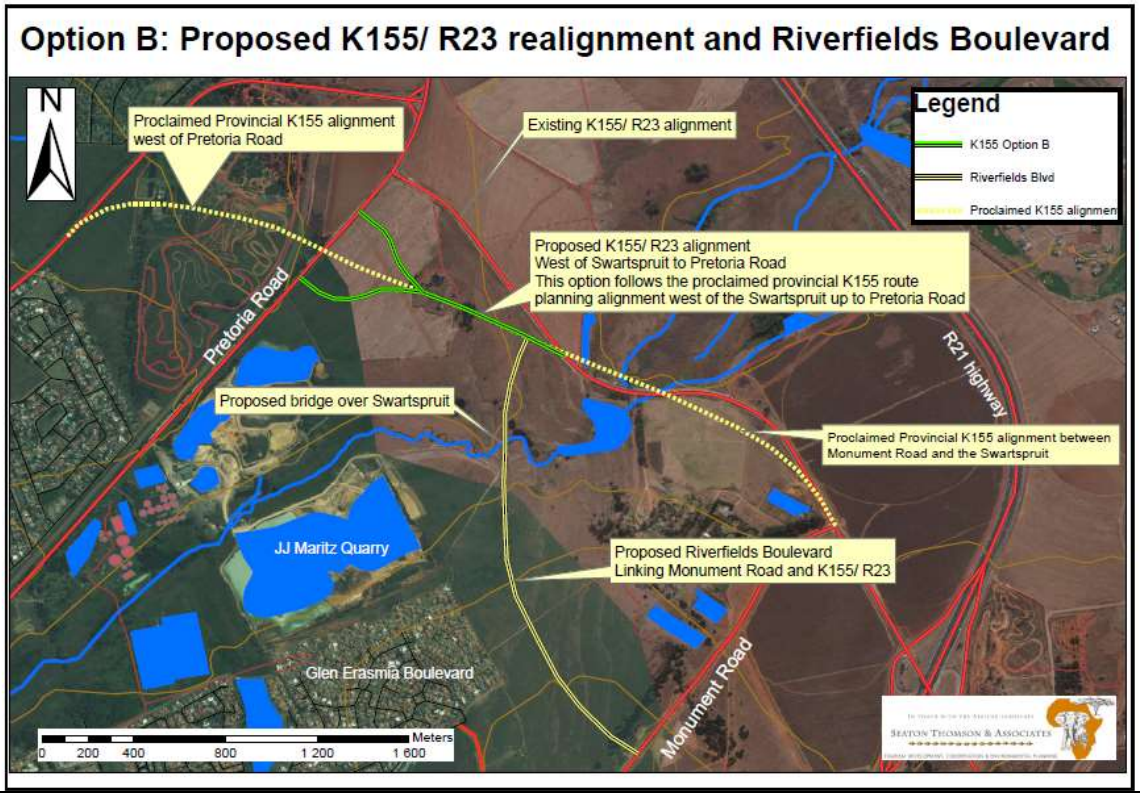

Figure 4-16: Option B of the proposed R23 realignment and Riverfields Boulevard

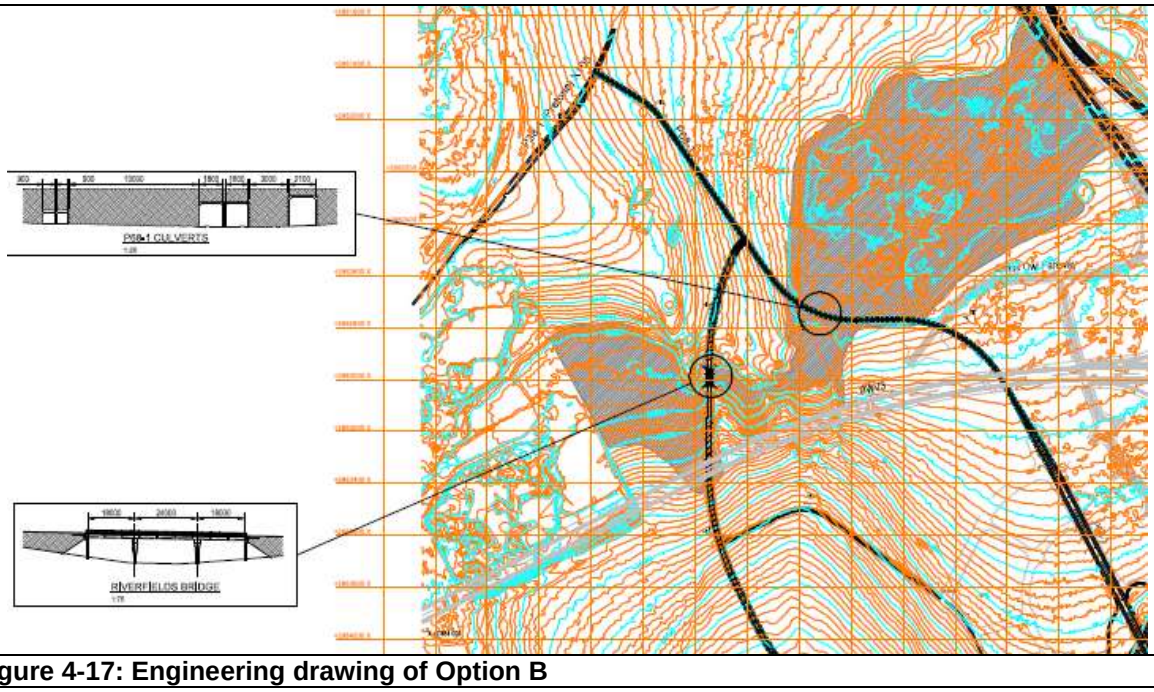

Figure 4-17: Engineering drawing of Option B

The widening of the existing R23 alignment will only mean an extension/ addition of approximately 10 meters to the existing road surface. This footprint is a quarter of the Option A full realignment as shown in the figure below.

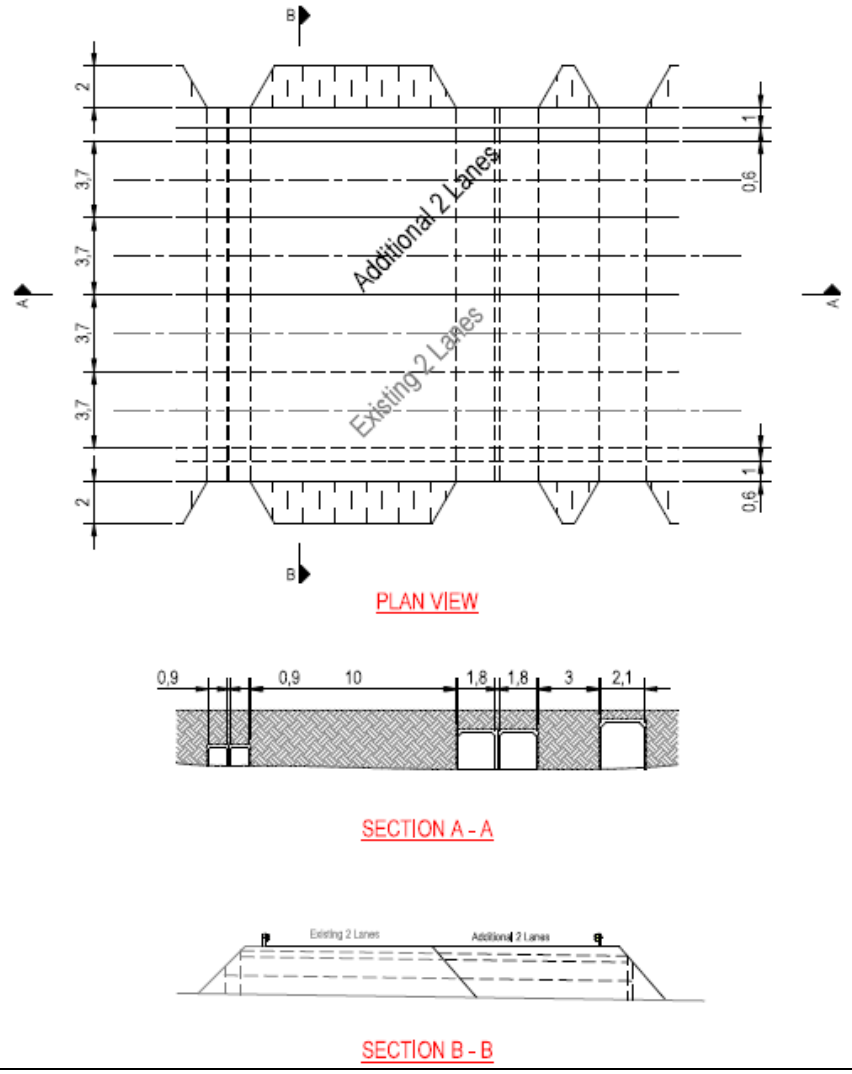

Figure 4-18: Option B road widening plan and section views

All the figures above are provided in a larger scale in Appendix 16: Large scale maps and plans.

4.4.1 Riverfields Bridge design alternatives

Design alternatives for the new Riverfields Blvd Bridge over the Swartspruit (in the area around the rocky ridges) have also been considered and assessed during this EIA phase. There are two options that have been assessed and discussed:

1. **Box culvert design**, involving large cut and fill to get road to level
2. **Span bridge** where road surface is a few meters above the river level, and is supported on individual pillars.

Box culvert design discussion and assessment:

Installing culverts for the Riverfields Boulevard bridge would have a huge impact on the environment. In most cases, box culverts are only 2-3 meters high, and with additional soil fill, may be up to 5 meters off the actual ground level. The Swartspruit cuts a deep profile through the rocky quartzite ridges in the area where the bridge is proposed to cross, with an elevation change of upward of 11 meters in some cases. This large elevation change would necessitate an extensive cut and fill operation, which would further necessitate the blasting of many parts of the rocky quartzite ridges, not to mention the possible restriction of flow of the actual watercourse under the culverts and cutting off small animal movement and foraging along the Swartspruit, if box culverts we considered feasible. Furthermore, due to the large elevation change through this area, the road level would have to be fairly steep towards the Swartspruit, which from an engineering and traffic perspective, is not advisable.

Due to the reasons above, most specifically those relating to the environmental impact of box culverts in this area, mean that the option of installing a box culvert bridge for the Riverfields Boulevard Bridge is not a viable option or practical alternative.

Span bridge design discussion and assessment:

A span bridge with 2 central support pillars has been considered as the preferred alternative for the Riverfields Boulevard Bridge. As discussed above, the Swartspruit cuts a deep profile through the rocky quartzite ridges in the area where the bridge is proposed to cross, with an elevation change of upward of 11 meters in some cases. It is for this reason that a span bridge has been assessed. The span has been determined to be 60 meters, with the two central pillars 24 meters apart and then a distance of 18 meters between them and the end supports, which will tie into a soil filled road surface. This is illustrated in the diagram below.

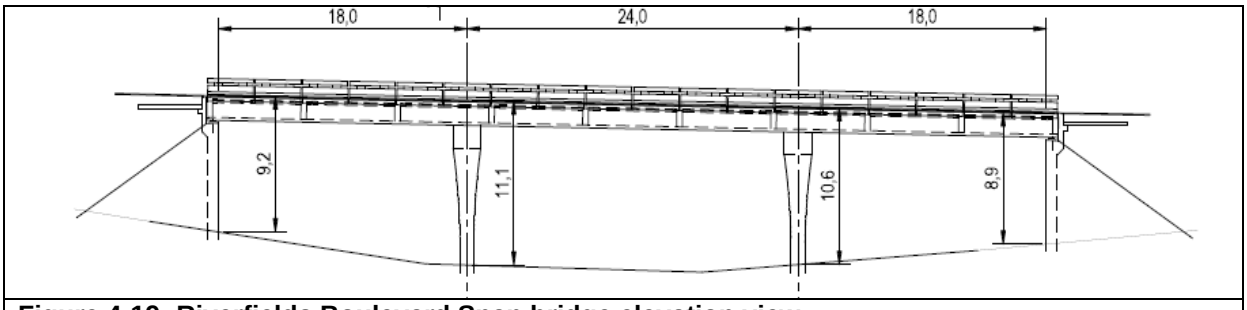

Figure 4-19: Riverfields Boulevard Span bridge elevation view

The actual Swartspruit river is only 4-5 meters wide at this point (during normal base flow periods), and up to 18-20 meters wide during heavier flooding events. The central pillars are designed to be 24 meters apart, thereby ensuring that they are some distance from actual watercourse, allowing the free flow of water, as well as the free movement of animals that may be moving or foraging along the edge of the river. The additional 18 meters from each of them to the outer support pillars provide for even more space for animal movement and water flow if there are severe storm

events. Furthermore, the central pillars will also have a much smaller direct physical footprint on the ground, which will mean far less loss of natural grassveld (as compared to box culverts and a ground-level road).

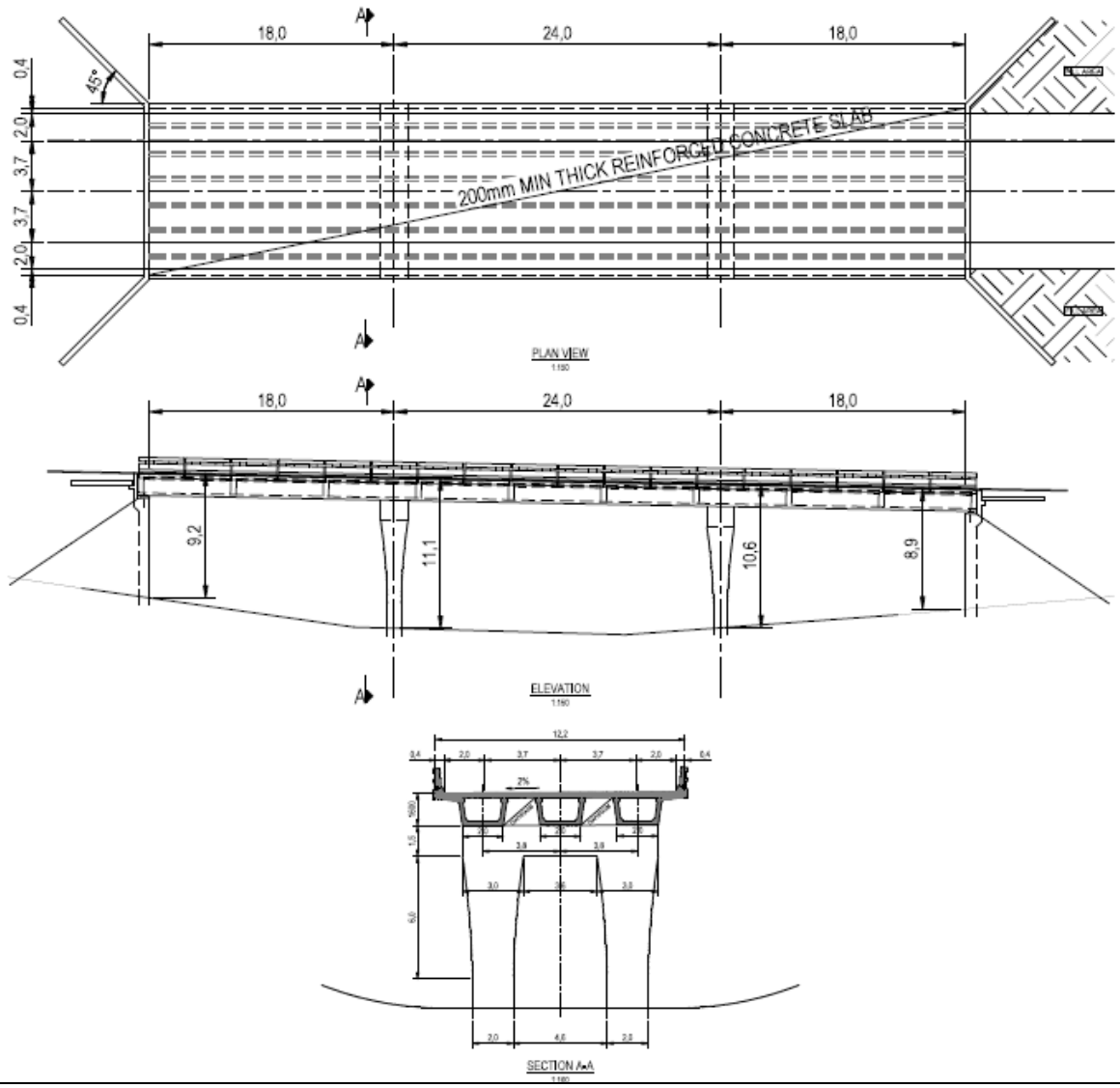

Figure 4-20: Riverfields Blvd bridge plan, elevation and section view

From an engineering and traffic perspective the bridge will also allow for a shallower road gradient which is more desirable than a steep gradient over such a short horizontal area.

4.4.2 No-go alternative

No-Go Alternative – this option of not upgrading the roads and building new roads is really not an option at all. The entire area (Albertina Sisulu Corridor and Riverfields Development) is due to be developed over the next 5-15 years, and provision has to be made for the increase in traffic through the area, and the increase in people living in the area. There are many parcels of land within the Riverfields Development area that have recently (in the last 2-3 years) received environmental authorization for various land use typologies. Some of these areas are still not developed, but a few of them have already been developed with offices, warehouses and residential estates.

Due to the above, roads have to be built and upgraded in line with city planning and development, in order to cater for the future uses in the area.

Not building new or upgrading existing roads in the area would mean that economically viable land within the R21 (Albertina Sisulu) corridor would actually not happen. This therefore means that land identified for longer term growth and development within an identified node would not be developed. The site is within the Ekurhuleni Aerotropolis. The Ekurhuleni Metropolitan Municipality officially announced its intention to transform the municipality into a functioning Aerotropolis, of which the R21 corridor is a major linkage. The Riverfields Development area has over 4 kilometres of R21 frontage, making it perfectly placed within the Aerotropolis and within the R21 corridor.

The no-go alternative is not considered viable or sustainable, as development in this corridor is inevitable in future, and roads and services are critical to this development.

4.4.3 Summary of preferred alternative

The impact assessment that has been undertaken later in this report has concluded that the **Option B** would be the preferred alternative from an environmental perspective. This is due to the fact that a smaller area of river/ wetland will be disturbed by the widening of the R23/ K155 as opposed to complete realignment. Economically, the widening of the road is also a better option, as it provided the traffic capacity, for far cheaper, as 2 lanes are already existing, and this option only added to them. The widening of the existing R23 alignment will only mean an extension/ widening of approximately 10 meters to the existing road surface. This footprint is a quarter of the Option A full realignment.

Regarding the Riverfields Boulevard Bridge, a span bridge with 2 central support pillars has been considered as the preferred alternative for the bridge design.

4.5 Need and Desirability of the roads

As indicated earlier in the report, the development of the entire Riverfields area has significant desirability in terms of the implications of a major economic investment into the area, together with the required infrastructure improvements which will be of benefit not only to the development, but to the wider community generally. The development of residential, commercial, offices and retail is much needed in an area that is expanding rapidly, and then of course the associated roads and services that go with that (this particular application for example) is critical. Due to this the realignment/ widening of the R23 is critical for increased traffic numbers, and future growth. Riverfields Boulevard and its' associated bridge over the Swartspruit is also critical for traffic flow from the Plumbago office park and proposed new regional shopping centre.

The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The EMF also encourages development within this area. All of these factors

and polices point to the fact that development within this R21 Development Corridor is indeed desirable.

5. DESCRIPTION OF RECEIVING ENVIRONMENT

5.1 Bio- Physical

5.1.1 Landuse and landcover

The entire road alignment consists of Highveld grass veld, with scatter patches of bluegum and blackwattle. Riverfields Boulevard is proposed to cross over the Swartspruit. According to the most recent vegetation map of the country (Mucina et al., 2005) the study area falls within one regional vegetation type, Soweto Highveld Grassland. Another vegetation type, Carletonville Dolomite Grassland, is found a short distance to the west of the site, but according to the vegetation map, does not occur on site.

The Soweto Highveld Grassland vegetation type is found in the Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces (Mucina et al. 2006). It extends further westwards along the southern edge of the Johannesburg Dome (including part of Soweto) as far as the vicinity of Randfontein. In southern Gauteng it includes the surrounds of Vanderbijlpark and Vereeniging as well as Sasolburg in the northern Free State. It occurs on gently to moderately undulating landscape on the Highveld plateau. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover. The vegetation structure is a short to medium-high, dense tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix*.

5.1.2 Climate

The Kempton Park area normally receives about 549mm of rain per year, with most rainfall occurring during summer. It receives the lowest rainfall (0mm) in June and the highest (106mm) in January. The monthly distribution of average daily maximum temperatures and the average midday temperatures for Kempton Park range from 16.8°C in June to 26°C in January. The region is the coldest during July when the mercury drops to 0.9°C on average during the night.

5.1.3 Flora

The road traverses areas that are identified by the Gauteng Conservation Plan (C-Plan) as Critical biodiversity areas (CBA's). There is also a very large part of the Riverfields Boulevard that will traverse grassland used for grazing, which has not been identified as having any conservation/ biodiversity status by the C-plan.

Most of the natural grass veld vegetation has been extensively disturbed over the years, and is subjected to illegal dumping on the peripheries. Figure 5-1: CBAs and ESAs shows the identified sensitivities of the area as defined on the C-Plan.

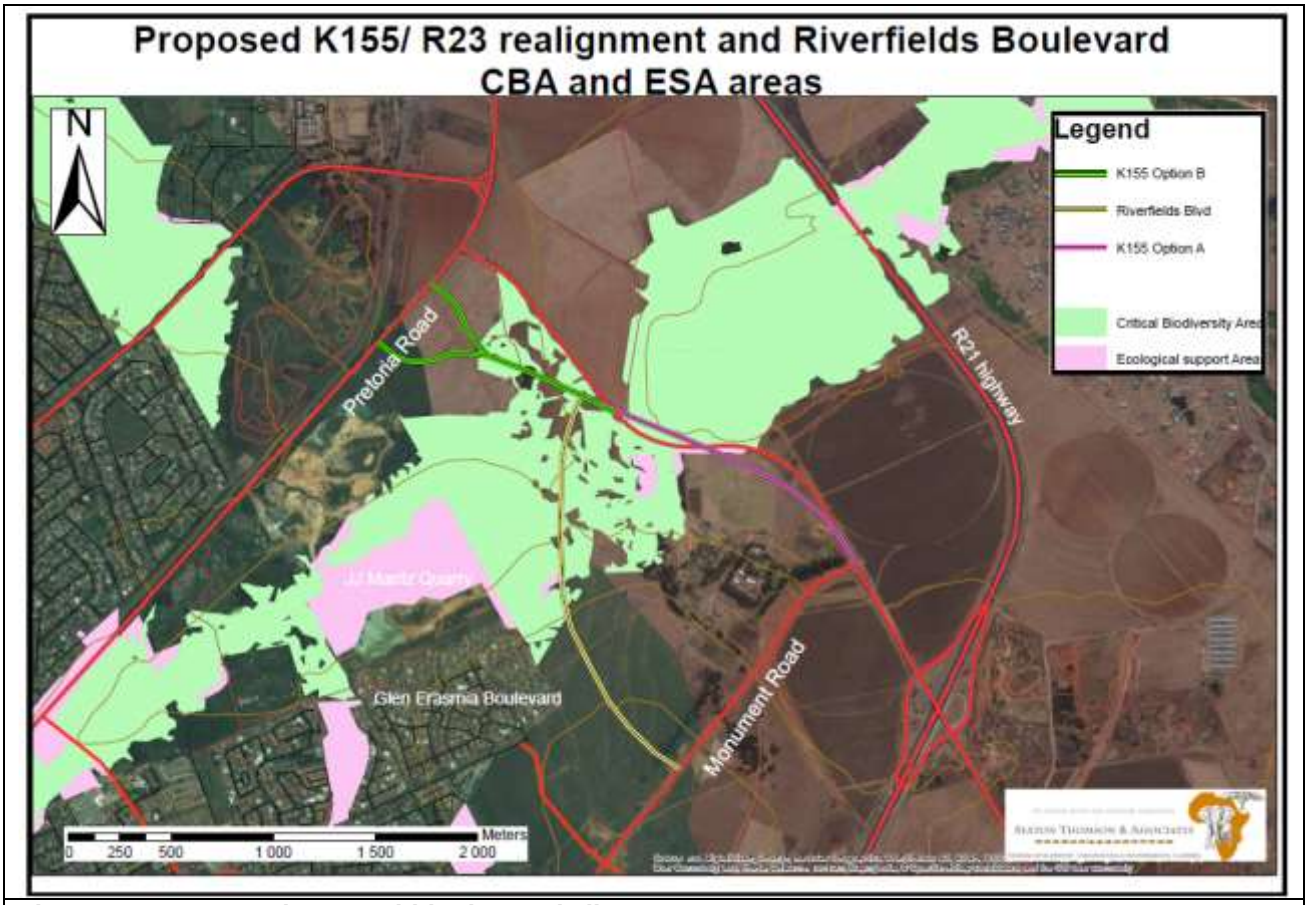

Figure 5-1: CBAs and ESAs within the road alignment

A vegetation assessment was undertaken for almost the entire Riverfields Development area. The vegetation assessment is contained in Appendix 6: Witfontein vegetation assessment to this report.

