

ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED MONAVONI X 51

Part of the Remainder of Portion 5 of the Farm Mooiplaats
355-JR and Part of Portion 2 of the Farm Swartkop 383
JR

GAUT: 002/13-14/E0032

SEPTEMBER 2015



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Part 1 of 2

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LIST OF ABBREVIATIONS

CBD: Central Business District

C-Plan: Conservation Plan

DFA: Development Facilitation Act

EAP: Environmental Assessment Practitioner

ECA: Environmental Conservation Act

EIA: Environmental Impact Assessment

IEMA: Institute of Environmental Management and Assessment

EIAR: Environmental Impacts Assessment Report

EMM: Ekurhuleni Metropolitan Municipality

CoT: City of Tshwane

DWA: Department of Water Affairs

EMP: Environmental Management Plan

GAPA: Gauteng Agricultural Potential Atlas

GDARD: Gauteng Department of Agriculture and Rural Development

GSDF: Gauteng Spatial Development Framework

I&AP: Interested and affected party

IDP : Integrated Development Plan

NSBA: National Spatial Biodiversity Assessment

NEMA : National Environmental Management Act

PoS: Plan of Study

SACLAP: The South African Council of the Landscape Architects Profession

SAHRA: South African Heritage Resources Agency

SR: Scoping Report

SDF: Spatial Development Framework

TIA: Traffic Impact Assessment

UNCED : United Nations Conference on Environment and Development

WMA: Water Management Area

WWTP: Waste Water Treatment Plant

GLOSSARY OF TERMS

Agricultural Hub: An area identified for agricultural use by GDARD according to the Draft Policy on the Protection of Agricultural Land (2006).

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Applicant: Any person who applies for an authorisation to undertake an activity or to cause such activity to be undertaken as contemplated in the National Environmental Management Act (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2006.

Biodiversity: The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are apart.

Conservation of Agricultural Resources Act (Act No. 43 of 1983): This Act provides for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

Ecology: The study of the inter relationships between organisms and their environments.

Environment: All physical, chemical and biological factors and conditions that influence an object and/or organism. Also defined as the surroundings within which humans exist and are made up of the land, water, atmosphere, plant and animal life (micro and macro), interrelationship between the factors and the physical or chemical conditions that influence human health and well-being.

Environmental Impact Assessment: Assessment of the effects of a development on the environment.

Environmental Management Plan: A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project.

GDARD Draft Ridges Policy, 2001: According to the GDARD Draft Ridges Policy no development should take place on slopes steeper than 8.8%.

GDARD Draft Red Data Species Policy, 2001: A draft policy to assist with the evaluation of development applications that affected Red Data plant species.

GDARD Requirements for Biodiversity Assessments Version 2 (2012): GDARD requirements for biodiversity assessments.

GIDS: The GIDS focuses on the mapping and management of biodiversity priority areas within Gauteng. The GIDS includes protected areas, irreplaceable and important sites due to the presence of Red Data species, endemic species and potential habitat for these species to occur. GIDS, 2007.

National Environmental Management Act (NEMA), 1998 (Act No 107 of 1998): 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-ordinating environmental functions exercised by organs of state; and to provide for matters connected therewith.

National Environmental Management: Air Quality Act (Act No. 39 of 2004): The purpose of the Act is “To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incident thereto”.

National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004): The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003): The purpose of this Act is to provide the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.

National Heritage Resource Act, 1999 (Act No 25 of 1999): The National Heritage Resources Act legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 ha. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

National Veld and Forest Fire Act, 1998 (Act No. 101, 1998): The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic. Furthermore the Act provides for a variety of institutions, methods and practices for achieving the prevention of fires.

National Road Traffic Act, 1996 (Act No. 93 of 1996): This Act provides for all road traffic matters which shall apply uniformly throughout the Republic and for matters connected therewith.

National Water Act, 1998 (Act No 36 of 1998): The purpose of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled.

Open Space: Areas free of building that provide ecological, socio-economic and place-making functions at all scales of the metropolitan area.

Study Area: Refers to the entire study area encompassing the total area of the land parcels as indicated on the study area map.

Sustainable Development: Development that has integrated social, economic and environmental factors into planning, implementation and decision making, so as to ensure that it serves present and future generations.

Water Services Act, 1997 (Act No 108 of 1997): The purpose of this Act is to ensure the regulation of national standards and measures to conserve water.

1. INTRODUCTION

1.1 Background

JR 209 Investments (Pty) Ltd trading as **M&T Development (Pty) Ltd** is planning a proposed township development to be known as Monavoni Extension 51 on part of the Remainder of Portion 5 of the farm Mooiplaats 335 JR and part of Portion 2