The report concluded that there were a number of plant communities, including *Wetland Community, moist grassland community, wetland slopes, riverbank community, grassland community, rocky quartzite outcrop* and *agricultural land*.

Furthermore, the vegetation report indicated in the final conclusions that: "*The study site comprised a mix of communities that had mostly low ecological value according to their scoring values. It is surrounded by agricultural areas on the northern side and urban areas on the southern side and does not adjoin any other natural habitat. Very little connectivity exists between the site and that of other neighbouring natural habitat. Vegetation surrounding this site comprises spots with a high percentage of alien invasive species such as Acacia mearnsii (black wattle) and other exotics. Conserving this site in its entirety would be pointless however the wetlands and moist grassland, have a high ecological value with numerous diverse, unique species present in each.*

These communities also form niches for faunal elements such as birds, amphibians and insects and as such have a high ecological value. The ecological functionality is high, the mountain wetland being the most unique habitat followed by the wetland and moist grassland (although wetland scoring was reduced due to overgrazing). The ecological processes especially the water dynamics that these water-rich

communities contribute towards, are underestimated, but need to be preserved. They have a high conservation value and also contain the most unique species.

The mountain slopes wetland, wetland and moist grassland should be maintained and conserved as it forms part of the greater catchment of the area, also marked as irreplaceable in GDARD's C-Plan, while the rocky quartzite outcrop forms part of a ridge and should be protected by the Ridges Policy. The grassland is not unique while its conservation value is not high and it is found in the surrounding area where better spots could be conserved.

5.1.4 Fauna

A preliminary assessment of the fauna in the wider area indicated that, as a result of high levels of human presence, services, land use activities, etc… in the area, coupled with surrounding habitat destruction and disturbances, there was minimal evidence of remaining indigenous fauna.

Mammals - The majority of larger mammal species are likely to have been eradicated or have moved away from the area. This is mainly a result of human disturbances on site as well as in the surrounding and adjoining area. No sensitive or endangered mammals are expected to be found within the study area.

The fauna along the alignment and within the general area is discussed in more detail in the impact assessment section of this report. A faunal report was done for the farm Witfontein and is contained in Appendix 5: Witfontein faunal assessment.

5.1.5 Geology, ridges, Topography and soils

According to the available geological map, sheet 2628 East Rand at a scale of 1:250 000, the geological contact between the Black Reef Formation (quartzite & shale) and dolomite and chert of the Malmani Sub-Group runs roughly east of the site.

The topography gets steeper as it drops away to the north between small cliffs and rocky ridges over the Swartspruit.

5.1.6 Hydrology and catchments

The road alignment lies within the catchment of the Swartspruit and Rietvlei River, which flow northwards to join the Sesmylspruit. The catchment forms part of Quaternary Catchment A21A, which forms part of the larger Crocodile (West) and Marico Water Management Area (WMA).

The existing road alignment of the R23 crosses the Swartspruit and the proposed realignment (option A) will impact on the Swartspruit as well. Riverfields Boulevard will also cross the Swartspruit, through the rocky ridge area. The proposal for this crossing is a high bridge on columns (span bridge). There have been 2 wetland reports done for the Witfontein farm, one east of the R23 and the other west of the R23. These 2 reports are contained in Appendix 7: Witfontein eastern wetland study and Appendix 8: Swartspruit western wetland/ river assessment.

5.1.7 Geohydrology

It is inferred from the Regional Geohydrology Map (Ref. Map 2628 Benoni 1:50 000) received from the EMM database that the area is located within the Sterkfontein Upper groundwater compartment. The original groundwater level for this compartment is at 1590m and thus the rest water levels recorded in the boreholes on the Riverfields Development site is at or well above the original groundwater level.

5.1.8 Pollution

The general area and road alignments contains some pollution in that it has been used for illegal dumping of garden cuttings, building rubble and general domestic waste in the past. As described before, the surrounding areas are used for agricultural purposes. No major pollution occurs or has occurred in the past.

Much of the pollution along the roads is as a result of illegal dumping of garden cuttings, building rubble and general domestic waste.

5.1.9 Socio-Economic status of the general area

The immediate surrounding areas are in the process of change and transition, from their historic agricultural use to mixed forms of urban development and infrastructure. The area has been earmarked by the Ekurhuleni Metropolitan Council as a mixed use development corridor, i.e. the R21 Corridor. This has been identified as a priority development area due to the increasing demand for development adjacent to this route.

The area within which the proposed roads will be constructed/ re-aligned contains a variety of uses and is also surrounded by diverse uses. To the north-west and east of the area, the land is still predominantly agricultural in nature and is being used for crop farming. Further to the north east and on the other side of the R21 and the proposed interchange of the R21/ PWV3 is the Serengeti residential golf estate development. To the south and south west of the area are the extensions of the original Glen Erasmia Extension 17 development, which were proclaimed during 2011. Most of this area is in the process of being developed for commercial uses. To the west of the site are extensive residential areas of Glen Erasmia and the Glen Eagles Residential Estates.

The area, as such, is in the process of change to accommodate various mixed land uses and activities, which also include residential uses to accommodate various levels of income categories and a diversity of residential and other land use activities.

This project comprises of a further phases of development for the area, which aims to bring a diversity of mixed uses into the area, including residential, retail, commercial, recreational, industrial or institutional uses, which is intended to create an integrated living environment, including sustainable job creation in this part of Ekurhuleni.

5.1.10 Agricultural Soils

The alignment along which Riverfields Boulevard is proposed does contain a small area of high potential agricultural soils on the far northern section of the alignment.

Most of the alignment is however natural grass veld, that has never been used for active crop agriculture. This is due to limited soil depth, rock outcrops and steepness. According to the Gauteng Agricultural Potential Atlas, a large part of the site is considered to have VERY-LOW or NO agricultural potential.

The larger Riverfields site does not fall into the Ekurhuleni Agricultural Hub. It must be made clear that according to the Ekurhuleni EMF document, all land identified and classified as high potential agricultural land but incorporated completely within the boundaries of the urban edge will not be regarded as viable land for future agricultural development.

Therefore, the very small portion of the site with high potential agricultural soils should be considered to have no decision making impact in this case.

Figure 5-2 below shows the site in relation to the Agricultural Hub.

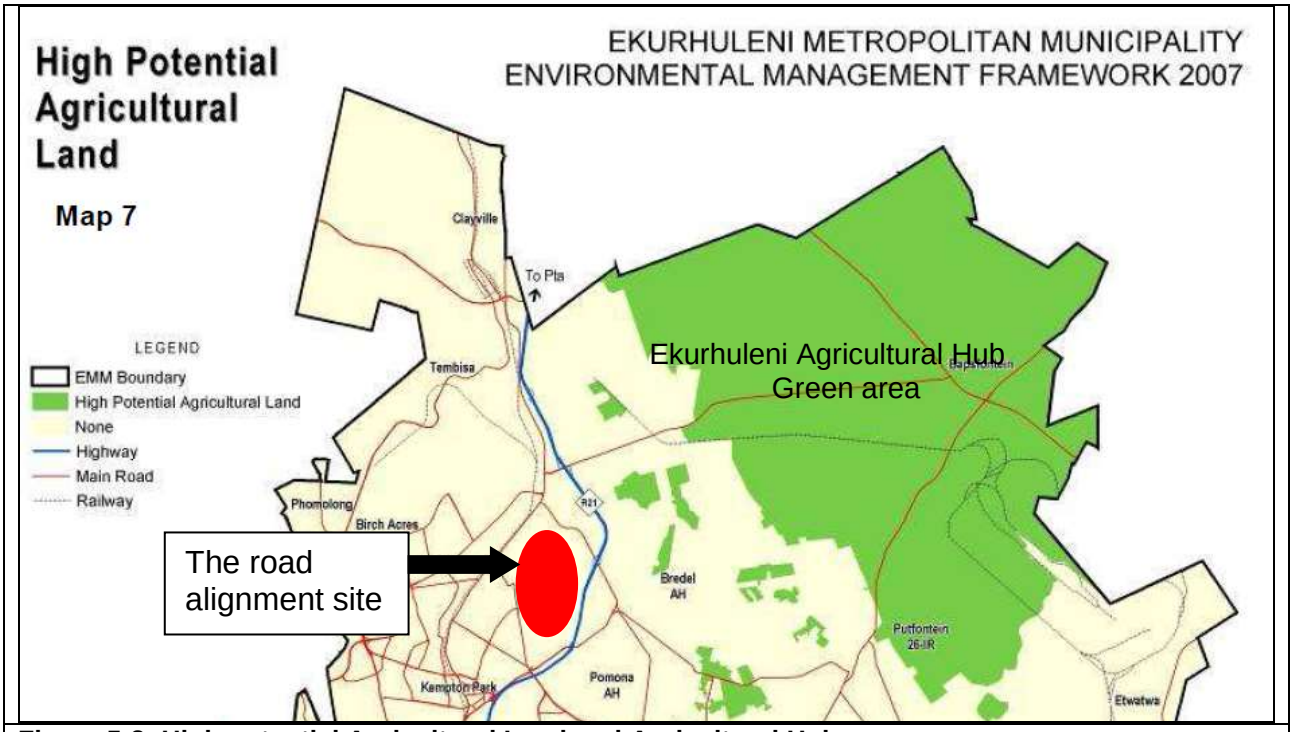

Figure 5-2: High potential Agricultural Land and Agricultural Hub

5.2 Cultural and Archaeological

There are a few small stone kraals and hunting blinds known within the rocky ridges next to the Swartspruit. There are also a number of old remains of buildings or recently abandoned informal homesteads.

The subterranean presence of any archaeological or historical sites, features or objects should always be kept in mind however.

A detailed heritage and archaeological assessment has been undertaken for the farm Witfontein, and if discussed in more detail in the impact assessment section of this report. The report is contained in Appendix 4: Archaeology and heritage report.

6. LEGISLATION, POLICIES & GUIDELINES

6.1 The South African Constitution Act 108 of 1996

The Constitution is the supreme law of South Africa against which all other laws in South Africa are measured. Laws in conflict with it are considered invalid. It protects certain fundamental rights, which are, however, not absolute and may be limited "*in terms of law of general application to the extent that the limitation is reasonable and justifiable in an open and democratic society based on human dignity, equality and freedom*" (Section 36)

One such fundamental right (Section 24 of the Act) provides the basic framework for all environmental policy and legislation and it states

> *"Everyone has a right –*
> *a) to an environment that is not harmful to their health or well-being; and*
> *b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –*
> *(i) prevent pollution and ecological degradation*
> *(ii) promote conservation; and*
> (iii) *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."

Although an activity may be allowed in terms of an Act of parliament or a permit issued under a statute, it may still be declared unlawful if it is harmful to human health or well being

6.2 National Environmental Management Act 107 of 1998

The National Environmental Management Act (NEMA) provides for co-operative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-coordinating environmental functions exercised by organs of the State and to provide for matters connected thereto. Section 2 of the Act establishes a set of principles, which apply to the activities of all organs of State that may significantly affect the environment, which include the following:

- development must be sustainable
- pollution must be avoided or minimised and remedied
- waste must be avoided or minimised, reused or recycled
- negative impacts must be minimised
- responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its life cycle

These principles are taken into consideration when a government department exercises its powers, for example, during the granting of permits and the enforcement of existing legislation or conditions of approval.

Section 24 provides that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to approval

In addition, it provides for the Minister of Environmental Affairs and Tourism or the relevant MEC to identify:

- new activities that require approval
- areas within which activities require approval and
- existing activities that should be assessed and reported on

It also provides for the Minister to make regulations with respect to the manner in which investigations should occur.

Section 28(1) states that "*every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring.*" If such pollution cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- assessing the impact on the environment
- informing and educating employees about the environmental risks of their work and ways of minimising these risks
- ceasing, modifying or controlling actions which cause pollution/ degradation
- containing pollutants or preventing movement of pollutants
- eliminating the source of pollution and
- remedying the effects of the pollution

The authorities may direct an industry to rectify or remedy a potential or actual pollution problem. If such a directive is not complied with, the authorities may undertake the work and recover the costs from the responsible industry.

6.2.1 Relevance to the application

This activity is listed under Regulations 982, 983, 984 and 985 of the National Environmental Management Act (NEMA) (Act 107 of 1998). The application will involve a number of listed activities, which have been outlined in previous sections.

The applicant will ensure that all requirements of NEMA are conformed with. The applicant is obliged under Section 28 to take actions to prevent pollution or degradation of the environment.

6.3 The National Heritage Resources Act 25 of 1999

The National Heritage Resources Act controls the protection and management of South Africa's heritage resources. The enforcing of this act is the South African National Heritage Resources Agency (SAHRA). In terms of the Act, historically important features such as graves, trees and the fossil beds of an area are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection.

In terms of Section 38 of the National Heritage Resources Act, SAHRA can call for an impact assessment. However, the Act also makes provision for the assessment of heritage impacts as part of the EIA process. A heritage assessment has been undertaken for this project.

6.4 National Water Act 36 of 1998

Water use is controlled by the National Water Act and the enforcing authority if the Department of Water Affairs (DWA).

The National Water Act recognises that water is a scarce resource in South Africa and its provisions are aimed at achieving sustainable use of water to the benefit of all users. The provisions of the Act are thus aimed at discouraging pollution and waste of water resources.

In terms of the Act, a land user, owners or occupier on whose land an activity occurs; which causes or has the potential to cause pollution from occurring. Non-compliance with this provision constitutes a criminal offence.

Water use can be specifically defined in the Act and can be broadly summarised as the abstraction, consumption and discharge of water. Use of water includes:

- abstraction of water from either the ground water or from surface water
- the discharge of water containing waste into a water resource and
- impeding or diverting the flow of water in a water course

Unless authorised by a General Authorisation, a license is required to use water in this manner.

In terms of discharging water containing waste to a water resource, a General Authorisation is applicable when

1. it conforms to a required standard
2. the volume is less than 2000m³/ day and
3. the discharge is registered with the Department of Water Affairs and Forestry (DWAF)

In addition, irrigation of any land with water containing waste is a controlled activity and a Water Use License is required unless authorised by a General Authorisation.

The building and expansion of road bridges over the Swartspruit will require a water use licence in terms of Section 21 (c) and (i) of the National Water Act. A separate water use licence application will be undertaken for this project, as part of a greater Integrated Water Management Plan for Riverfields Development.

6.5 Mineral and Petroleum Resources Development Act (Act 28 of 2002)

Mining and quarrying in South Africa is controlled by a raft of legislation and regulations. The MPRDA is one Act that governs all the mineral and petroleum resources within the Republic of South Africa.

The JJ Maritz quarry is directly to north-west of the proposed site, and these mining rights fall on the Farm Witfontein. The quarry is currently being mined and is proposed to still be a productive mine for a number of years to come.

The development of the general Riverfields area will be close proximity to the quarry, although the quarrying activities will not affect or be effected by the road alignments.

Riverfields Boulevard comes very close to the farthest eastern corner of the mining/ quarrying operations, and may encroach very slightly into this area when built. This will be addressed specifically with JJ Maritz at detailed design phase. As there is no major blasting that takes place within the quarry, it is not deemed a significant problem to the road alignments.

6.6 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The objective of the Biodiversity Act of 2004 is to: "*To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith*."

The Biodiversity Act (Act 10 of 2004) provides for listing threatened or protected ecosystems, in one of four categories: **critically endangered (CR), endangered (EN), vulnerable (VU) or protected**. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value.

According to the mapping that was undertaken, the Riverfields Development area falls within the Rietvleiriver Highveld Grassland which is considered CR and the Soweto Highveld Grassland which is considered VU.

6.7 Development Policies for the Area

Development policies were discussed at length in the Scoping report for this project.

In summary however, the development site falls within the delineated Gauteng Urban edge, which makes up part of the provincial Spatial Development Framework. The proposed development is consistent with the Ekurhuleni Metropolitan Council policies

for the development of the R21 Corridor. The application site is earmarked in terms of the R21 LIDP as a “Mixed Land Use” and “residential” node which includes residential, industrial, commercial, retail, office development. It will also contribute to the national policies of infill and densification within the built up urban footprint.

The Ekurhuleni Metropolitan Spatial Development Framework, April 2011; identifies the area between OR Tambo International Airport, Tembisa and north along the R21 highway as a major development corridor. The Riverfields Development area falls well within the development corridor. Furthermore, the site falls well within the identified Aerotropolis, which is a major long-term development node for Ekurhuleni Metropolitan Municipality.

Various development policies have been discussed in detail in the Section 4.2 Vision of Witfontein Farm – Riverfields Development and Ekurhuleni Development Policies.

These policies that have been considered in this EIR are as follows:

1. The 2007 Ekurhuleni EMF document
2. The Gauteng EMF document of November 2014
3. The R21 corridor Local Spatial Development Framework (LSDF) document 2006
4. The 2011 Ekurhuleni Metropolitan Municipality (EMM) Spatial Development Framework document

7. PUBLIC PARTICIPATION PROCESS

The public participation process (PPP) is a vital component of the overall Scoping and Environmental Impact Assessment process, and is therefore, critical to the success of the project. **The purpose of the PPP is to ensure all the views and concerns of interested and affected parties (I&APs) are identified, recorded and addressed during the process**. The PPP is of further importance, as issues are raised by I&AP’s that have local and specialist knowledge of the area and of the site. The PPP to date is set out below:

7.1 Identification of Stakeholders

Stakeholders were identified during the initial advertising phase and the Scoping phase of the project. These included relevant government organisations, conservation bodies, NGO groups, local business, landowners etc. A list of the I&AP’s forming the initial database, is enclosed in Appendix 15: Public Participation report – EIA phase.

7.2 Notification of Interested and Affected Parties (I&AP’s)

In order to comply with both the legislation the following was undertaken:

- A notice of the Scoping and EIA process was published in a local newspaper
- Notices were posted or emailed to the identified parties and surrounding land
- In addition to the above, two site notices were placed at two points on the site, and road intersections, which are deemed to be high visibility areas

- All the notices advised I&AP's that they had 30 days in which to register as an I&AP with the environmental consultant. Certain interested parties did respond and their details have been recorded in a register
- A register of all I&AP's was compiled during the Scoping phase, and is being used in the EIA phase

7.3 Summary of Issues Raised by I&AP's during Scoping & Draft EIR phase

There were no major issues raised by any registered parties during the draft or final scoping phase of the project. This section will be updated in the FINAL EIA, once any comments are received on the Draft EIR.

7.4 Draft and final Scoping Report

Registered I&AP's were notified of the availability of the Draft Scoping report and the time within which they have the opportunity to submit further comments and concerns once they have reviewed the report. The Draft Scoping Report **was made available to the public for a 30 day review period from 26 April to 27 May 2016, and the final Scoping report was circulated for comment from 24 June to 15 July 2016.** The final scoping report was also submitted to GDARD on the 24th of June 2016, and approved on the 5th of August 2016. Proof of this is contained in Appendix 15: Public Participation report – EIA phase.

After completion of the public review period within which interested and affected parties had the opportunity to review the Draft Scoping report, the final scoping report was prepared. Registered I&APs were notified that the final report has been compiled and submitted to the competent authority. It will also be made clear to the I&APs that any additional comments on the FINAL scoping report must be submitted directly to the competent authority, with a copy to the environmental consultant, as indicated in Regulation 56(6). There was no comment received from any of the interested parties.

7.5 Draft Environmental Impact Assessment Report

The final Scoping report was lodged with the authorities (GDARD) on 24 June 2016. That final scoping report was approved by the Gauteng Department of Agriculture and Rural Development (GDARD) on 5 August 2016 (see the approval letter in Appendix 2: GDARD approval of Scoping report). Thus, the approval of the final scoping report meant that the project could continue into the EIA phase.

This report is the draft Environmental Impact Report (EIR), which reports on the actual environmental impacts of the proposed roads, and the various management and mitigation measures that should be put in place to deal with those various impacts. This draft EIR is then be made available to the interested and affected parties for review and further comment.

8. ASSESSMENT OF POTENTIAL IMPACTS

8.1 Summary of specialist reports and key issues raised

In summary the following conclusions were drawn by the specialist studies undertaken for the Environmental Impact Assessment:

1. Vegetation assessment: much of the natural grassland vegetation on the southern extent of the Riverfields Boulevard alignment is infested with "Bankrotbos" and has been heavily overgrazed. The only grassland in a more natural condition is closer to the Swartspruit and around the rocky ridge areas through which Riverfields Boulevard and the north-western section of the proposed R23/K155 alignment passes. There are patches of wattle and blue gum trees within the rocky ridges that should be cleared. Overgrazing of the entire area has reduced the biodiversity of the natural veld grass. Wetland vegetation exists along the existing R23 road crossing the Swartspruit, but disturbance will be minimal as the road widening will be directly next to the existing road surface (where there is already edge effects), and within what was the old R23 road alignment footprint slightly north of the current alignment.
2. Faunal assessment: Although larger animals such as porcupine and jackal would frequent the area from time to time, most of the larger animals would stay away from the existing residential areas of Glen Erasmia and in all likelihood remain closer to the rocky ridges around the Swartspruit and in the Swartspruit wetland east of the R23 road. Other wild fauna are more likely to be prevalent along the river corridors, moving between feeding areas along this green space, or seeking other habitat. The partial re-alignment and widening of the R23 (Option B alternative) will have less of an impact on Fauna than the full realignment (Option A alternative). Riverfields Boulevard alignment and bridge over the Swartspruit will be built as a span bridge over the river, and as such this will also provide open space below the bridge for the movement of fauna up and down the Swartspruit, thereby not cutting them off from free movement or severe habitat fragmentation.
3. Heritage/ archaeology impact assessment: Of the 13 sites identified in the greater Witfontein area, and more specifically within the rocky ridge area, only site 10, 11 and 13 are on or right next to the alignment of Riverfields Boulevard and the north-western extension of the R23 realignment. Due to this, only these sites have been discussed in this section of the EIA report. Sites 10, 11 and 13 have all be given a LOW significance rating, with the more significant sites within the general area having higher significance, but will not be impacted by the proposed road alignments.
4. Socio-economic impact assessment: The proposed Riverfields mixed use development is bound to have a positive and far-reaching economic impact on the local, regional, metropolitan and provincial economies, including previously disadvantaged communities such as Tembisa. It would however be important to maximise the potential economic benefits to second economy areas by means of, inter alia, increasing linkages and reducing leakages in the local economy, skills development programmes, preferential procurement, local labour promotion, etc. The upgrade, widening and building of new roads within

this area is critical for the development of the area in the longer run and to link main arterial routes between residential, commercial and office park areas.

5. Riverfields Boulevard Bridge over the Swartspruit and impact to watercourse: A span bridge with 2 central support pillars has been considered as the preferred alternative for the Riverfields Boulevard Bridge. The Swartspruit cuts a deep profile through the rocky quartzite ridges in the area where the bridge is proposed to cross, with an elevation change of upward of 11 meters in some cases. It is for this reason that a span bridge has been assessed. The span has been determined to be 60 meters, with the two central pillars 24 meters apart and then a distance of 18 meters between them and the end supports, which will tie into a soil filled road surface. This design is seen to be the most environmentally sensitive design.
6. R23 widening along the current alignment over the Swartspruit and impact on watercourse and wetlands: Two alternatives were assessed for this crossing point, and the Option B alternative was determined to be the preferred alternative from an environmental and economic perspective. Environmentally, widening an existing alignment keeps impact areas contained, rather than a full realignment, which would encroach deeper into the more sensitive wetland areas and grass owl habitat north of the existing alignment. Adding culverts on one side to the existing culverts will mean work can be undertaken from the existing bridge, and no additional damage will be done to more sensitive areas. This widening will also be within what was the old R23 road footprint alignment slightly north of the current alignment, which can still be seen on the ground. This means that already impacted and disturbed areas will be used for the widening.

A summary of the main key issues and potential impacts as identified and assessed in this Environmental Impact Report:

- The impact to the Swartspruit river system, both at the Riverfields Boulevard bridge crossing and at the R23 widening
- The impact to the rocky ridge areas alongside the Swartspruit
- The impact on possible heritage and archaeological sites in the rocky ridges
- The impact to fauna and flora
- The impact of the roads upgrade and development and its associated elements to the economy / capital improvements / social standards of the area (positive impact) – with reference to the SDF, EMF and R21 Development Corridor Document

8.2 Impact Assessment Methodology

An assessment of the potential impacts will be conducted according to a synthesis of criteria required by the integrated environmental management procedure, contained in the DEA Guideline Document. This method provides for an assessment in terms of Nature of the impact, extent, duration, intensity, probability, mitigation, enhancement, reversibility and the determination of significance of the impacts.

The Impact Assessment Methodology is contained in Appendix 13: Impact Assessment Methodology

The following characteristics have been identified to assist the assessment of the potential impacts on the surrounding environment:

- *Nature*: which shall include a description of what causes the effect, what will be affected and how it will be affected;
- *Extent*: wherein it will be indicated whether the impact will be local, limited to the immediate surroundings or regional;
- *Duration*: wherein it will be indicated whether the lifetime of the impact will be short, medium, long term or permanent;
- *Intensity*: Is the impact destructive, or benign. Does it destroy the impacted environment, alter its functioning, or slightly alter it
- *Probability*: which shall describe the likelihood of the impact actually occurring, indicated as improbable, probable, highly probable or definite;
- *Mitigation*: (for a negative impact): is about eliminating, minimizing or compensating for negative impacts
- *Enhancement*: (for positive impact): magnifies the benefit of the project
- *Reversibility*: considers to what extent a negative impact can be reversed
- *Significance*: which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;

8.3 Impact Assessment – construction phase

8.3.1 Fauna

Introduction:
The roads traverse a large area of natural grassland vegetation. Riverfields Boulevard from Monument Road crossing the Swartspruit will pass over grassland vegetation, although heavily infested and overgrazed.

Taken from the faunal Report: The grassland vegetation situated within the low-lying quartzite ridge situated on the south-western portions of the site falls within the Soweto Highveld Grassland (Gm8) vegetation unit (Mucina & Rutherford 2006) or Moist Clay Highveld Grassland (35) (Low & Rebelo 1995). The grasslands have been impacted on by anthropomorphic activities during previous agricultural activities as well as current human activities.

Although larger animals such as porcupine and jackal would frequent the grassland area from time to time, most of the larger animals would stay away from the existing residential areas of Glen Erasmia and in all likelihood remain closer to the rocky ridges around the Swartspruit and in the large Swartspruit wetland east of the R23 road. Other wild fauna are more likely to be prevalent along the river corridors, moving between feeding areas along this green space, or seeking other habitat.

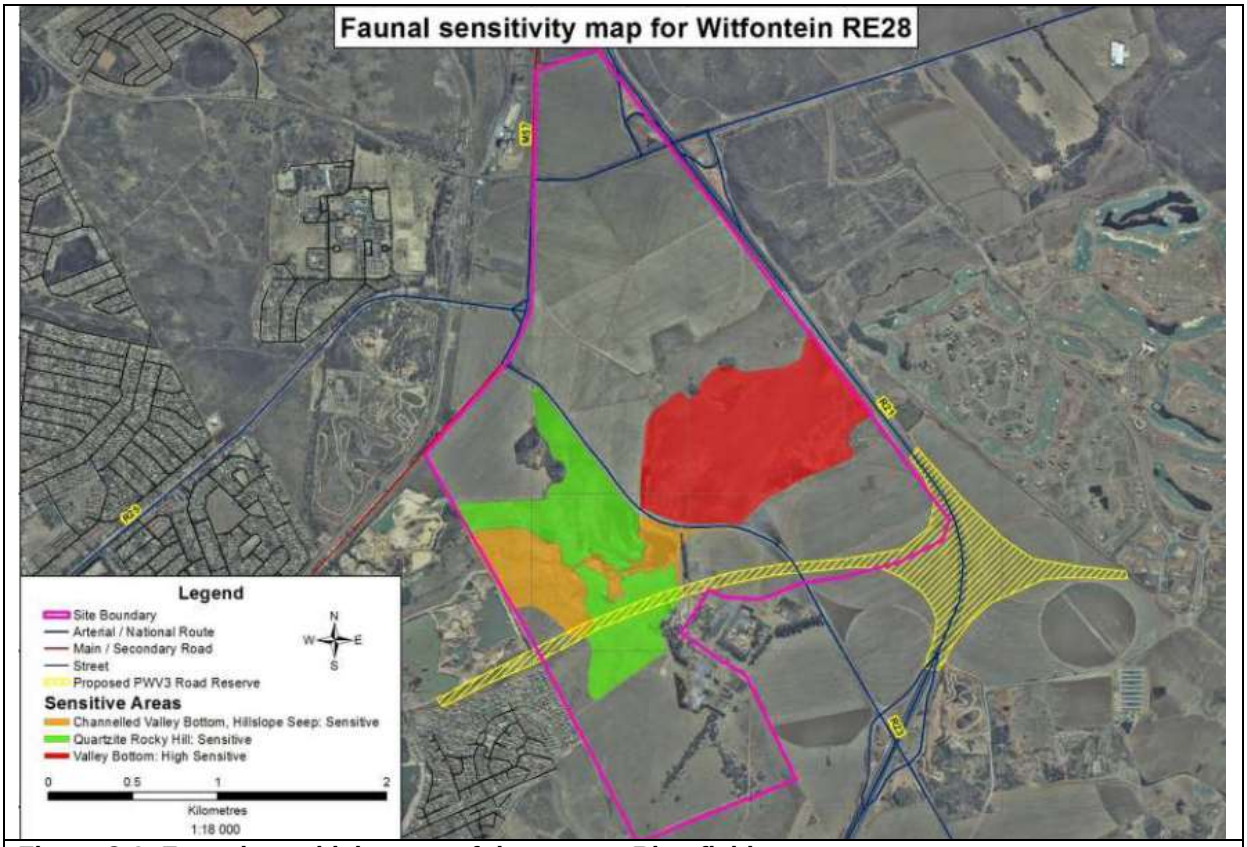

Figure 8-1: Faunal sensitivity map of the greater Riverfields area

The Riverfields Boulevard does pass through the rocky ridge area, although does not actually cross any major part of rocky ridge areas next to the Swartspruit. As can been seen in Figure 8-2: Road alignments through rocky ridges below, the road alignment has taken into account the rocky ridges, as well as one of the narrowest parts of the Swartspruit to cross. During the construction phase there will disturbances in these areas, as construction workers will be moving along these rocky ridge edges and smaller fauna will be disturbed. However, there are large tracts of rocky ridge areas and a dam directly to the east of the Riverfields Boulevard bridge where small fauna would take refuge during the construction phase when there will be the most disturbance.

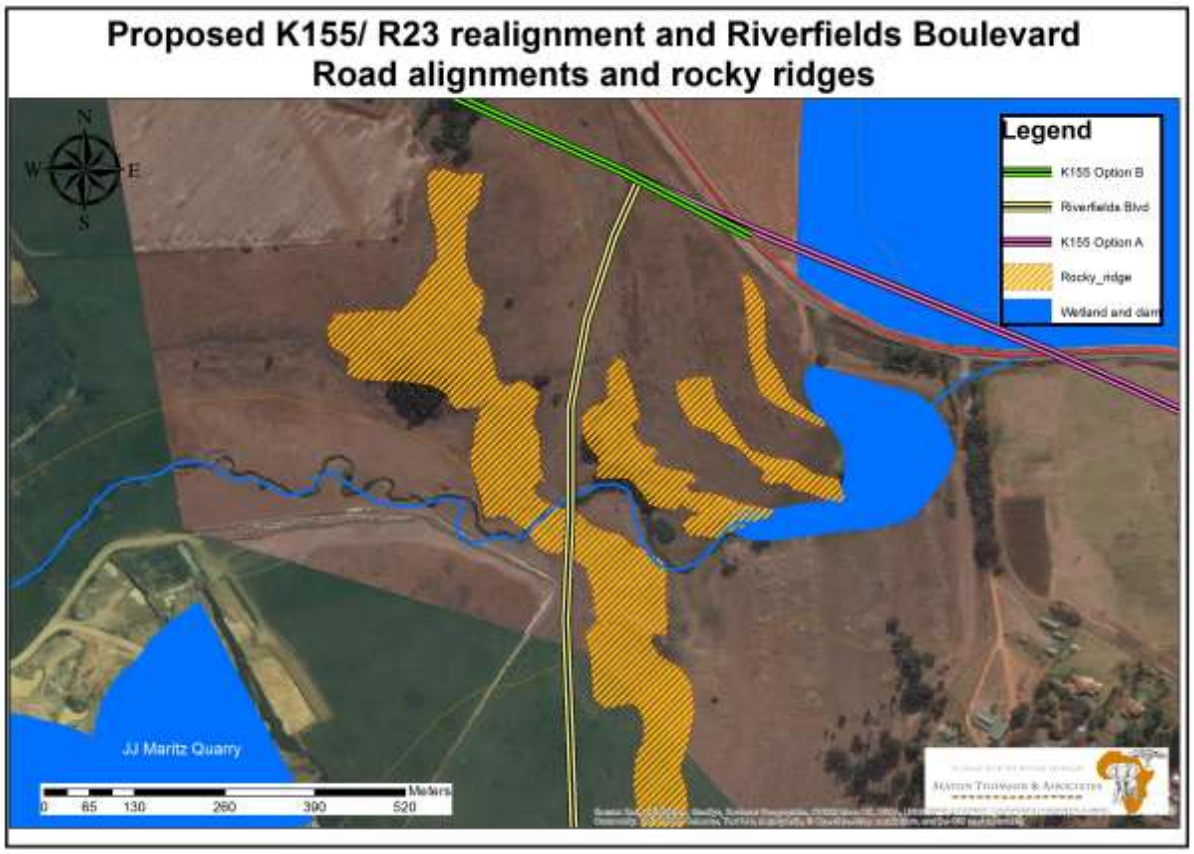

Figure 8-2: Road alignments through rocky ridges

Regarding the widening or complete realignment of the R23, there is no doubt that the full realignment over the Swartspruit will have a far greater impact than the widening of the road in this area. This can be seen in Figure 8-3 below, which shows that the complete realignment would mean that there would be encroachment into the larger eastern wetland area, and impact of this would be further-reaching into this sensitive wetland area. This realigned road would also mean that the old road surface would have to be removed and the area completely rehabilitated, which is additional cost and potential unnecessary impact on the system. However, if the road is widened to double its current alignment on the downstream side, then the impact will be very limited to within an areas that has already been impacted on by the old (historical) road alignment of the R23 that was there many years ago, and the old tar surface is still visible in places.

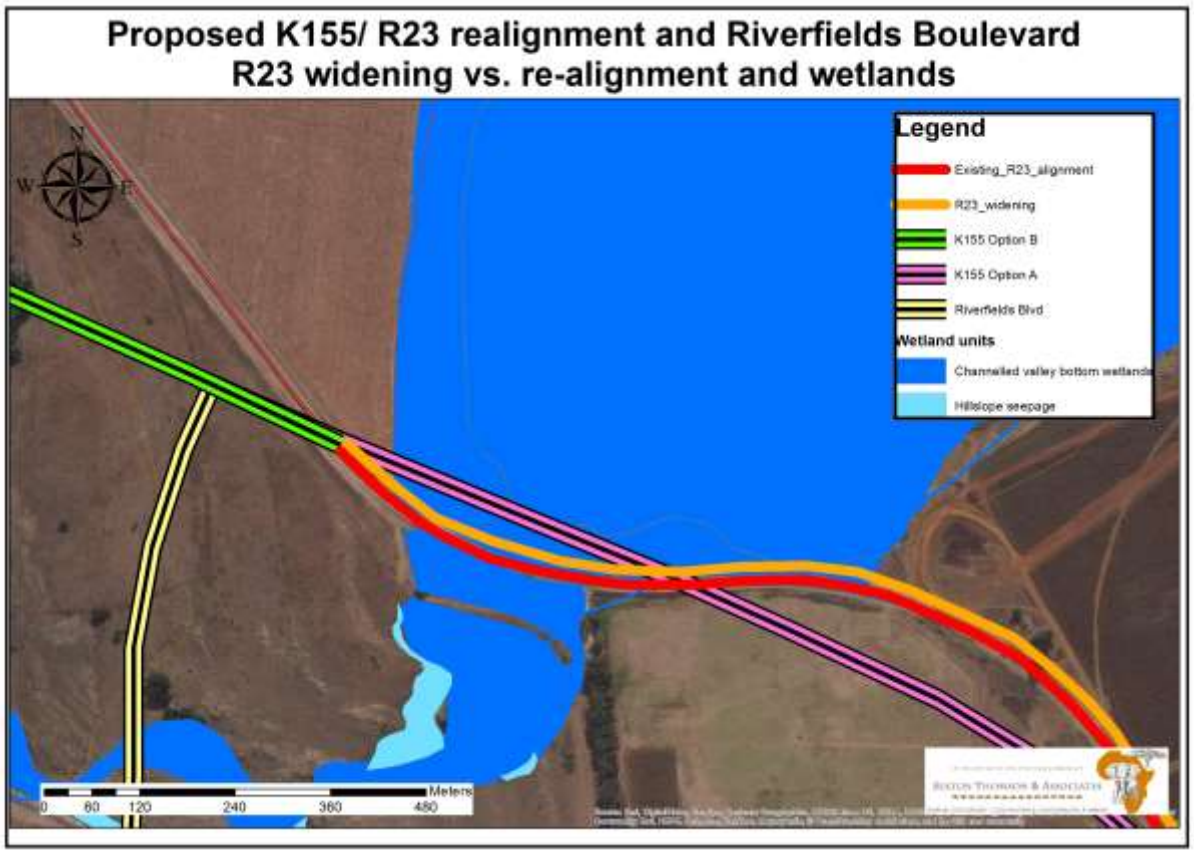

Figure 8-3: R23 widening and re-alignment options with wetlands

The north-western extent of the R23 realignment from the Riverfields Blvd intersection crosses mostly agricultural lands which no faunal habitat function or value.

The details of the realignment versus the widening are annotated in the map below.

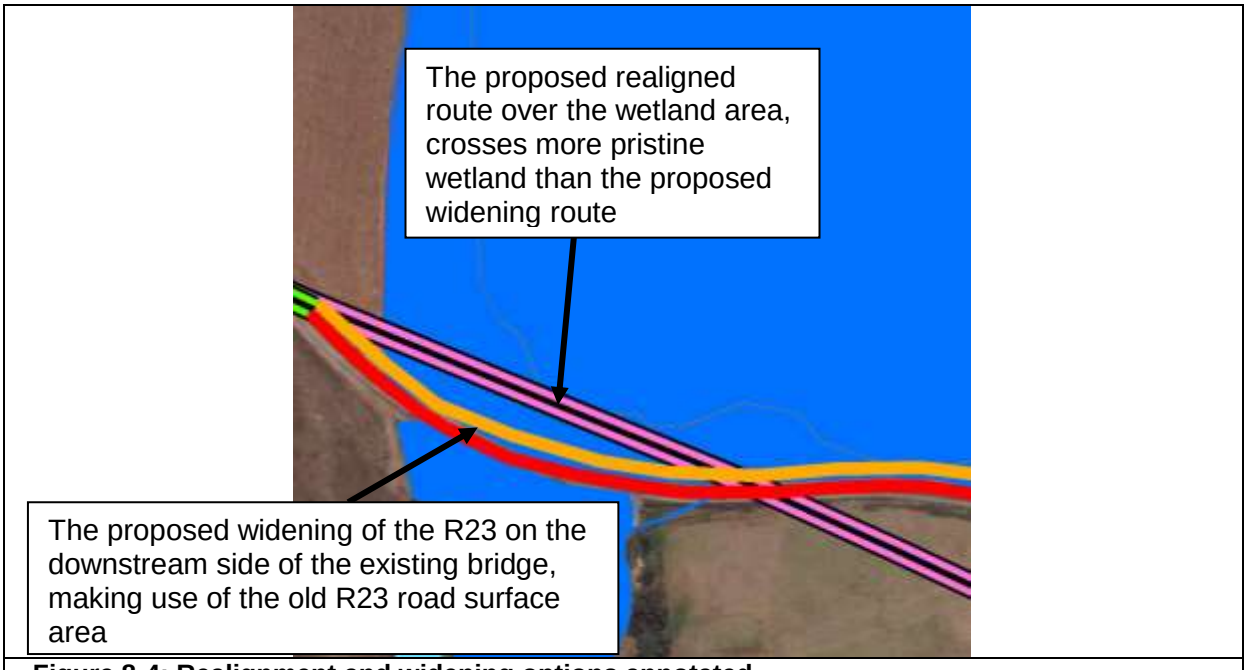

Figure 8-4: Realignment and widening options annotated

The tables below show the impact difference of the 3 areas:

1. Riverfields Boulevard road and bridge

Aspect	Fauna						
Impact	Overall loss and disturbance of fauna and faunal habitat along the Riverfields Boulevard and bridge alignment						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	3	4	3	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							24
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

2. Full realignment of the R23

Aspect	Fauna						
Impact	Overall loss and disturbance of fauna and faunal habitat for the R23 full realignment						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	4	4	3	1
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							40
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

3. Widening of the R23

Aspect	Fauna						
Impact	Overall loss and disturbance of fauna and faunal habitat for the R23 widening						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	3	4	3	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							24
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Although the overall impact on fauna is moderate during the construction phase for each of the 3, it is clear that the full R23 realignment option will have a higher impact on fauna, mainly due to the further encroachment of the road surface in to sensitivity wetland area.

The impact of the Riverfields Boulevard Bridge area and the widening of the R23 can however be managed adequately by enforcing controls on limits of construction and construction workers movements. Any fauna that is potentially displaced during the construction phase will merely move away to the areas further to the east of the site, where there are still vast open areas and green belts created by wetlands and rivers.

Management and mitigation actions:
The enforcement of the “limits of construction” within the road servitudes must be very strict, and limited only to the actual development footprint. The way in which the

Riverfields Blvd Bridge is designed will allow for mitigation of fauna, and continue to provide the linkage corridor for movement of larger wild fauna up and down the Swartspruit area and within the rocky ridge areas. The control measures are future detailed in the EMP.

8.3.2 Avi-fauna

Introduction:
There are areas within close proximity to the roads that are known as owl habitat. Specifically areas directly east of the R23 road, within the large wetland area. Optimal breeding habitat for Grass Owls was found directly downstream of the R23, and in another area closer to the R21 highway. This can be seen in Figure 8-5 below.

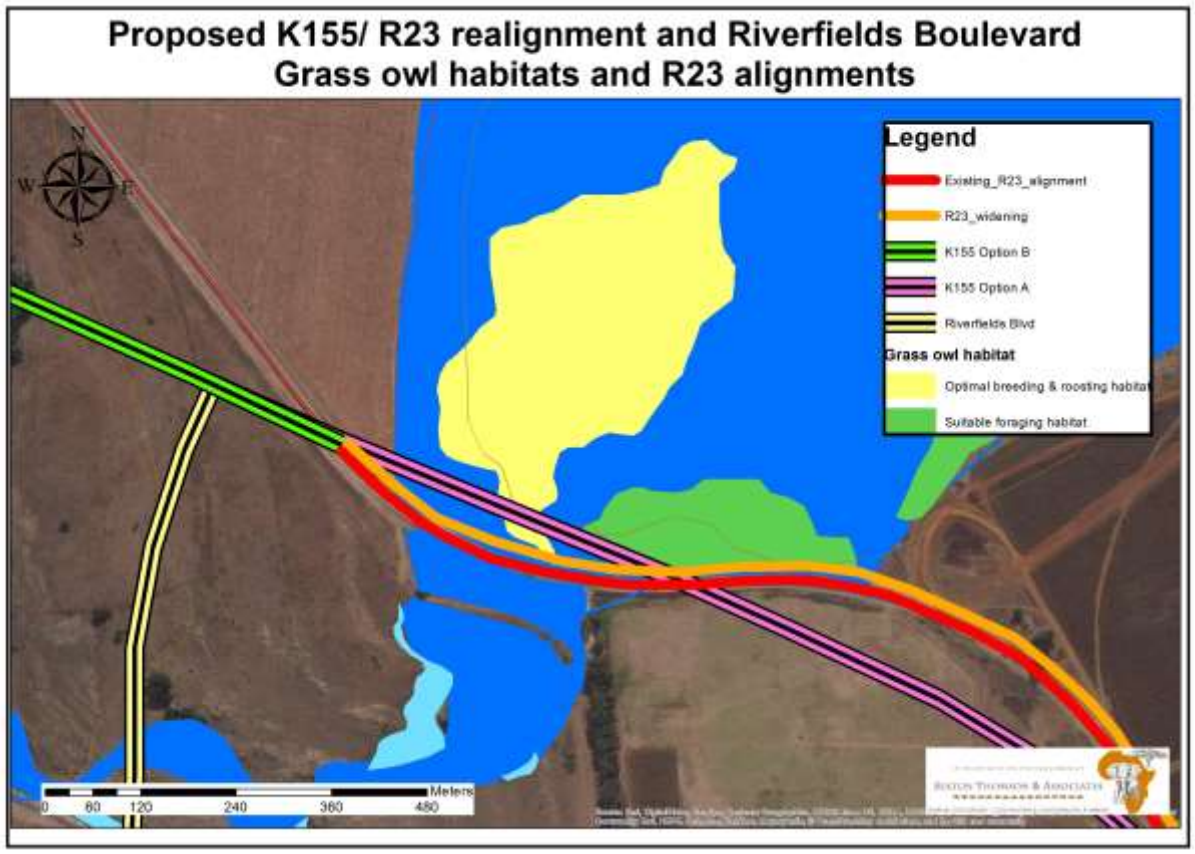

Figure 8-5: Grass owl habitats and R23 alignments

The larger Eucalyptus and wattle trees on the Farm Witfontein are most likely used by birds to roost and nest in, as they are old and established trees. Smaller hawks may also make use of these trees as vantage points from which to hunt for rats and mice in the agricultural fields and grasslands. The main Swartspruit will remain a green belt area within the Riverfields development and also the wetland/ river areas will be left and green belts for bird foraging and habitat. The rocky ridges through which Riverfields Boulevard will pass, will also remain for potential avi-fauna habitat, as the road does not traverse directly through the rocky ridges, only passes close past them. The impact is thus deemed to be very moderate, as birds can adapt well and easily move off to another area. In conclusion, there is certainly no prime bird habitat that will be destroyed. A faunal assessment has been undertaken for a large part of the farm Witfontein, including this road alignment area. The full faunal report is

contained in Appendix 10: . There was also a Grass Owl assessment undertaken for the proposed realignment of the R23. That report is contained in Appendix 9: Grass Owl assessment this report.

As with the predicted impacts on fauna, the impacts of completely realigning R23 over the Swartspruit would cut through a section of optimal grass owl breeding habitat. However, widening of the R23 instead will have a far lesser impact, as the impact will be limited to an area directly next to the existing road and on what has already been impacted on by the old (historical) road alignment of the R23 that was there many years ago, and the old tar surface is still visible in places. This can be seen in Figure 8-6 below, in relation to the grass owl breading habitat.

The widening of the existing R23 alignment will only mean an extension/ widening of approximately 10 meters to the existing road surface. This footprint is a quarter of the Option A full realignment.

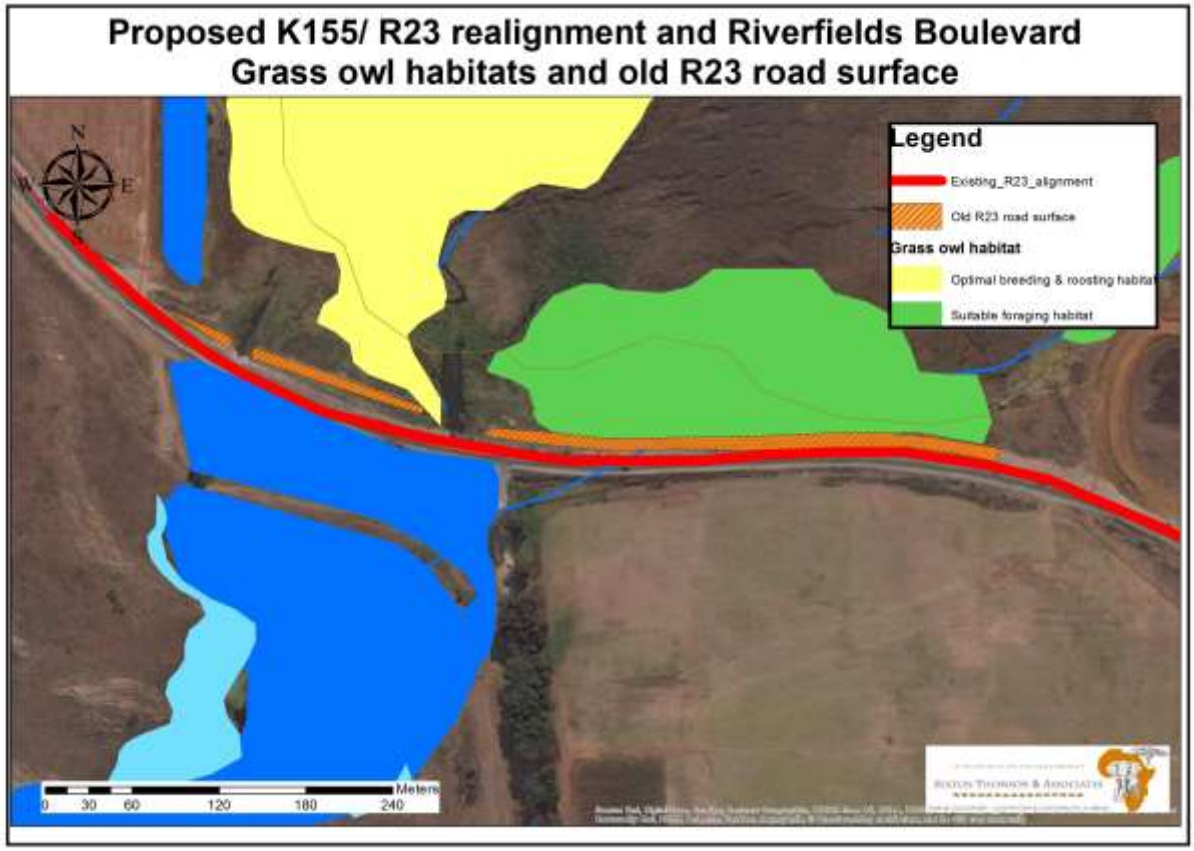

Figure 8-6: Grass owl habitats and old R23 road surface

The table below shows that the overall impact (taking both Riverfields Blvd and the R23 widening into consideration), and has been calculated and is deemed to be moderate. The impact will be greatest during construction, as birds will be disturbed and will be forced to move to other areas for hunting. This is however not seen to be a major impact, as there are many hectares of open land to the far north and east of the site that will provide just as much hunting habitat for the birds.

Aspect	Avi-fauna						
Impact	Disturbance to birds (especially owls) on the site and destruction of potential habitat						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	3	4	3	3	2	1
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							42
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
The following mitigation measures have been taken from the Gras Owl assessment report:

- The extent of the laydown area should be demarcated on site layout plans and its placement should avoid areas of optimal Grass-owl habitat. Areas surrounding the laydown site that are not part of the demarcated development area should be considered as “no-go” areas for employees and machinery. Strong security structures must be put in place to control accessibility into areas of high sensitivity;
- The road reserve shall be temporarily fenced to prevent any overspill of construction activities into areas of high sensitivity;
- Construction activities should be restricted to daylight hours and should avoid the peak breeding months of February to May;
- Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas are to be undertaken;
- A stormwater management plan for the road will be required to attenuate flood events and prevent excessive erosion; and
- Implement traffic calming devices along the road where a high frequency of road kills (e.g. dispersing small mammals and amphibians) are likely to be present (e.g. streams or wetland crossings). Typical traffic calming devices would include signage indicating appropriate speed limits and the application of speed humps.

8.3.3 Flora

Introduction:
The following is a summary of the vegetation report that was compiled for a larger area of Witfontein, over-which the roads traverse:

*“The study site comprised a mix of communities that had mostly low ecological value according to their scoring values. It is surrounded by agricultural areas on the northern side and urban areas on the southern side and does not adjoin any other natural habitat. Very little connectivity exists between the site and that of other neighbouring natural habitat. Vegetation surrounding this site comprises spots with a high percentage of alien invasive species such *Acacia mearnsii (black wattle) and other exotics. Conserving this site in its entirety would be pointless however the wetlands and moist grassland, have a high ecological value with numerous diverse, unique species present in each.*

These communities also form niches for faunal elements such as birds, amphibians and insects and as such have a high ecological value. The ecological functionality is high, the mountain wetland being the most unique habitat followed by the wetland and moist grassland (although wetland scoring was reduced due to overgrazing). The ecological processes especially the water dynamics that these water-rich communities contribute towards, are underestimated, but need to be preserved. They have a high conservation value and also contain the most unique species.

The mountain slopes wetland, wetland and moist grassland should be maintained and conserved as it forms part of the greater catchment of the area, also marked as irreplaceable in GDACE's C-Plan, while the rocky quartzite outcrop forms part of a ridge and should be protected by the Ridges Policy. The grassland is not unique while its conservation value is not high and it is found in the surrounding area where better spots could be conserved." It was further noted that "*no red- listed species / orange-listed species, or rare species were found while conducting this study*."

The full vegetation report is contained in Appendix 11: .

As described in the fauna section above, Riverfields Boulevard does pass through the rocky ridge area, although does not actually cross any major rocky ridge areas. As can been seen in the Figure 8-2 in section 8.3.1, the road alignment has taken into account the rocky ridges, as well as one of the narrowest parts of the Swartspruit to cross, and as such has avoided the more sensitive rocky ridge areas. During the construction phase there will disturbances in these areas, as construction workers will be moving along these rocky ridge edges and vegetation will be disturbed. However, disturbance will be limited to the actual alignments, and strictly monitored.

There is no doubt that the full realignment over the Swartspruit will have a far greater impact on flora than the widening of the road in this area. This can be seen on Figure 8-3, it shows that the complete realignment would mean that there would be encroachment into the larger eastern wetland area, and impact of this would be further-reaching into this sensitive wetland area. This realigned road would also mean that the old road surface would have to be removed and the area completely rehabilitated, which is additional cost and potential unnecessary impact on the system. However, if the road is widened to double its current alignment on the downstream side, then the impact will be very limited to within an areas that has already been impacted on by the old (historical) road alignment of the R23 that was there many years ago, and the old tar surface is still visible in places. This would naturally mean that there is far less vegetation (and specifically wetland vegetation) that would be disturbed as a result of the widening, as opposed to the full realignment. The widening of the existing R23 alignment will only mean an extension/ widening of approximately 10 meters to the existing road surface. This footprint is a quarter of the Option A full realignment.

The north-western extent of the R23 realignment from the Riverfields Blvd intersection crosses mostly agricultural lands which hold no natural value at all. The land is mostly planted with agricultural crops for most of the year.

There is a large stand of black wattle located on the north-western alignment of the R23 (between Pretoria Road and Riverfields Blvd intersection), and this will be

completely cleared for the road alignment. This is however black wattle, which are invasive exotic and must be removed in any event. There is therefore no negative impact in removing this stand of trees.

Aspect	Flora						
Impact	Loss of significant or rare vegetation on the site, as well as loss of wetland vegetation						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	1	3	3	4	2	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							19,2
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
The same mitigation and management action apply as per detailed above, which are: The enforcement of the “limits of construction” within the road servitudes must be very strict, and limited only to the actual development footprint. The way in which the Riverfields Blvd Bridge is designed will allow for minimal impact to vegetation right along the Swartspruit. The road has been designed to miss the main rocky ridge areas, and as such less natural vegetation within these areas will be disturbed.

8.3.4 Heritage and archaeology

Introduction:
An archaeological and heritage impact assessment was undertaken for a large part of the farm Witfontein, and is contained in Appendix 7: . The assessment was undertaken for a larger piece of land including areas north of the Swartspruit, but the entire area where the proposed roads are to be built is included in this study area. During the survey, thirteen (13) “archaeological sites” were identified, having varying significance in terms of historical and cultural importance, all of which were within or right adjacent to the rocky ridge areas.

Of the 13 sites, only site **10, 11 and 13** are on or right on the boarder of the proposed road alignments. Due to this, only these sites have been discussed in this section of the EIA report. All other sites are located outside of the road alignments in the main rock ridge areas.

Figure 8-7 below shows the location of the 13 sites, in relation to the road alignments and the rocky ridge areas.

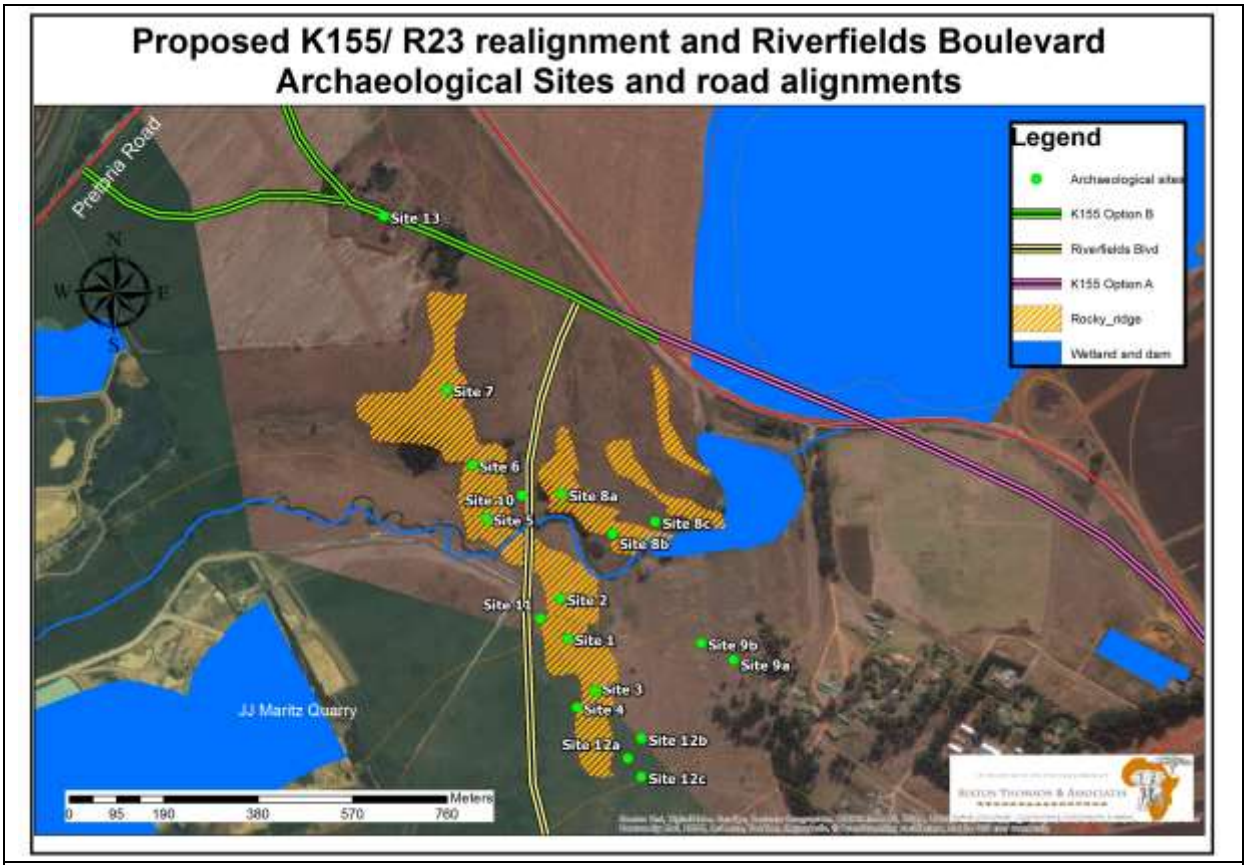

Figure 8-7: archaeological sites and road alignments

The following is taken from the Heritage survey, 2012: "*A different type of walling marks pastoral encampments. Typically, the stone foundations for skin shelters surround a large low circle (about 12m across) for domestic stock. At least four of these rare sites were noted:*

Site 8c: 26 03 12.7S 28 15 48.4E — medium significance;
Site 9a: 26 03 21.7S 28 15 53.5E with about 8 small foundations — high significance
Site 9b: 26 03 20.6S 28 15 51.4E) — medium significance;
Site 10: 26 0311S 28 15 39.7E — Low significance.

One rectangular kraal (15 x 30m) was built against a quartzite ridge near the boundary with the large quarry west of the project area. It probably enclosed European sheep at the end of the 19th century.

Site 11: 26 03 19S 28 15 40.9E — Low significance.

Two large pits in the northern part of the project area are the remains of a quarry operation, probably for quartzite aggregate. The foundations of the main office still stand next to one pit:

Site 13: 26 02 52.8S 28 15 30.7E - Low significance.

The above description from the heritage report indicates that all 3 sites are of **Low significance**. There were no recommendations given in the Heritage report as to what mitigation is necessary for these sites, but as they are of low significance, it is

concluded that there is no value in keeping them, and that they can be destroyed. There has only been mitigation measures proposed for the sites of greater significance within the rocky ridges, which will not be effected by the road alignments.

The table below shows that the impact of the road alignments will have on site 10, 11 and 13 will be moderate, but not high. The reason the impact is moderate, even though these sites will be destroyed, is due to the fact that the sites have a very low significance rating.

Aspect	Heritage and archaeology						
Impact	Impact on heritage sites 10, 11 and 13 that will be destroyed by the road alignments						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	1	5	2	4	1	1
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							48
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
None proposed for these particular sites, as they are low significance and removing them will have no archaeological or heritage impact.

8.3.5 Geotechnical and geological – Dolomitic Stability

According to the available geological map, sheet 2628 East Rand at a scale of 1:250 000, the geological contact between the Black Reef Formation (quartzite & shale) and dolomite and chert of the Malmani Sub-Group runs roughly through the centre of the Riverfields Development areas.

The southern and western half of the Riverfields development area is underlain by sediments of the Black Reef Formation. No wad or dolomite was encountered in any of the eight boreholes drilled to delineate this zone boundary when drilling was undertaken for a piece of land south-east of the road alignments.

The following maps indicate 2 pieces of land that been extensively drilled for the presence of Dolomite. The road alignments are shown in red in Figure 8-8.

The first map, shown below as Figure 8-8 indicated that there is an "*inferred dolomite/ black reef geological boundary*" (thick yellow line). Areas to the west of this boundary are classified as non-dolomitic and thus no D classification applies (This area is referred to as Zone 1).

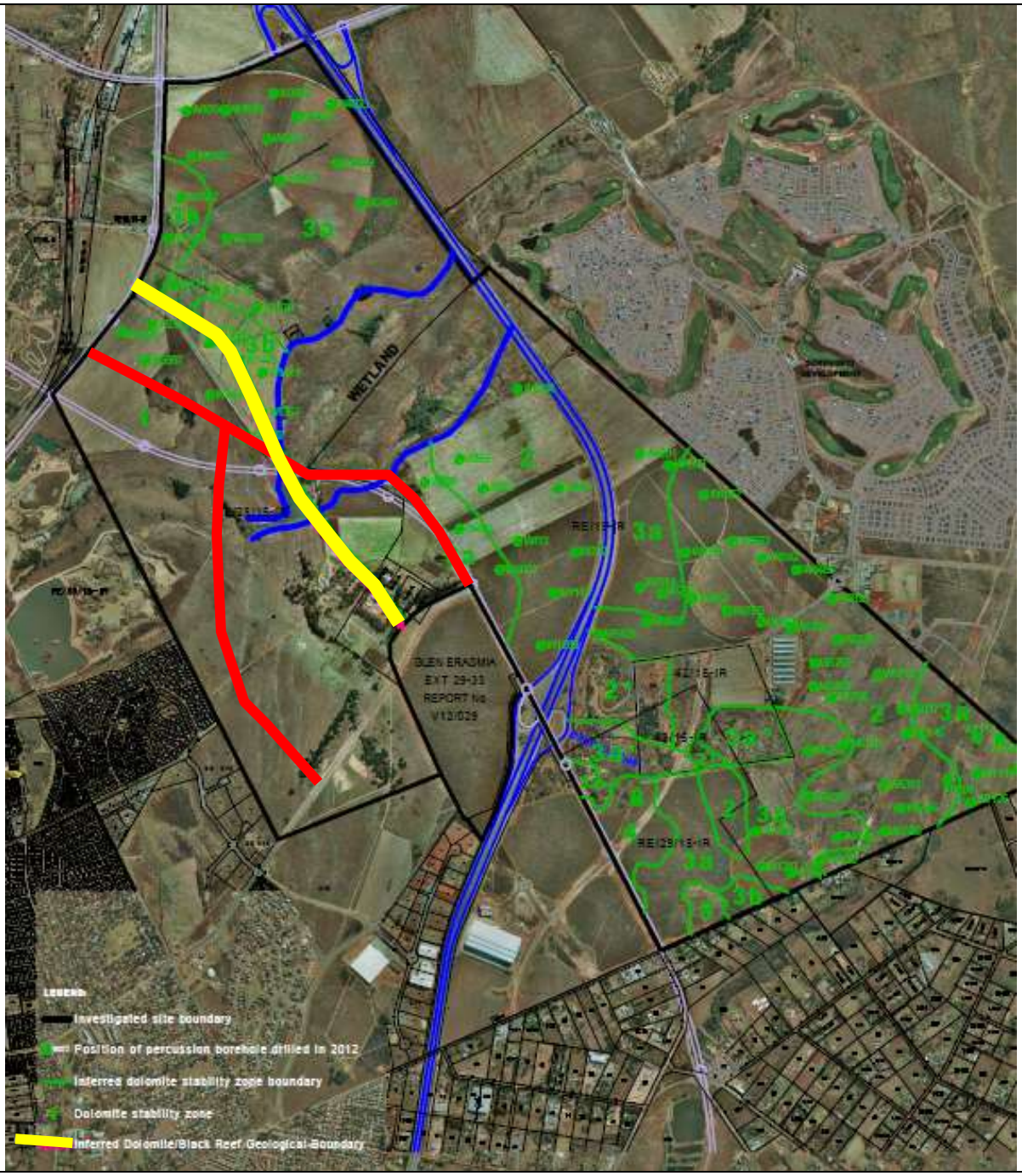

Figure 8-8: Dolomite stability (zone) map for the Riverfields development area

From the above dolomite zone stability map it is clear that all of Riverfields Blvd and the north-western alignment of the R23 is on non-dolomitic ground. The R23 over the Swartspruit and south towards the Monument Road intersection is on dolomitic ground. However, dolomite is not a major concern for road construction, especially as there is an existing road that is being widened. Dolomite is a concern for housing and commercial developments.

From the impact table shown below, it is evident that dolomite is not a concern for the proposed roads at all, as various engineering designs of base layers can easily overcome this. Due to this, the impact is deemed to be low, provided that all the

engineering specifications for road construction can be implemented accordingly for the sections of road that require intervention.

Aspect	Geotechnical, geological and dolomite stability						
Impact	Road impact on geology of the site and surrounds, and the impact of Dolomite conditions on road construction						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	1	3	3	3	4	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							10,28571429
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
All road building engineering specifications must be taken into consideration for the building of the roads.

8.3.6 Wetland and river systems

Introduction:
The Swartspruit runs directly through the Riverfields Development area, and the R23 already crosses the Swartspruit. A wetland delineation and assessment has been dine for the section between JJ Maritz Quarry and the R23, and another report was done for the large eastern wetland between the R23 and the R21. Both of these reports have been included as Appendices to this EIA report.

The 2 areas will be dealt with as separate sections below, as Riverfields Blvd Bridge related to one wetland report, and the widening of the R23 related to the other wetland report.

The figure below shows the wetland delineations in relation to the proposed road alignments.

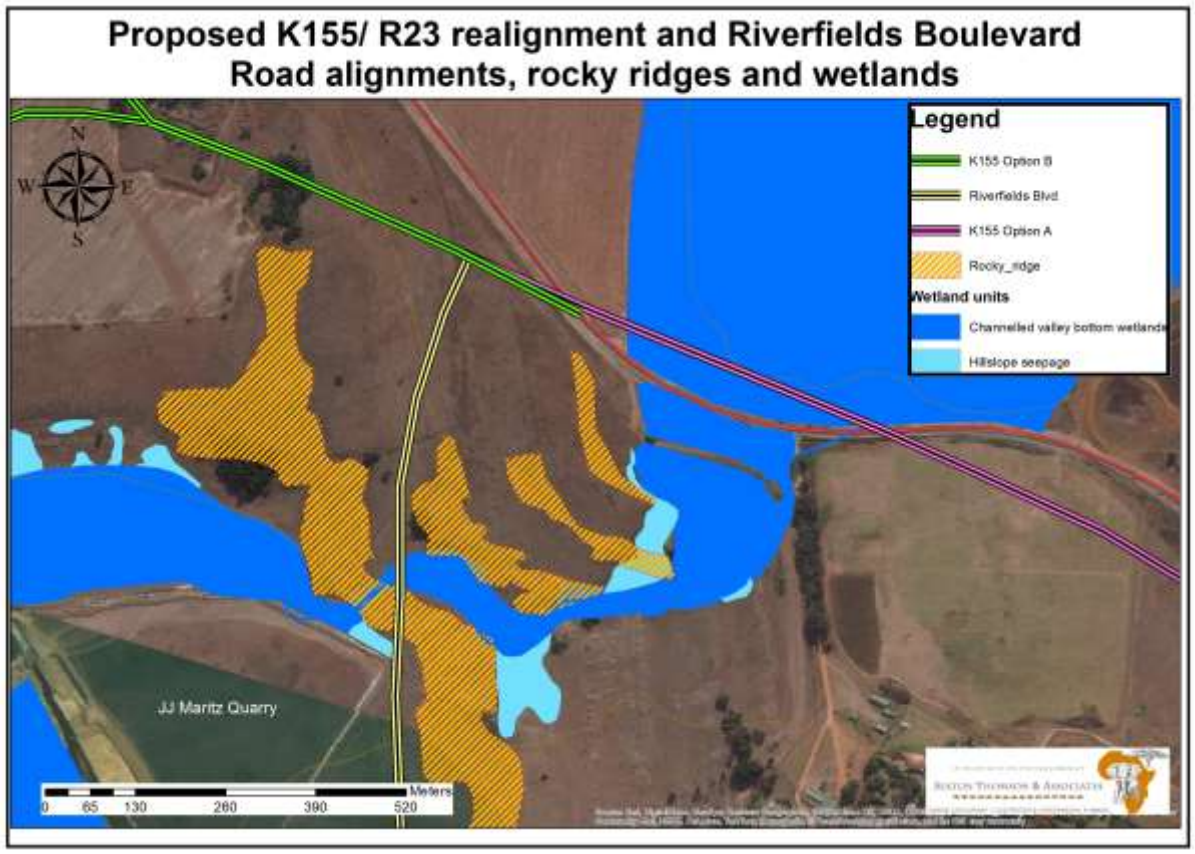

Figure 8-9: Rivers and wetlands delineation with road alignments

Riverfields Blvd bridge - western Swartspruit section

The following is taken from the Wetland Delineation and Assessment by Wetland Consulting Services:

Two hydro-geomorphic wetland types were identified on the site and delineated namely:

- Channelled valley bottom wetland
- Hillslope Seepage wetlands

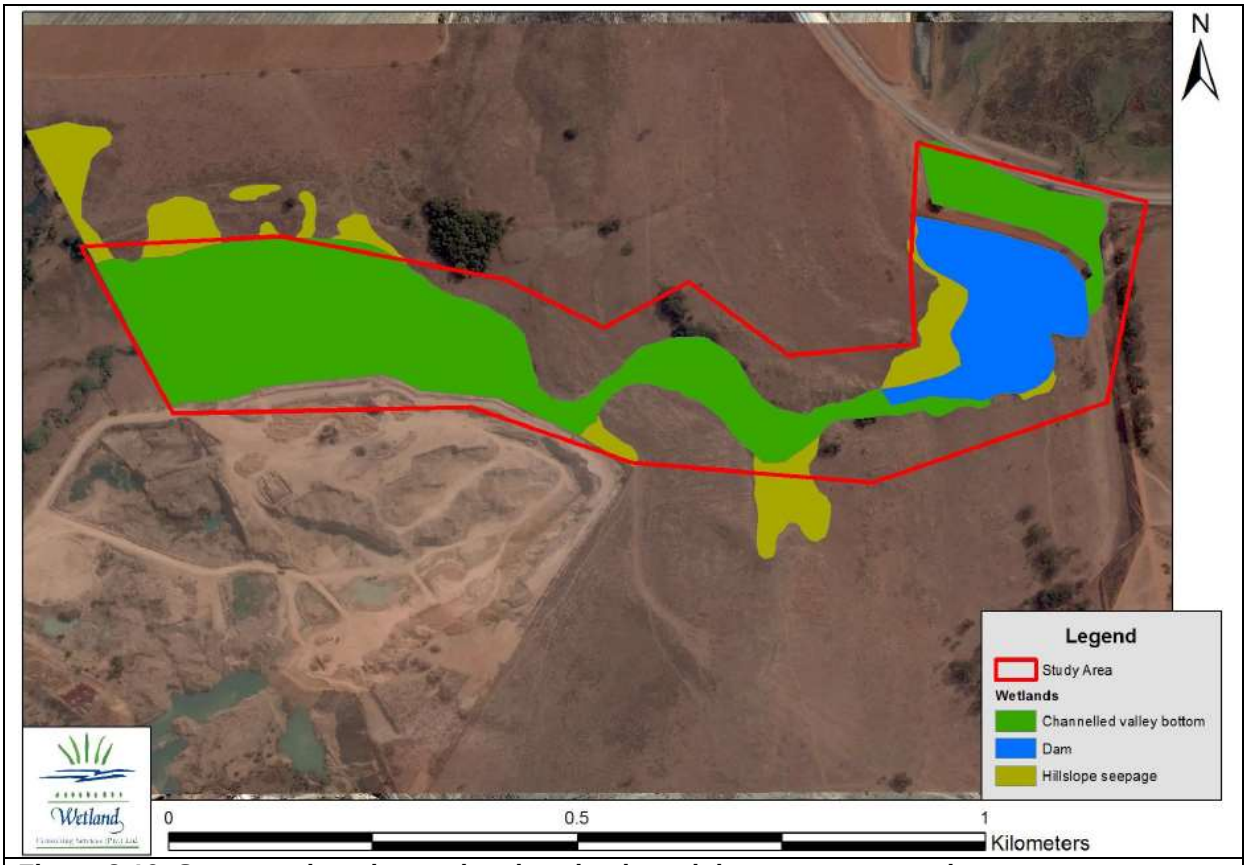

Figure 8-10: Swartspruit and associated wetlands and dam - western section

"*Along the full length of the main valley bottom system on site a number of small hillslope seepage wetlands occur along the footslope to the valley bottom and drain into the valley bottom. All of the hillslope seepage wetlands can be considered seasonal to temporary wetlands, being maintained by the shallow, subsurface seepage of water derived from rainfall infiltrating the soils in the wetland and its catchment. The seepage wetlands were characterised by a mix of grass and sedge species, with grasses dominating in the more temporary areas and sedges in the more seasonally saturated sections. All of these wetlands showed signs of heavy grazing pressure*."

"*The valley bottom wetland is considered to be* ***largely modified (PES category D – 5.3),*** *relating mostly to changes in the supporting hydrology, but also expressed as significant degradation of the geomorphological component. The construction of a dam across the bottom part of the wetland has altered the retention and distribution patterns of water within the wetland, and also altered the geomorphological regime through trapping of sediments. Hardening of the catchment due to urbanisation has also impacted on water inputs to the wetland. These increased flows have led to increased channel incision. The vegetation composition has altered in response to these changes as well*."

"*The valley bottom wetland was considered to be of* ***High importance and sensitivity****, related to both its role in biodiversity support and its hydrological functioning, specifically its role in moderating flood flows and water quality derived from urban runoff*."

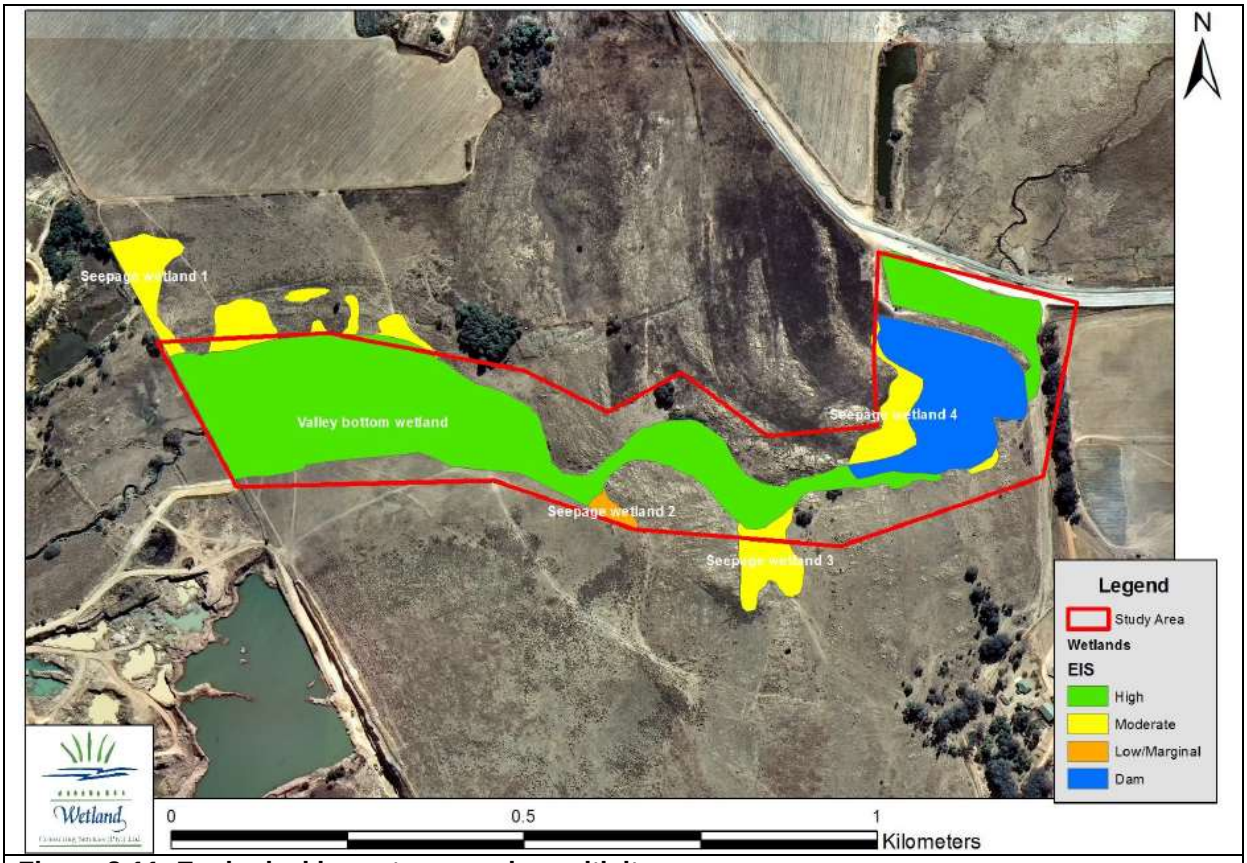

Figure 8-11: Ecological importance and sensitivity map

R23 realignment or widening - eastern Swartspruit Section

The following is taken from the Wetland Delineation and Assessment by Imperata Consulting:

- "*The delineated wetland has a size of 87.69 ha.*
- *The delineated wetland area has hydromorphic (wetland soil), hydrophytic (wetland plants) and terrain unit (landscape position) features that are consistent with wetland watercourses.*
- *Sample points in and around the majority of the wetland area were typically characterised by an abrupt transition between upland and wetland areas*
- *A range of soils forms typical included cf. Tukulu to cf. Katspruit sequences over short distances, with the latter is regarded as a diagnostic wetland soil form (DWAF 2005).*
- *Wetland soils are characterised by a high percentage of clay particles with few sandier areas that are potentially associated with preferential lateral water movement.*
- *The majority of the wetland is dominated by seasonal and especially permanent zones of wetness, with common obligated hydrophytes in the form of Phragmites australis and Typha capensis covering large areas. Other obligated hydrophytes include Persicaria spp. and several species from the family Cyperaceae*."

As can been seen in Figure 8-12 below, the Swartspruit eastern wetland is very large, and is bounded by the R23 on the western side.

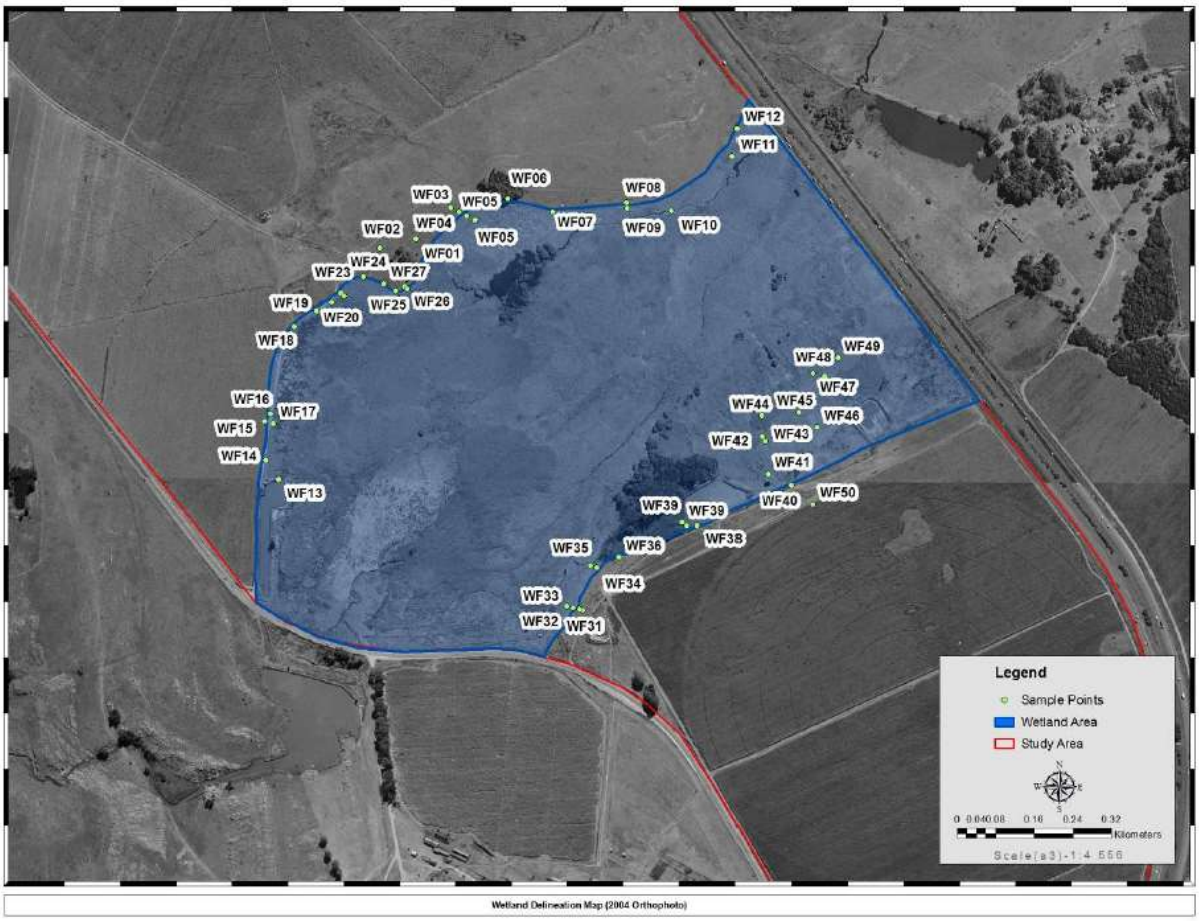

Figure 8-12: Swartspruit eastern wetland delineation

"*The wetland has a **C Present Ecological State (PES) value**, which indicates a Moderately modified delineated wetland*"

*"The Ecological Importance and Sensitivity (EIS) assessment indicated a value of **3.0, which is regarded as a High to Very high** EIS category.*
The wetland contains habitat that is regarded as suitable roosting, breeding and foraging habitat for the Vulnerable Red Data species Tyto capensis (African Grass Owl)"

There are 3 impact prediction tables given below, one is for the impact of Riverfields Blvd bridge on the western Swartspruit section, and the other impact tables for the widening of the R23 along its current alignment of the Swartspruit, and then the 2nd alterative of a full realignment of the R23.

Swartspruit western section - Riverfields Blvd bridge crossing

Aspect	Swartspruit western section - Riverfields Blvd bridge crossing						
Impact	Impact on hydrology, functioning and biodiversity						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	3	4	2	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							24
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Swartspruit eastern section - R23 widening along the existing alignment

Aspect	Swartspruit eastern section - R23 widening along the existing alignment						
Impact	Impact on hydrology, functioning and biodiversity						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	4	5	3	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							33,33333333
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Swartspruit eastern section - R23 full realignment over the Swartspruit wetland

Aspect	Swartspruit eastern section - R23 full realignment over the Swartspruit wetland						
Impact	Impact on hydrology, functioning and biodiversity						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	5	5	2	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							62,5
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

It is clearly evident from the impact tables above that the full realignment of the R23 over the Swartspruit wetland will have a far higher impact on the wetland system as opposed to the widening of the existing alignment. This is further proof that the option to widen the R23 along its current alignment over the Swartspruit has less of an impact.

The fact that a span bridge is proposed for the Riverfields Blvd Bridge means that the actual impact on hydrology, functioning and biodiversity of the actual Swartspruit will be on the low side of “moderate”. Although there will be impacts, these can be adequately mitigated. The central pillars on which the span bridge will be supported will be some distance from the actual watercourse flow, and as such reducing the impacts greatly.

Figure 8-13 below shows the road alignments in relation to the delineated wetlands on the Witfontein site.

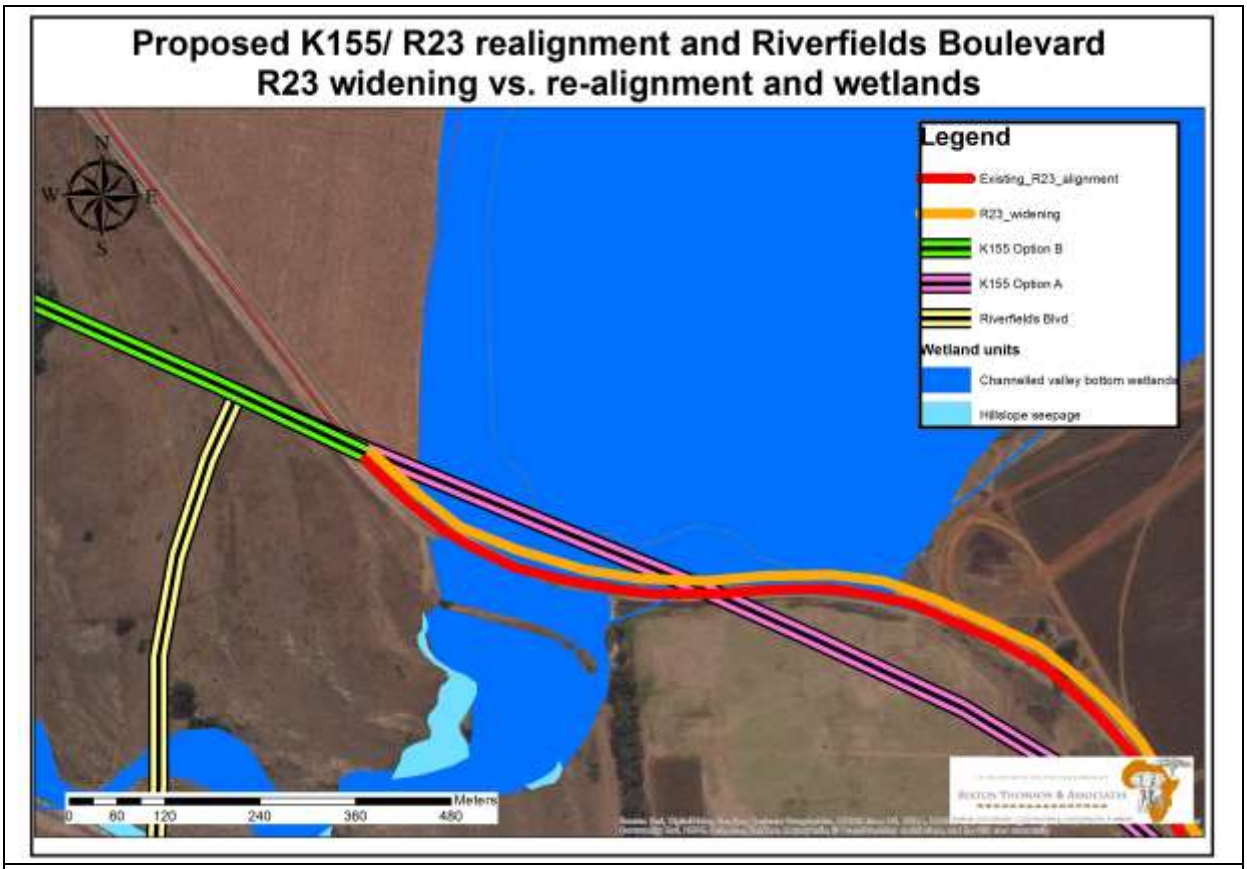

Figure 8-13: Wetlands and road alignments

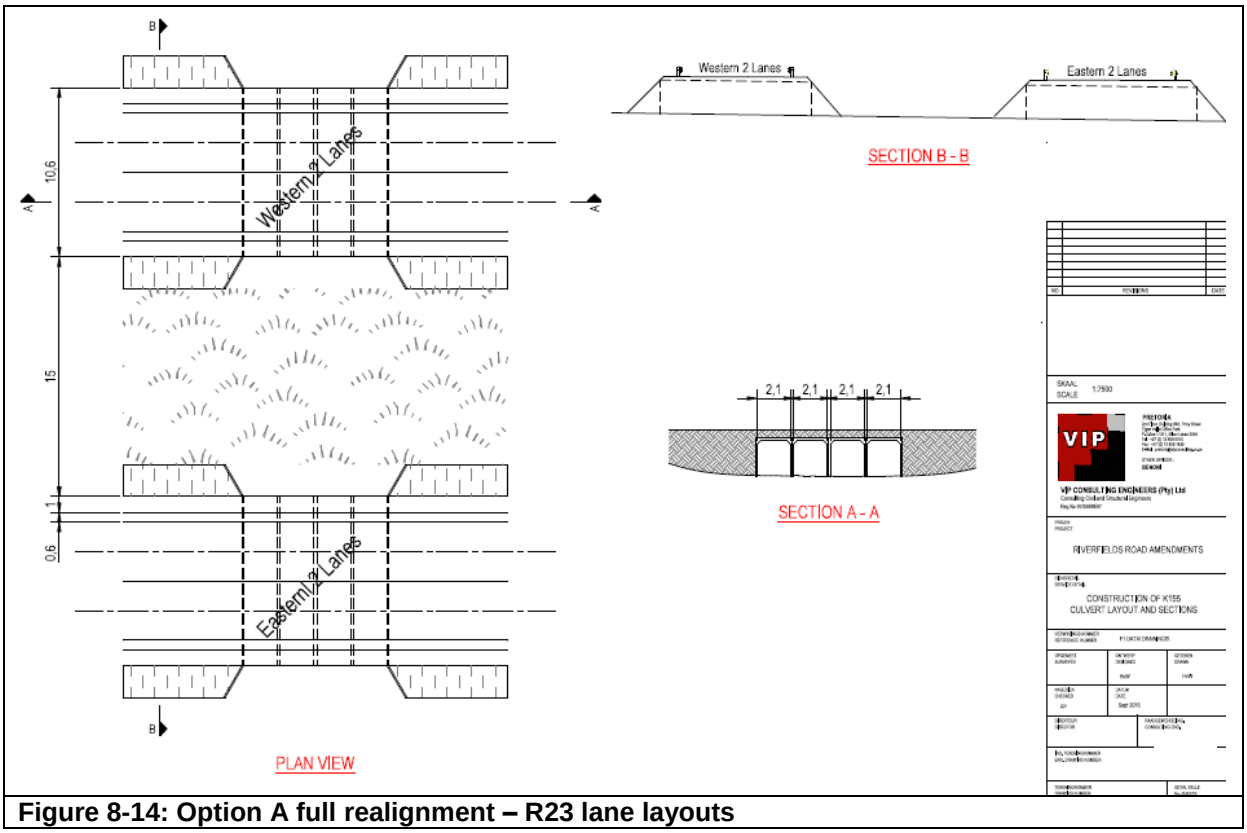

Figure 8-14: Option A full realignment – R23 lane layouts

The 2 lanes of traffic in each direction would be spaced 15 meters apart, and from with a 10,6 meter wide road surface for eastern and western lanes, the entire road footprint width would be close to 40 meters wide. This is shown in Figure 8-14 above. It must be noted that this full realignment option is along a “K” route (the K155), and the specification for the road surface and how far apart the lanes should be from one another is a requirement from Gautrans for all “K” routes.

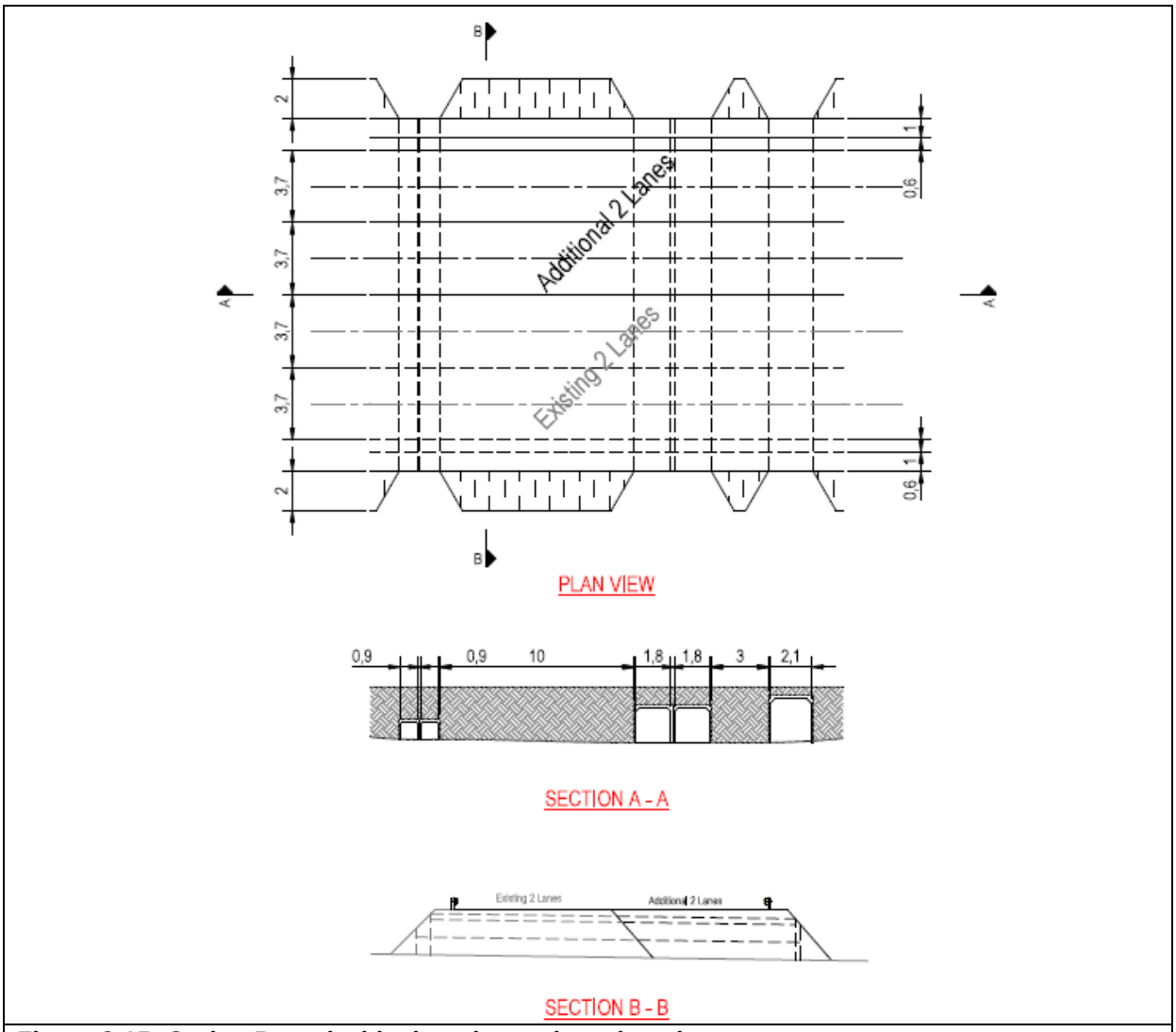

Figure 8-15: Option B road widening plan and section views

The widening of the existing R23 alignment will only mean an extension of approximately 10 meters to the existing road surface. This footprint is a quarter of the Option A full realignment as shown in Figure 8-15 above.

Management and Mitigation actions:

- The widening of the existing R23 road surface should be undertaken/ implemented as opposed to the full realignment of the road
- The 2 central support pillars for the Riverfields Blvd bridge are to be at least 8 meters from the edge of the actual stream area on both north and south of the stream
- No water from the river is to be used in any construction or cement mixing

- Berms or sand bags are to be placed around the base of the support pillars while they are being built to avoid erosion and any cement wash from entering the stream
- No cement mixing is to take place within 50m of the edge of the river, and all cement mixing must be on impermeable, bunded surfaces or in cement mixers.

Additional measures as proposed by the Grass Owl specialist for the R23 section:

- The extent of the laydown area should be demarcated on site layout plans and its placement should avoid areas of optimal Grass-owl habitat. Areas surrounding the laydown site that are not part of the demarcated development area should be considered as "no-go" areas for employees and machinery. Strong security structures must be put in place to control accessibility into areas of high sensitivity;
- The road reserve shall be temporarily fenced to prevent any overspill of construction activities into areas of high sensitivity;
- Construction activities should be restricted to daylight hours and should avoid the peak breeding months of February to May;
- Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas are to be undertaken;
- A stormwater management plan for the road will be required to attenuate flood events and prevent excessive erosion; and
- Implement traffic calming devices along the road where a high frequency of road kills (e.g. dispersing small mammals and amphibians) are likely to be present (e.g. streams or wetland crossings). Typical traffic calming devices would include signage indicating appropriate speed limits and the application of speed humps.

Further to the above, the Swartspruit is subjected to floodlines. The map below is an indication of the floodlines on the property. The floodlines roughly correspond with the wetland delineations, and there will be no impact or change to the current floodlines due to the span bridge that is proposed for Riverfields Blvd and additional culverts on the downstream side of the existing R23 crossing to widen the road.

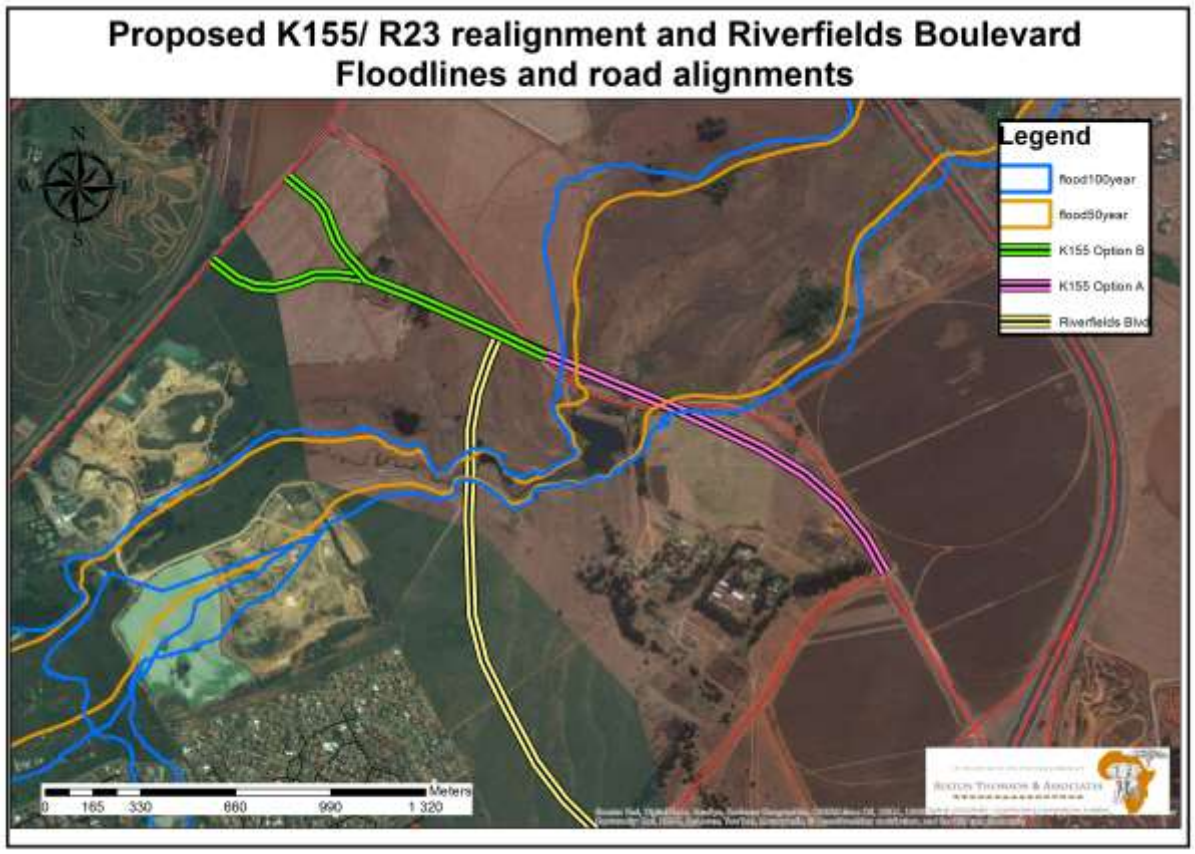

Figure 8-16: Swartspruit floodlines and road alignments

8.3.7 Quartzite rocky ridge areas - linked to fauna and flora

As discussed earlier in this report, there are quartzite rocky ridges on the site, specifically where Riverfields Blvd road will traverse.

The Riverfields Boulevard does pass through the rocky ridge area, although does not actually cross any major rocky ridge areas, apart from a small section just to the south of the Swartspruit. As can been seen in Figure 8-17 below, the road alignment has taken into account the rocky ridges, as well as one of the narrowest parts of the Swartspruit to cross. During the construction phase there will disturbances in these areas, as construction workers will be moving along these rocky ridge edges and possible disturbance will occur.

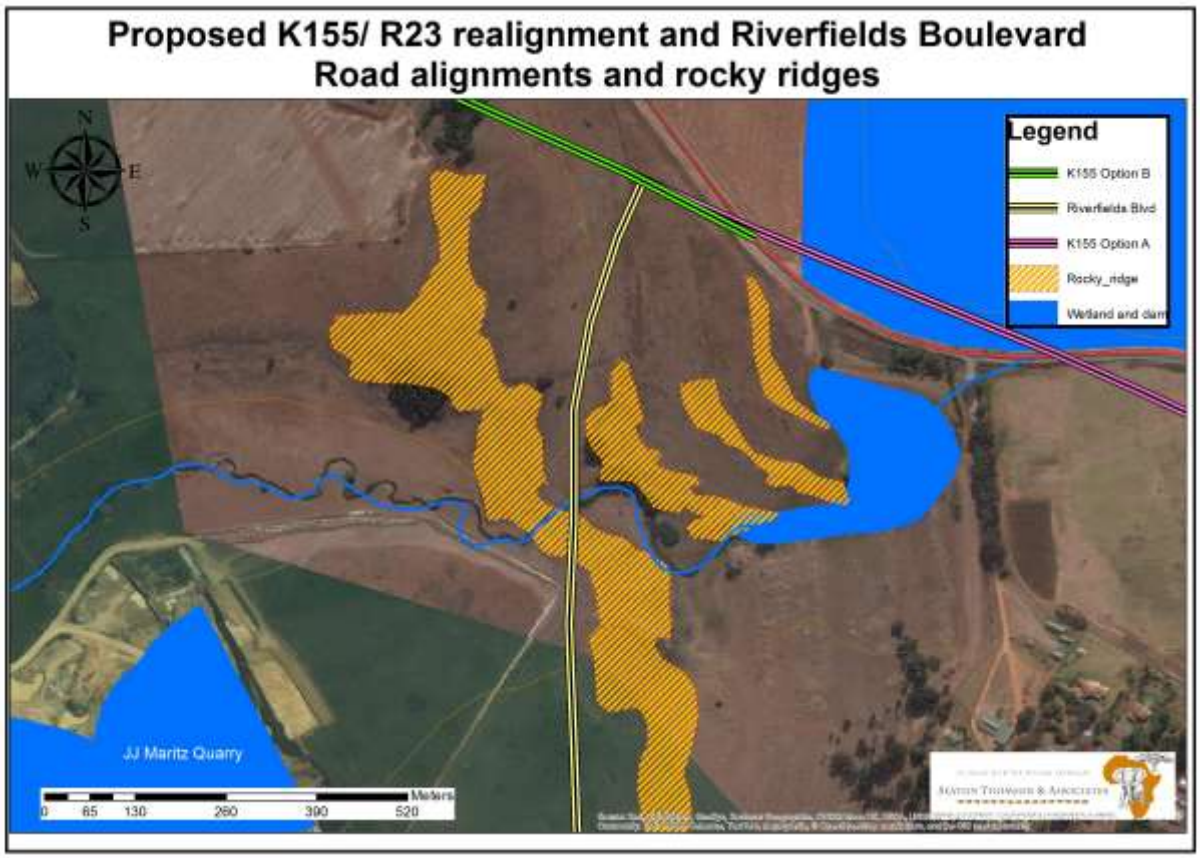

Figure 8-17: Rocky ridges and road alignments

Management and Mitigation actions:
The road alignment servitude must be fenced off before any construction commences on the site, and all works, temporary construction roads and construction workers are no to stray into the rocky ridge areas.

8.3.8 Proximity of road alignments to the JJ Maritz quarry

The JJ Maritz quarry lies to west of the proposed roads.

Riverfields Blvd traverses the very eastern tip of the quarry, as can be seen in Figure 8-18 below.

Riverfields Boulevard may encroach very slightly into this area when being built. This will be addressed specifically with JJ Maritz at detailed design phase before construction commences. There is no major environmental impact of this, as this will be an agreement regarding detailed design between the engineers and JJ Maritz. As there is no major blasting that takes place within the quarry, it is not deemed a significant problem to the road alignments.

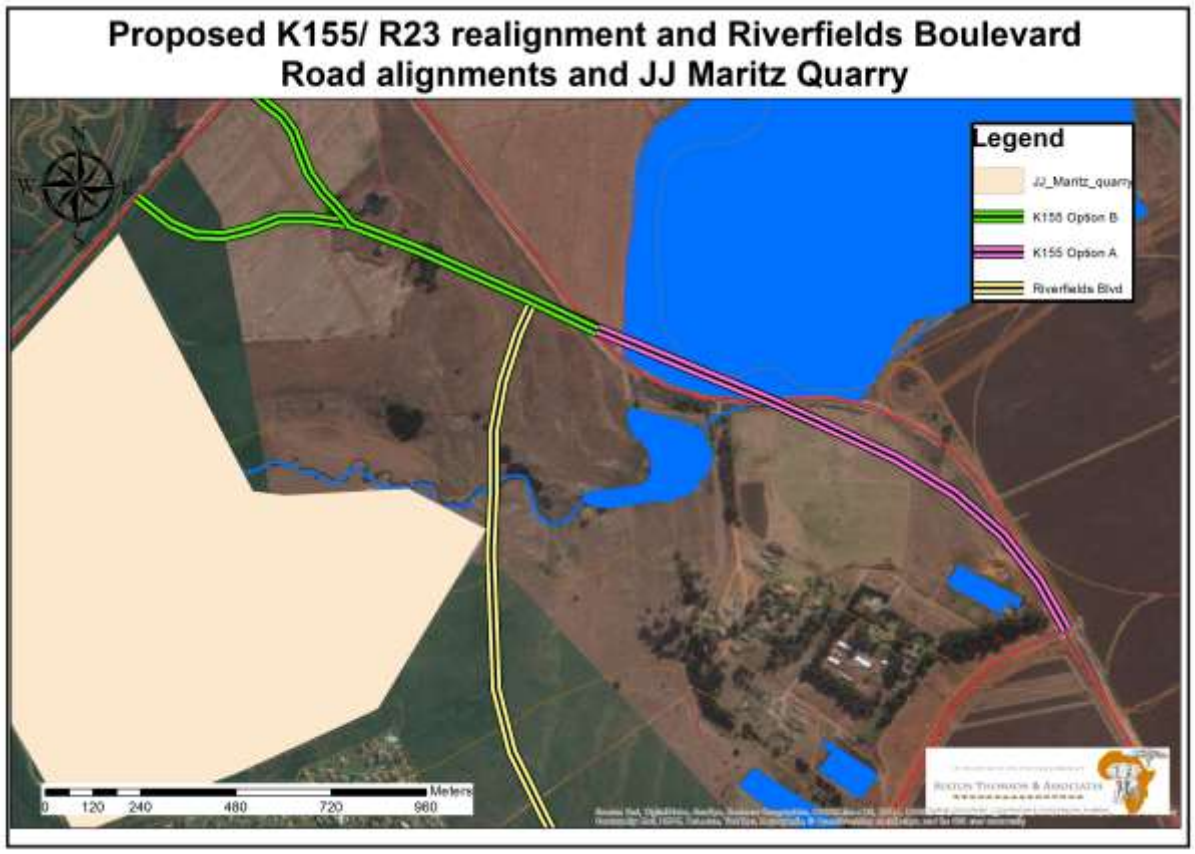

Figure 8-18: JJ Maritz quarry and road alignments

8.3.9 Agricultural soils

The R23 alignment does cross a small area of high Agricultural Potential soils on the western section. This can be seen in Figure 8-19 below. The “Option A” alternative of re-aligning the R23 would also mean that a section of high agricultural potential spoils is crossed on the south-eastern section of the alignment. The quartzite rocky ridges and wetland areas are however low agricultural potential.

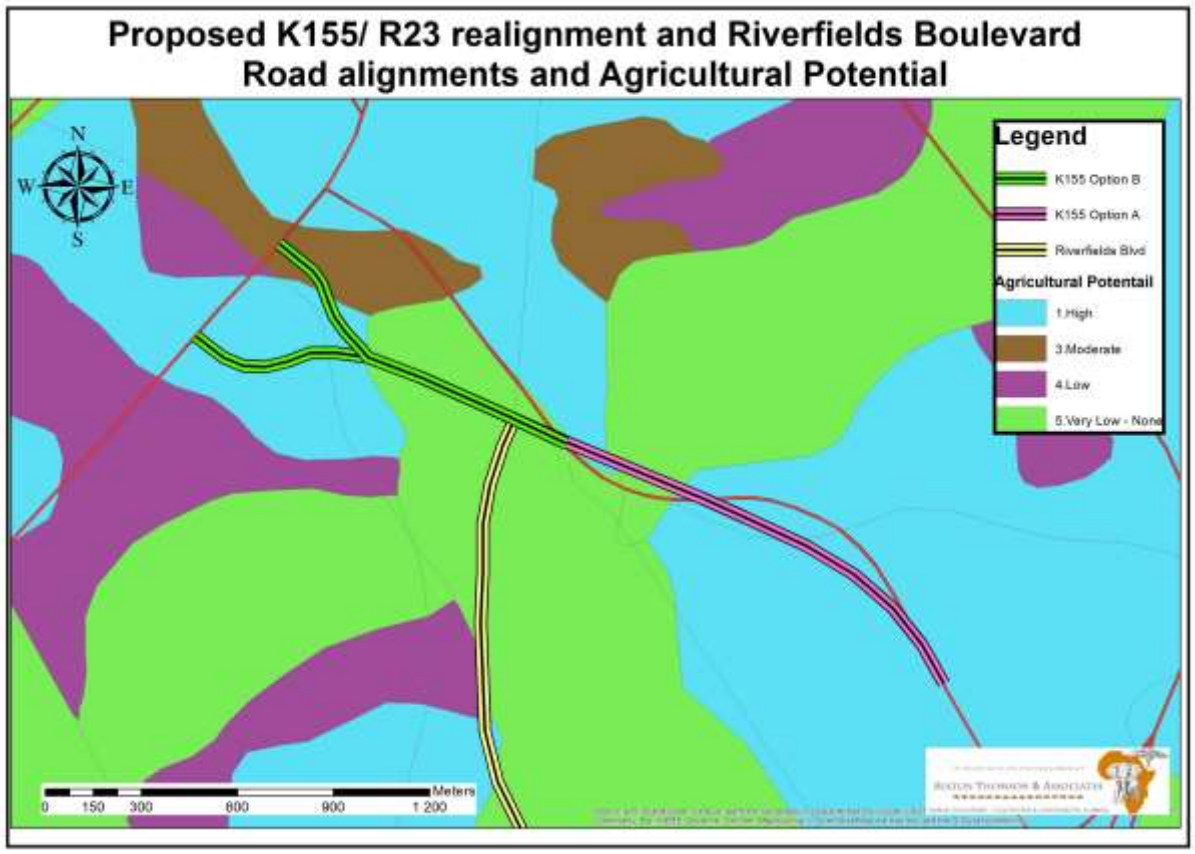

Figure 8-19: Road alignments and agricultural potential

The following is taken from EMM EMF 2007: The Gauteng policy on the protection of high potential agricultural land (2006) defines high potential agricultural land as *"Having the soil and terrain quality, growing season and available moisture supply needed to produce sustained high yields of crops economically when treated and managed according to best possible farming practices".*

Applying this definition, a land capability mapping study was completed during 2006 for Gauteng Province with the objective to identify and protect areas of high agricultural potential. The result of this study was subsequently classified and grouped into the following 5 classes:

- ***Agricultural hubs:*** High potential agricultural land that resides outside the urban edge. Seven hubs have been identified in the Gauteng Province.
- ***Important agricultural sites:*** All land identified as high agricultural potential land and located outside the urban edge but not within an identified Agricultural hub. A complete agricultural specialist study is required for any proposed development on these areas.
- ***Incorporated within the urban edge 3 :*** All land identified and classified as high potential agricultural land but incorporated completely within the boundaries of the urban edge will not be regarded as viable land for future agricultural development.
- ***Overlapping the urban edge[3]:*** High potential agricultural land that is located in close proximity and / or overlapping the urban edge boundary is regarded as agricultural land that could be utilized for agricultural production purposes. A complete agricultural specialist study is required for any proposed development on these areas.

- ***Protected area:*** High potential agricultural land within protected areas will not be used for agricultural purposes.

The high potential agricultural land in Ekurhuleni is depicted in Figure 5-2: High potential Agricultural Land and Agricultural Hub. Only one *agricultural hub* as defined by GDARD, occurs in Ekurhuleni in the Bapsfontein area. Several important agricultural areas are scattered across Ekurhuleni and are also indicated in Figure 5-2.

Furthermore, Figure 8-20 below (taken from the EMM EMF of 2007) shows the development constraints within the Ekurhuleni Area. "Agriculture" has not been considered as a "development constraint" by the EMF for the site in question.

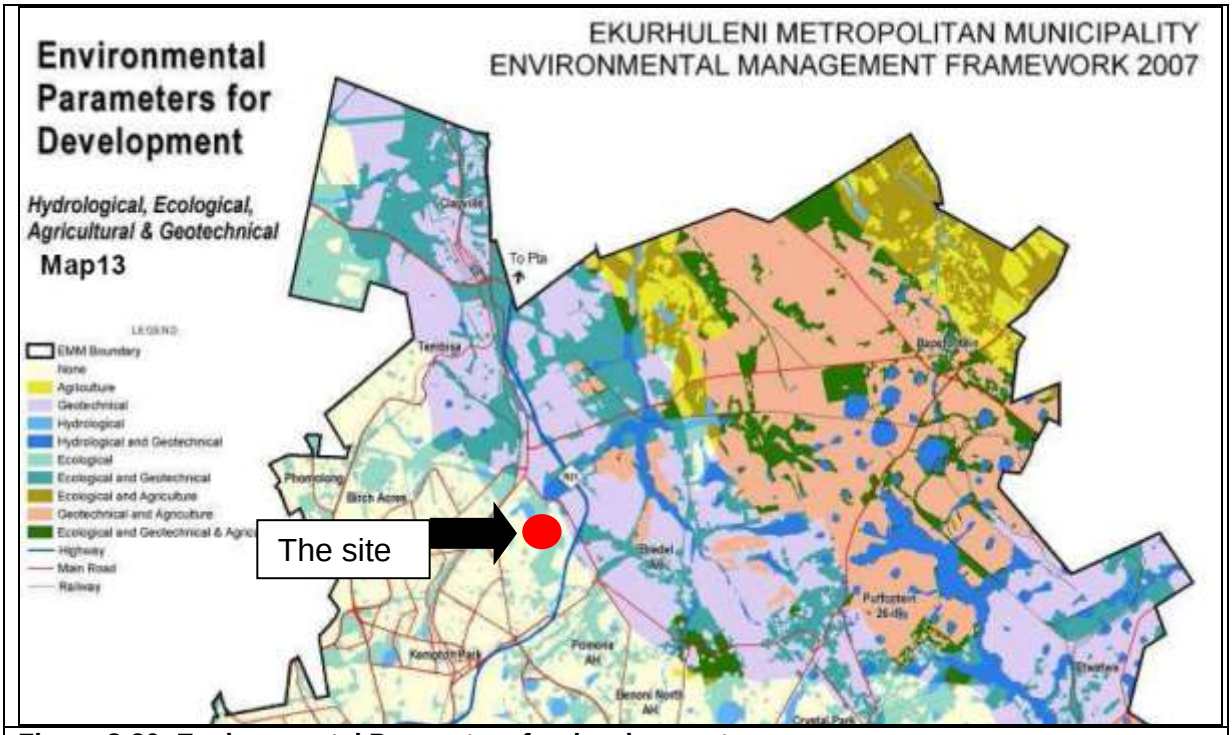

Figure 8-20: Environmental Parameters for development

The site is well within the urban edge, far from the Agricultural Hub and all high potential agricultural land within the urban edge has been discarded.

The EMF fully supports development within this R21 Corridor area, and supports all council plans for integrated and mixed development within this area. The EMF further confirms that: *"All land identified and classified as high potential agricultural land but incorporated completely within the boundaries of the urban edge will not be regarded as viable land for future agricultural development*." Therefore, these roads are within the Urban Edge, it is supported for development, despite the fact that there is an area of high potential agricultural soils.

Furthermore, the following is noted from the EMF: "*As part of the negotiations between GDACE (Now GDARD) and the EMM during the compilation of the EMF and the determination of the Urban Development Boundary, it was agreed that the*

agricultural potential within the R21 Corridor area will not be solely used as the basis for granting negative RODs for development proposals"

8.3.10 Traffic

The planning of the Riverfields road network is being done by means of **extensive transportation modelling** and traffic simulation. The Traffic Report undertaken for this area should therefore be considered within the context of the transportation planning that is being done for the whole area. It is impossible to take into consideration only the actual roads which are part of this application, as there are developments proposed for the entire Witfontein Farm (i.e. overall Riverfields Development), and as such the Traffic Assessment has taken this into consideration. Please see Appendix 3: Riverfields traffic Impact Report – July 2013

Access to the Riverfields Development Area from the existing national freeway (i.e. the R21 Freeway) is obtained via Road P68-1 (Planned K155) at the Benoni Interchange and via Road P91-2 (Planned K60) at the Bapsfontein Interchange.

The construction of one additional interchange is recommended, as well as several underpasses / overpasses of the R21 Freeway. It is important to link the land uses and development on both sides of the R21 Freeway by means of routes that do not interchange with the R21 Freeway to prevent congestion at the interchanges.

The Riverfields Road Master Plan is a dynamic plan that is developed in collaboration with the various Road Authorities in the area, namely the EMM, GAUTRANS, and SANRAL. Forward road planning is essential to ensure that the required road reserves are obtained and protected to serve the planned development in the area, as well as the necessary regional and national traffic that transverses the study area. The Road Master Plan is based on the land use framework for the area, and takes into account all the environmentally sensitive areas such as wetlands, ridges, and features of historical significance.

A part of Riverfields Blvd is already built on an area that has environmental authorization, and this would be an extension to the existing road. The R23 already exists, and upgrades and minor realignment is necessary for the proposed future uses in the area that will result in increased traffic throughout the entire Riverfields area.

The planning of the road network is being done by means of extensive transportation modelling and traffic simulation by using state-of-the-art transportation models such as VISSUM, VISSIM, and VISTRO.

Figure 8-21: Riverfields Roads master plan

From the impact prediction table below, it is evident that there would be a low impact on the traffic of the area during construction. This impact is unavoidable, but also well mitigated by the upgrading and building of new roads and will have a positive impact on traffic flow during the operational phase.

Aspect	Traffic						
Impact	Impact of traffic on and immediately surrounding the site during construction of the R23 and Riverfields Blvd						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	2	3	3	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							12
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Long term management and mitigation actions for Riverfields Traffic:

This Road Master Plan includes the improvement and construction of the following major roads in lieu of the payment of bulk contributions for major development within the Riverfields area:

- Construction/ extension of Riverfields Boulevard;
- Construction/ extension of Mulder Road;
- Construction of the 2nd carriageway of Monument Road from Braambos Avenue in the south to Benoni Road (P68-1) in the north;
- Construction of Dann Road from Pretoria Road (P38-1) in the west to Veld Street in the east;
- Construction of Veld Street from Glen Erasmia Boulevard in the south to Riverfields Boulevard in the north;
- The widening or re-alignment of the R23.

8.3.11 Noise

Noise during any construction will have a negative impact on the surrounding areas, particularly the neighbouring Glen Erasmia Boulevard residential area. Currently, ambient noise levels in the area are primarily from traffic noise on the R23, Monument Road, the R21 and overhead aeroplanes (due to the proximity to the airport).

The impact prediction table below shows that the noise impact will be moderate during construction, especially as the main Riverfields Boulevard alignment is 250m at its closest to Glen Erasmia Boulevard.

Aspect	Noise						
Impact	Increase in ambient noise levels during construction (particularly of Riverfields Blvd)						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	3	3	2	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							22,5
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:

Noise will predominantly be created on weekdays, between 7am and 5pm. Always keep residents of the area surrounding the site informed of unusually noisy activities (i.e. blasting). Noise suppression measures can be applied to all equipment.

Equipment must be kept in good working order, and where appropriate fitted with silencers which are to be kept in good working order.

8.3.12 Visual and aesthetic

The building of roads does not have the same negative visual impact that major development has. The area is already earmarked (and in some areas already approved) for development to take place which will have a far greater visual impact that the roads.

The Riverfields Blvd through the rocky ridges and the bridge over the Swartspruit will have a higher visual impact, but will be fairly well concealed from sight by the rocky ridges around it, as it passes through them, and not straight over the top of them.

From the impact prediction table below, it is evident that there would be a LOW negative impact on the visual and aesthetic quality of the area.

Aspect	Visual and aesthetic						
Impact	Decrease in aesthetic appeal of the area, and increase in visual obtrusiveness						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	3	2	3	2	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							15
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:

No actions proposed during construction.

8.3.13 Crime

It has been determined that during the construction phase, the potential increase in crime will be low to medium. The influx of more people to the area as informal construction job seekers, and formal workers does have a potential increase in risk of crime to surrounding areas, due to the increased number of people.

Aspect	Crime						
Impact	Increase in crime levels surrounding the site						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	4	3	4	3	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							28.8
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:

Contractors are to provide for 24 hour security on and around the road building laydown camps, during all phases of the road building project. The developer is also

responsible to control access to the site camps and laydown yards and guard these areas to reduce crime.

The relevant policing and security forces that are responsible for the area must be approached and become involved in the monitoring of activities on and around the road construction area.

Fence off and screen (using shade cloth or similar) the construction site camps and laydown areas, and to keep construction personnel and equipment within these areas. The height of the fence and shade cloth should not be less than 2.5m from ground level. There should be 24 hour security at the construction camp/ laydown yard to control all access.

8.3.14 Location of laydown areas and road construction site camps

The location of the any laydown areas and site camps for the proposed road construction should be already impacted land, and preferably on agricultural lands and no on grassland areas. All site camps and laydown yards should be at least 100m from any of the wetlands, dams or rivers.

The proposed location of site camps are shown in Figure 8-22: Proposed locations for site camps below. This is not to say that these are the exact locations of the site camps, but they are suggested. The final location of site camps must be finalised in conjunction with the Environmental Compliance Officer, to make sure that there is minimal impact and distance maintained between the camps and sensitive areas.

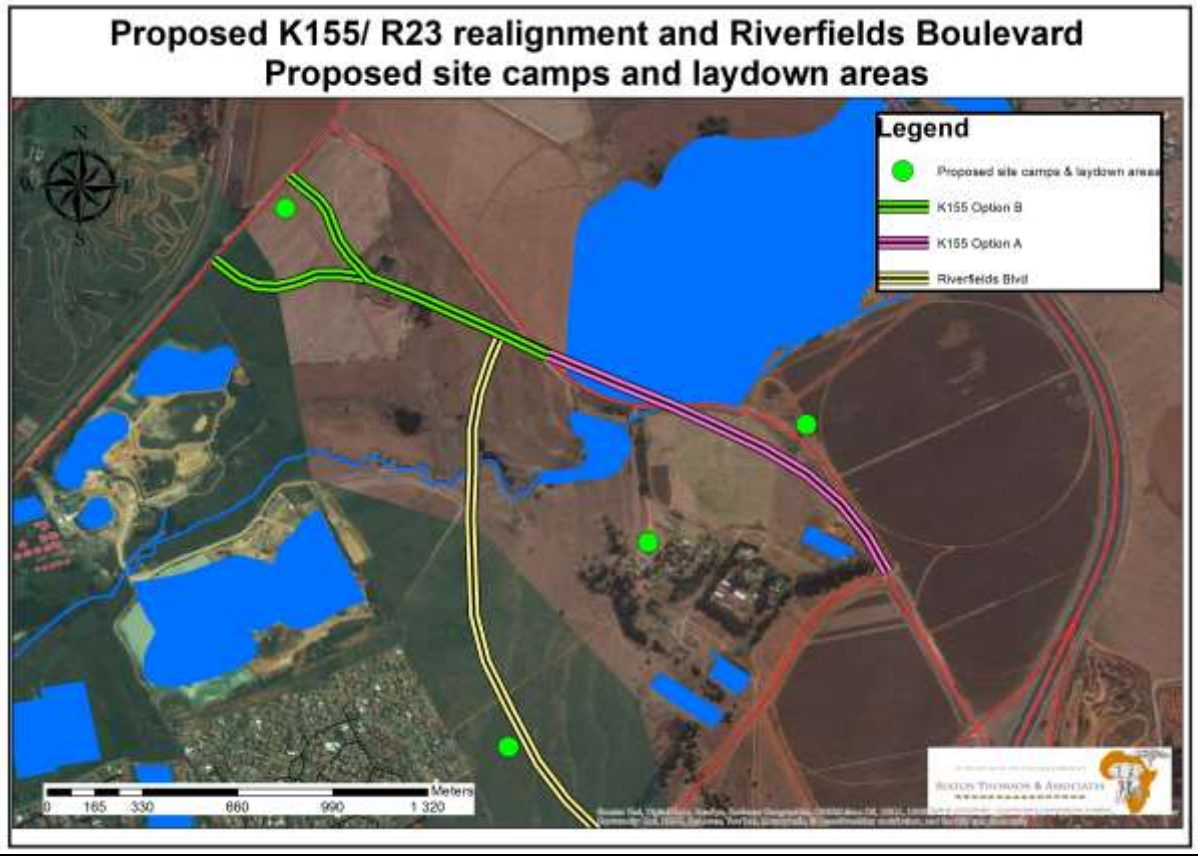

Figure 8-22: Proposed locations for site camps

8.3.15 Job creation and socio-economics (Positive impact)

There is no doubt that the over construction and development of the entire Riverfields area will create both formal and informal construction related jobs. Informal hawkers/vendors selling food and drink will also benefit from the construction workers in the area. A full economic assessment of the entire Riverfields Development has been undertaken and is contained in Appendix 10: Demacon Economic impact assessment.

The following is taken from the Demacon report: "*It can therefore be concluded that the proposed Riverfields mixed use development is bound to have a positive and far-reaching economic impact on the local, regional, metropolitan and provincial economies, including previously disadvantaged communities such as Tembisa.*

It would however be important to maximise the potential economic benefits to second economy areas by means of, inter alia, increasing linkages and reducing leakages in the local economy, skills development programmes, preferential procurement, local labour promotion, etc.

The assessment of the potential impacts in the municipal area shows that there are a number of opportunities, which over the medium to long term, can bring about growth and development in the area / local economy. The pace of this development will, however, be reliant on external intervention and the development could bring further investment to the area."

The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The EMF also encourages development with this area. All of these factors and polices point to the fact that development within this R21 corridor is indeed desirable.

It has been determined that the positive impact that it would have on job creation in the greater Kempton Park/ Tembisa area would be moderate (bordering on high). The construction of roads as is proposed in this assessment will assist with the growth of the area, as transport infrastructure is need for areas to grow and develop.

Aspect	Socio-Economics						
Impact	Positive impact: Job creation during construction (informal jobs)						
	Criteria Scoring						
	Nature (N)	**Extent (E)**	**Duration (D)**	**Intensity (I)**	**Probability (P)**	**Mitigation /Enhancement (M/H)**	**Reversibility (R)**
Positive Impact	-0.25	3	4	3	3	3	
Negative Impact							
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							
Impact Significance for Positive Impact = N x (E+D) x I x P x H							**-47.25**

However, all informal hawkers/ vendors that may set up stalls must be restricted to a permitted and prescribed area on boundary of the laydown areas or site camps.

Aspect	Socio-Economics						
Impact	Positive impact: Job creation during construction (formal jobs)						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0.25	3	4	4	3	2	
Negative Impact							
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							
Impact Significance for Positive Impact = N x (E+D) x I x P x H							-42

It has been determined that during construction, the impact of the construction works on the social or economic activities of the existing residential areas of Kempton Park and Tembisa will be negligible. The construction works are some distance from these areas, and any impact that may be realised is very difficult to actually quantify.

Additional actions to enhance the positive socio-economic impact are as follows:

- Utilise Local Market - The labour force should largely be recruited from the local communities, where ever possible, including skilled and semi-skilled positions. The Contractors must indicate that recruitment will take place through formal procurement procedures, which will be implemented in conjunction with the local community.
- Training and Education - In order to facilitate training and education, it is recommended that the contractors, where possible, recruits its Employees from previously disadvantaged groups and from low income areas such as Tembisa, and not only will they fill certain posts, but for those posts that they are inexperienced in, a mentorship process should be initiated.
- Labour intensive construction methods - Where appropriate, labour intensive construction methods should be utilised to maximise the potential number of employment opportunities whilst mitigating impact on site of machinery

A detailed Economic Impact Assessment was done in October 2013, and is contained in Appendix 10: Demacon Economic impact assessment.

8.4 Impact Assessment – operational phase

8.4.1 Traffic

This application involves the construction and widening of roads. This is necessary specifically due to the fact that the entire Riverfields areas is becoming increasingly built up and more and more traffic using the existing roads in the area. A new regional shopping centre is also planned, which will increase traffic considerably.

Once the roads as described in this report are built and widened, the impact on general traffic patterns in the area will be very POSITIVE.

Aspect	Traffic						
Impact	Positive impact: Roads are a contribution to infrustructure and contribute to better traffic circulation in the general area						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0,25	3	5	3	4	2	
Negative Impact							
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							
Impact Significance for Positive Impact = N x (E+D) x I x P x H							-48

Management and mitigation actions:

Riverfields Boulevard should be built on its proposed alignment, taking into account all environmental features in and arounds its alignment.

The R23 should be widened over the Swartspruit alongside its existing alignment, and then follow the new alignment towards Pretoria road across the agricultural lands to the south of the current alignment.

Both roads should cater for 2 lanes of traffic in both directions, to allow for future traffic volumes due to be accommodated.

8.4.2 Flora

Most impacts on flora of the on the alignment and immediate surrounds will be during the construction phase when most of the land clearing will take place along the actual road alignments. The actual impact on flora during the operational phase is considered to be LOW, as once built, the roads will have no further impact on flora. The alignment of the R23 towards Pretoria Road passes through agricultural fields, and has no impact on natural vegetation.

Aspect	Flora						
Impact	Impact on flora along the fringes of the new roads						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	5	2	2	2	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							14
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:

All road verges and batter slopes must be hydroseeded with an indigenous grass mix to rehabilitate any scars left by the construction phase on the natural vegetation along the fringes of the roads.

8.4.3 Fauna

As with flora, most impacts on fauna of the site and immediate surrounds will be during the construction phase when most of the land clearing and disturbance to fauna will occur. The R23 bridge over the Swartspruit will be a culvert bridge (as per the existing bridge), all fauna will still be able to pass underneath the bridge, or cross the road between east and west.

The Riverfields Boulevard bridge is proposed to be a span bridge. The span has been determined to be 60 meters, with the two central pillars 24 meters apart and then a distance of 18 meters between them and the end supports, which will tie into a soil filled road surface. Due to this wide span, there will be a large area underneath the bridge for free movement of wildlife.

Currently, wildlife has to cross the R23 road in its current position, or use the culverts underneath the road to cross. This crossing area will be wider, but "operational phase" impact to fauna will remain as per status quo.

Aspect	Fauna						
Impact	Impact on fauna once the roads are built/ widened and traffic is using them						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	5	2	3	2	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							16,8
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
Speed limiting controls along all roads to reduce the possibility of road-kills.

8.4.4 Swartspruit watercourse systems

Once built and operational, the impact to the watercourse systems will return to the current status quo. This system is in a relatively healthy condition, and the large natural wetland east of the R23 must be preserved.

The actual impact on the wetland and watercourse system during the "operational phase" of the road is considered to be LOW. Impacts associated with stormwater runoff from the road surfaces will be the only tangible impact on the watercourses, but this can be adequately mitigated by using adequate engineered stormwater control structures in the form of curb inlets as well as gabion and reno-mattress outlet structures (were necessary).

Aspect	Swartspruit River system						
Impact	Impact on hydrologyand river system functioning						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	5	2	3	3	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							14
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
Implement engineered stormwater control structures in the form of curb inlets as well as gabion and reno-mattress outlet structures (were necessary).

8.4.5 Noise

There is already a fair amount of general ambient noise levels within the Riverfields development area due to the R21 highway, the R23, the proximity to OR Tambo International Airport, and the JJ Maritz quarrying operations. As this application involves roads which are proposed to carry traffic, the addition to noise is deemed to be negligible.

Aspect	Noise						
Impact	Increase in noise levels in the general surrounding area by increased traffic						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	5	1	2	3	1
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							7
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
There are very few management and mitigation measures that can be put in place to curb increased noise levels in the surrounds. Speed limits and other traffic calming measures should be put in place to limit speed, which in turn will limit noise.

8.4.6 Visual and aesthetic

There will be no doubt be a change in the visual character of the area with new roads that will traverse areas previously undeveloped. More specifically the new Riverfields Blvd road and bridge.

The Riverfields Blvd through the rocky ridges and the bridge over the Swartspruit will have a higher visual impact, but will be fairly well concealed from sight by the rocky ridges around it, as it passes through them, and not straight over the top of them.

Aspect	Visual and aesthetic						
Impact	Decrease in aesthetic appeal of the area, and increase in visual obtrusiveness by the new roads, especially Riverfields BLvd						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact							
Negative Impact	1	2	5	1	2	3	1
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							7
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							

Management and mitigation actions:
None proposed for the operational phase.

8.4.7 Socio-economics (positive)

The socio-economic impact of the entire Riverfields development needs to be taken in to account, as it is very difficult to quantify in this specific case the positive socio-economic impact that new roads and road links will have. However, if these roads are not built, then prime developable land, much of which already has approvals for development, will not be able to realise development as roads infrastructure in the general area cannot cater for this expansion at their current capacities.

The entire Riverfields development area needs to be considered when discussing the socio-economic viability of the particular road construction and widening, therefore, a discussion is included below.

During the operational phase of the Riverfields development, the impacts on socio-economics are positive. There will be in increase in job creation amount all sectors and income levels. Domestic jobs, as well as municipal management jobs etc… will be created by the new mixed use development on the greater property. There will be additional ancillary services and infrastructure provided by the development, which will in the longer term have positive spin off for both formal and informal job creation.

The following is taken from the Demacon report: "*It can therefore be concluded that the proposed Riverfields mixed use development is bound to have a positive and far-reaching economic impact on the local, regional, metropolitan and provincial economies, including previously disadvantaged communities such as Tembisa.*

It would however be important to maximise the potential economic benefits to second economy areas by means of, inter alia, increasing linkages and reducing leakages in the local economy, skills development programmes, preferential procurement, local labour promotion, etc.

The assessment of the potential impacts in the municipal area shows that there are a number of opportunities, which over the medium to long term, can bring about growth and development in the area / local economy. The pace of this development will, however, be reliant on external intervention and the development could bring further investment to the area."

Aspect	Socio-Economics						
Impact	Positive impact: Job creation during operational phase (informal domestic jobs, formal qualified jobs etc…)						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0.25	3	5	4	3	2	
Negative Impact							
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							
Impact Significance for Positive Impact = N x (E+D) x I x P x H							-48

The positive impact will also contribute to increased living and lifestyle standards for many individuals and families in and around the Kempton Park area. This provision of housing, retail, shops, roads and services will have a very high positive impact on the families that will benefit from the development. There will not only be a positive impact on those families that may live in the new residential component of the development, but also have a positive impact on existing residents of the Kempton Park, Serengeti, Tembisa and Benoni areas, as there will be additional shops, offices and a variety of services available in closer proximity to their homes, and well as improved roads and transportation networks. This will mean less travel time to work, a more integrated lifestyle living environment and greater productivity.

Aspect	Socio-Economics						
Impact	Positive impact: Provision of housing, new shops, economic boost to area						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0.25	3	5	4	4	2	
Negative Impact							
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							
Impact Significance for Positive Impact = N x (E+D) x I x P x H							-64

It is clear from the impact table above that there will be an economic boost the area. In the medium to longer term, development of the area is inevitable. The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The EMF's (Ekurhuleni and Gauteng) also encourages development with this area. All of these factors and polices point to the fact that development within this R21 corridor is indeed desirable.

A detailed Economic Impact Assessment was done in October 2013, and is contained in Appendix 10: Demacon Economic impact assessment.

9. FINDINGS AND RECOMMENDATIONS

9.1 Environmental Impact Statement

Seaton Thomson and Associates have completed the Environmental impact assessment report for the proposed re-alignment of the K155 (Existing R23) over the Swartspruit, including the construction of Riverfields Boulevard and new bridge over the Swartspruit, in The Riverfields Development Area, Kempton Park, Ekurhuleni., Gauteng.

The objectives of the Environmental Impact Assessment phase are generally as follows:

- address issues that have been raised during the scoping phase;
- assess alternatives to the proposed activity in a comparative manner;
- assess all identified impacts and determine the significance of each impact; and
- Formulate workable and reasonable mitigation measures.

9.2 Key Findings of the Environmental Impact Assessment

From the assessment of all impacts, it can be concluded that there are essentially 3 main areas that are of concern; these are the proximity of the site the Swartspruit watercourse, the loss of natural grassland and the provision of services on the property. However, these particular areas have been addressed in the report, and it is believe that adequate mitigation measures have been tabled to manage and mitigate these impacts. In summary, the following can be said:

7. Vegetation assessment: much of the natural grassland vegetation on the southern extent of the Riverfields Boulevard alignment is infested with “Bankrotbos” and has been heavily overgrazed. The only grassland in a more natural condition is closer to the Swartspruit and around the rocky ridge areas through which Riverfields Boulevard and the north-western section of the proposed R23/K155 alignment passes. There are patches of wattle and blue gum trees within the rocky ridges that should be cleared. Overgrazing of the entire area has reduced the biodiversity of the natural veld grass. Wetland vegetation exists along the existing R23 road crossing the Swartspruit, but disturbance will be minimal as the road widening will be directly next to the existing road surface (where there is already edge effects), and within what was the old R23 road alignment footprint slightly north of the current alignment.
8. Faunal assessment: Although larger animals such as porcupine and jackal would frequent the area from time to time, most of the larger animals would stay away from the existing residential areas of Glen Erasmia and in all likelihood remain closer to the rocky ridges around the Swartspruit and in the Swartspruit wetland east of the R23 road. Other wild fauna are more likely to be prevalent along the river corridors, moving between feeding areas along this green space, or seeking other habitat. The partial re-alignment and widening of the R23 (Option B alternative) will have less of an impact on

Fauna than the full realignment (Option A alternative). Riverfields Boulevard alignment and bridge over the Swartspruit will be built as a span bridge over the river, and as such this will also provide open space below the bridge for the movement of fauna up and down the Swartspruit, thereby not cutting them off from free movement or severe habitat fragmentation.

9. Heritage/ archaeology impact assessment: Of the 13 sites identified in the greater Witfontein area, and more specifically within the rocky ridge area, only site 10, 11 and 13 are on or right next to the alignment of Riverfields Boulevard and the north-western extension of the R23 realignment. Due to this, only these sites have been discussed in this section of the EIA report. Sites 10, 11 and 13 have all be given a LOW significance rating, with the more significant sites within the general area having higher significance, but will not be impacted by the proposed road alignments.
10. Socio-economic impact assessment: The proposed Riverfields mixed use development is bound to have a positive and far-reaching economic impact on the local, regional, metropolitan and provincial economies, including previously disadvantaged communities such as Tembisa. It would however be important to maximise the potential economic benefits to second economy areas by means of, inter alia, increasing linkages and reducing leakages in the local economy, skills development programmes, preferential procurement, local labour promotion, etc. The upgrade, widening and building of new roads within this area is critical for the development of the area in the longer run and to link main arterial routes between residential, commercial and office park areas.
11. Riverfields Boulevard Bridge over the Swartspruit and impact to watercourse: A span bridge with 2 central support pillars has been considered as the preferred alternative for the Riverfields Boulevard Bridge. The Swartspruit cuts a deep profile through the rocky quartzite ridges in the area where the bridge is proposed to cross, with an elevation change of upward of 11 meters in some cases. It is for this reason that a span bridge has been assessed. The span has been determined to be 60 meters, with the two central pillars 24 meters apart and then a distance of 18 meters between them and the end supports, which will tie into a soil filled road surface. This design is seen to be the most environmentally sensitive design.
12. R23 widening along the current alignment over the Swartspruit and impact on watercourse and wetlands: Two alternatives were assessed for this crossing point, and the Option B alternative was determined to be the preferred alternative from an environmental and economic perspective. Environmentally, widening an existing alignment keeps impact areas contained, rather than a full realignment, which would encroach deeper into the more sensitive wetland areas and grass owl habitat north of the existing alignment. Adding culverts on one side to the existing culverts will mean work can be undertaken from the existing bridge, and no additional damage will be done to more sensitive areas. This widening will also be within what was the old R23 road footprint alignment slightly north of the current alignment, which can still be seen on the ground. This means that already impacted and disturbed areas will be used for the widening.

Physical

The development of Riverfields Blvd and bridge will undoubtedly result in a complete physical change to the land over which it passes. These roads are necessary as part of the overall larger development of the Riverfields area, and as part of the larger Riverfields Development traffic and urban design master plan. The development of the roads will result in physical change to the land, although there are limited environmental issues of significance, as the impacts can be adequately mitigated.

The overall Riverfields development, to which these roads will link and form part of, will result in a major contribution to middle to high income housing, office space, various shops and amenities and commercial warehousing, as well as services in the area. The Riverfields area will also have a large retail component (shopping centre), which will provide for many jobs, which will need to be serviced by quality road and transportation infrastructure.

Biophysical Environment

Over the years, the Riverfields development area has completely transformed from its original state, where it would have been predominantly natural Highveld grasslands. Grasslands have given way to intensive agricultural activities, quarrying, service installations such as roads, sewers and electrical lines.

The Riverfields Blvd bridge crosses the Swartspruit at a very narrow point, and has been designed to traverse around large parts of the rocky ridge areas, so as to limit the direct impact on these areas.

The widening of the R23 over the Swartspruit (which is the preferred alternative), will have a far lower impact on the wetland and hydrological system than a full realignment over the river.

There are a few small sites of cultural and archaeological significance within the rocky ridge areas, and these have been taken into account for the road alignment. Only 3 of the 13 sites will be effected, and all 3 of these sites have been deemed to have low significance.

If all mitigation measures are put in place and strictly controlled by an Environment Compliance Officer, the proposals as tabled would not contribute to the loss of any conservation worthy or sensitive areas at all, as the rocky ridges and Swartspruit system will be protected by the mitigation measures and engineering design plans.

The final site sensitivity plan is indicated in Figure 9-1: Final site sensitivity plan below.

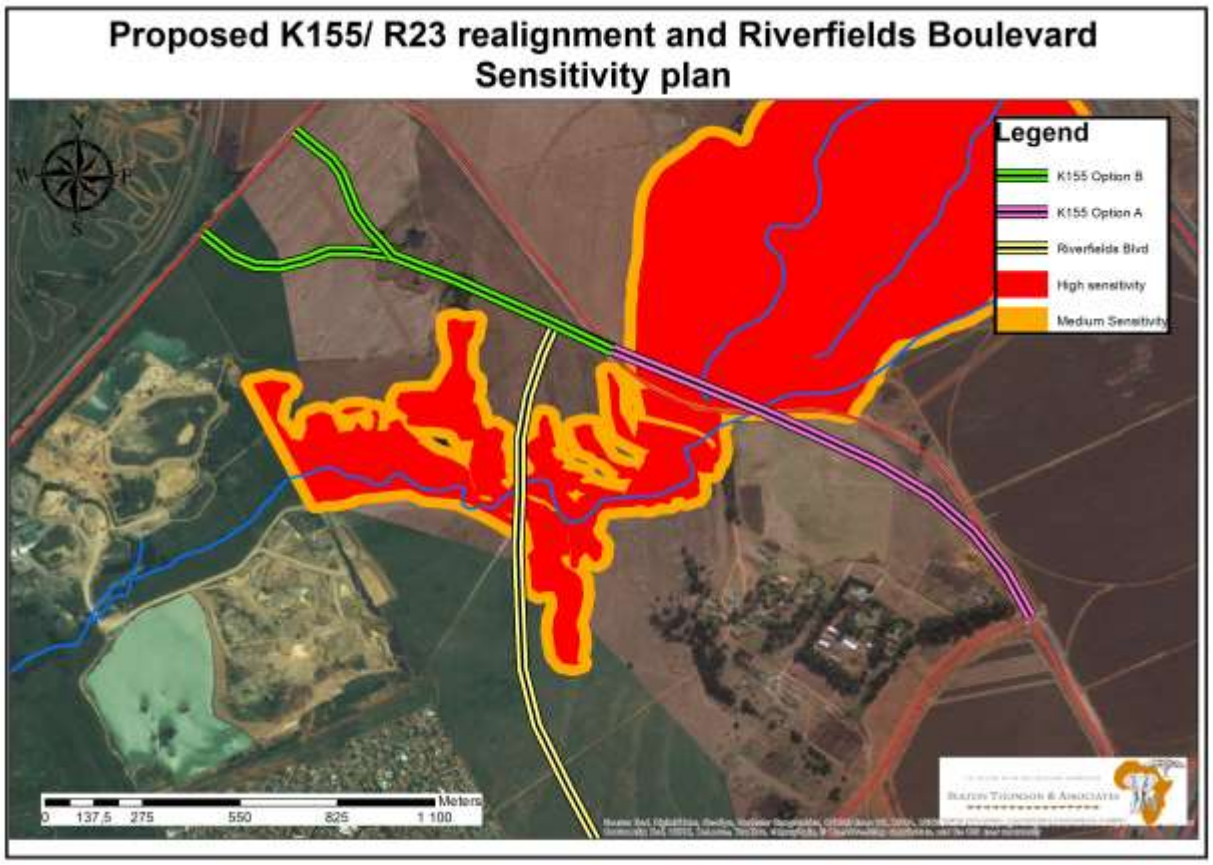

Figure 9-1: Final site sensitivity plan

Socio Economic Issues

The socio-economic impact of the entire Riverfields development needs to be taken in to account, as it is very difficult to quantify in this specific case the positive socio-economic impact that new roads and road links will have.

The activities of development and road construction will result in a change to the social and economic conditions of the general area, as it will create a positive, but significant economic and social investment in the area in terms of a significant number of new homes for the community, with offices, close by warehouse and shopping facilities will also provide many additional jobs and employment opportunities for the residential market, with a quality road and transportation network infrastructure. The development of the area will also assist in upgrading expanding of the infrastructural services in the area.

The development of this area is inevitable, as it is located in a prime spot along the R23 and R21 roads, both of which are major north-south arterial roads. The area is within the identified Albertina Sisulu development corridor along the R21 highway, and is identified in terms of the Ekurhuleni SDF as a development corridor. The overall Riverfields development will provide for shopping centres, offices, and residential, with associated infrastructure and roads, will contribute to positive, but significant economic and social investment in the area. This will be in respect of a major capital investment, as well as the creation homes and land ownership. The road building and widening project will also create many jobs during the construction

period. This has important downstream implications for overall standards of living in the area.

The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The Ekurhuleni and Gauteng EMF documents also encourages development with this area. All of these factors and polices point to the fact that development and infrastructure upgrades within this R21 corridor is indeed desirable.

Furthermore, the development has the potential to provide a significant number of new jobs, skills and training opportunities both during the construction and operational phases of the entire Riverfields development.

9.2.1 Comparative Assessment: Positive & Negative Implications of Activity

Positive Implications

There are numerous positive implications associated with the activity of building and upgrading roads, which include primarily the fact that there will be a major physical and economic investment into the area by stimulating growth and enhancing opportunities for business to develop around quality roads and transportation infrastructure. The overall Riverfields project will assist with the proposed provision of a number of new medium to high income residential homes, community amenities, office complexes, open spaces and bulk infrastructure and services in the overall development area.

Associated with the overall Riverfields development and road infrastructure upgrades, is the creation of significant employment opportunities during both the construction and operational phases. This has highly positive and beneficial social and economic implications to this area. There will be creation of jobs, both during the construction period of the roads, as well as numerous permanent, long term jobs for those employed in activities adjoining the roads, for example residential and office park establishments that are proposed.

There cannot be development of homes, offices, warehouses and retail facilities without the upgrading of roads and services. A full masterplan of the Riverfields area and road infrastructure network has been provided in this report, and it is for this reason that the development of roads is critical.

Negative Implications

There are few major negative implications associated with the implementation of the preferred alternative of road alignments and widening. Primarily, the new Riverfields Blvd road and bridge will result in the loss of a strip of grassland and potential edge effects within the rocky ridge areas. Only 2 low significance archaeological sites will be destroyed by Riverfields Blvd, and 1 other site by the realignment of the R23 west of the Swartspruit. The widening of the R23 over the Swartspruit along its current alignment will have far fewer impacts on the wetland, grass owl habitat, fauna and

flora than a full realignment of this section. The roads will result in a very slight the loss of aesthetic and visual nature of the area, but this of low significance.

Furthermore, there are potential negative implications associated with increased use of resources, an increase in traffic generation due to the new roads and people flocking into the area for both work and living purposes. The activities will also result in a change in the nature, function and visual appearance of the entire area, as it will improve traffic connectivity and assist with the growth of the area.

There are also anticipated impacts of increased crime and security issues, pollution, dust, noise and nuisance associated with the upgrading and development of roads, particularly during the construction period when there are a large number of contractors in the area. This will have implications on existing adjoining residents, but can be managed and mitigated accordingly.

Cumulative impacts and impact summary

The investigations and assessments undertaken during the Scoping and Environmental impact assessment phases have revealed that the only sensitive features on the site, from a physical environmental point of view, are the rocky ridges, and the Swartspruit system, as well as the few cultural/ archaeological sites identified by the Heritage specialist. The impacts to all of these (both the social impact regarding the heritage sites and the physical impact regarding the rocky ridges and wetland/ river area) can be adequately mitigated by imposing strict controls and engineering design.

The activities proposed in the overall Riverfields Development area (residential, retail, and offices/ businesses) have to be taken into consideration when assessing these road projects, as they are directly linked. The Riverfields Development will have an impact on the area as a whole in terms of the changed functioning of the area, use of the site, visual nature of the area and on the social and economic conditions of the area. This must be considered positive in view of the significant economic investment and the social benefits to the communities in the area, as new homes, office working environments and services are to be provided, including the provision of quality road and infrastructure. Additionally, the project has benefits in terms of the provision of job and work opportunities on both the formal and informal sector.

Potential negative impacts can also be expected primarily during the construction phases; however, these impacts can be mitigated to acceptable levels so that there is no continued environmental degradation along the road alignments and within a regional context.

The cumulative impact table below (for the construction phase) clearly shows that during construction, the negative impacts do outweigh the positive impacts. This cumulative impact table has been provide for the Option A alternative, which is the full realignment of the R23 over the Swartspruit all the way to Pretoria Road, and the construction of Riverfields Blvd road and bridge. It is clear that the impact of the full realignment is high, and that the overall cumulative impact during construction is thus NEGATIVE to the environment.

Aspect	CUMULATIVE IMPACT of entire construction phase of activity						
Impact	Cumulative impact of construction phase of the project (for Option A full re-alignment of the R23 over the Swartspruit)						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0,25	3	4	3	3	3	
Negative Impact	1	2	3	5	5	2	2
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							62,5
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							-47,25

The cumulative impact table below (for the construction phase) clearly shows that during construction, the negative impacts are almost equal to the positive impacts. This cumulative impact table has been provide for the Option B alternative, which is the widening of the R23 over the Swartspruit along its current alignment all the way to Pretoria Road and the construction of Riverfields Blvd road and bridge. It is clear that the impact of the widening is high, but far lower than the full realignment option. The overall cumulative impact during construction is thus NEGATIVE to the environment, but almost equal to the positive impact.

Aspect	CUMULATIVE IMPACT of entire construction phase of activity						
Impact	Cumulative impact of construction phase of the project (for Option B widening of the R23 over the Swartspruit)						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0,25	3	4	3	3	3	
Negative Impact	1	1	5	2	4	1	1
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							48
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							-47,25

The cumulative impact table below (for the operational phase) clearly shows that during the operational phase (i.e. once all construction is completed and the roads have traffic on them), the positive impacts do outweigh the negative impacts. The overall cumulative impact during operation is thus POSITIVE, from a social and economic standpoint. Negative impacts on the Swartspruit system (most directly from stormwater runoff from the roads) can be adequately mitigated by engineered designs of curb inlets and outlet structures.

Aspect	CUMULATIVE IMPACT of entire operational phase (i.e. fully established and functioning)						
Impact	Cumulative impact of operation phase of the project (I.e. township fully established and functioning)						
	Criteria Scoring						
	Nature (N)	Extent (E)	Duration (D)	Intensity (I)	Probability (P)	Mitigation /Enhancement (M/H)	Reversibility (R)
Positive Impact	-0,25	3	5	4	4	2	
Negative Impact	1	2	5	2	3	2	3
Impact Significance for Negative Impact = N x (E+D) x I x P ÷ ½(M+R)							16,8
Impact Significance for Positive Impact = N x (E+D) x I x P x (H)							-64

9.3 The Environmental Management Plan

An EMP has been prepared and is contained in Appendix 14: Environmental Management Plan**.** The plan provides detailed steps and mitigation measures to be undertaken during the planning/ design/ pre-construction, construction and

operational phases. Implementation of this EMP will ensure a high degree of environmental management of the site, whilst still achieving the social and economic objectives of the development.

9.4 Conclusions and Recommendations

Based on the findings, summary and conclusion in the report, the consultant is of the opinion that the proposed implementation of the Preferred Alternative should be undertaken. The preferred alternative is as follows:

1. Widen the R23 from Monument Road to the western side of the Swartspruit, along its current alignment
2. Realign the R23 from west of the Swartspruit in a straight alignment towards Pretoria Road intersection
3. Construction of Riverfields Blvd between Monument Road and the newly aligned R23, including the Riverfields Blvd span bridge over the Swartspruit.

The preferred alternative for which environmental authorization is applied, is annotated in the diagram below:

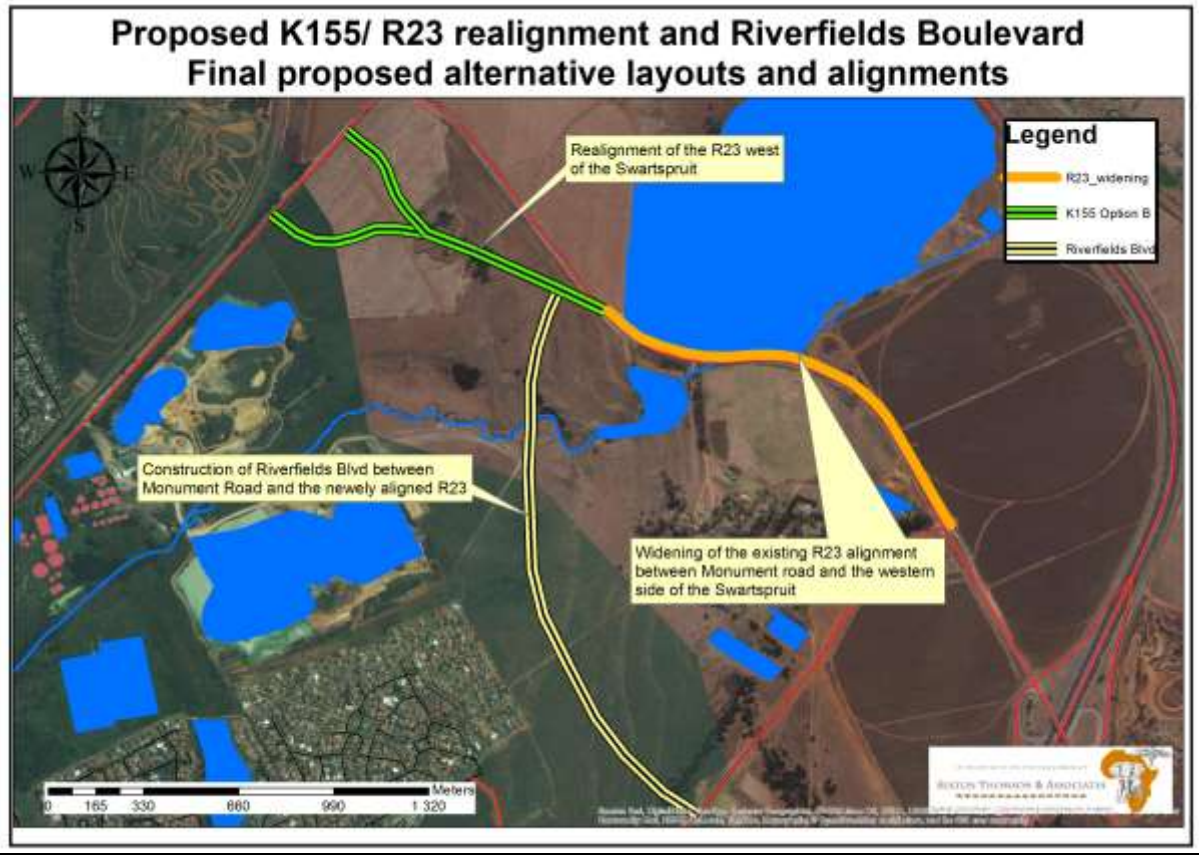

Figure 9-2: Final proposed alternative layouts and alignments

The activity of road widening and road building will not lead to substantial detrimental impacts on the environment that cannot be effectively mitigated, managed and reduced with the implementation of the EMP and that any potential impacts can be mitigated to acceptable levels that will ensure the principles of NEMA are achieved. This is conditional on the implementation of the EMP.

The development of roads will, however, contribute to substantial socio-economic benefits in respect of the greater Riverfields development as the greater area is destined for the creation of a significant number of new homes, as well as a significant investment into this area with the achievement of new jobs and employment opportunities and will also contribute to new infrastructural services in the area.

The area is within the Aerotropolis, it is proposed as a development Corridor according to the R21 Development Corridor document, and it is identified as a development node in terms of the local municipal Spatial Development Framework (SDF). The EMF also encourages development with this area. All of these factors and polices point to the fact that development within this R21 corridor is indeed desirable. The roads will mainly traverse areas identified as a Zone 1 EMZ in the Gauteng EMF of 2014.

Based on the findings, summary and conclusion in the report, the consultant is of the opinion that the full re-alignment of the R23 over the Swartspruit is NOT the preferred alternative, and the R23 should be widened along it current alignment over the Swartspruit, and then straighten to junction with Riverfields Blvd and then Pretoria road further north-west, as described above. The widening of the existing R23 alignment will only mean an extension/ widening of approximately 10 meters to the existing road surface. This footprint is a quarter of the Option A full realignment over the wetland area.

The construction of Riverfields Boulevard and new bridge over the Swartspruit is part of the preferred alternative, as both the road widening and Riverfields Blvd are critical in the overall roads layout and urban design masterplan for the Riverfields Development Area.

Although there will be some negative impacts that range from medium to low in significance (specifically during construction) there are many positive social and economic implications that considerably outweigh the negative implications of building the roads and the positive impact on development within the area.

The consultant is, therefore, of the opinion that the activities as applied for (Riverfields Blvd and bridge as well as the widening of the R23 over the Swartspruit, and the re-alignment of the R23 from west of the Swartspruit to Pretoria road), should be authorised, with the condition that terms, conditions and guidelines contained the EMP be effectively, efficiently and professionally implemented.

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11. Appendix 1: Environmental Practitioner: Seaton Thomson and Associates company profile and EAP CV's

12. Appendix 2: GDARD approval of Scoping report

13. Appendix 3: Riverfields traffic Impact Report – July 2013

14. Appendix 4: Archaeology and heritage report

15. Appendix 5: Witfontein faunal assessment

16. Appendix 6: Witfontein vegetation assessment

17. Appendix 7: Witfontein eastern wetland study

18. Appendix 8: Swartspruit western wetland/ river assessment

19. Appendix 9: Grass Owl assessment

20. Appendix 10: Demacon Economic impact assessment

21. Appendix 11: Dolomite assessment for Witfontein

22. Appendix 12: Dolomite assessment for Ext 29-33

23. Appendix 13: Impact Assessment Methodology

24. Appendix 14: Environmental Management Plan

25. Appendix 15: Public Participation report – EIA phase

26. Appendix 16: Large scale maps and plans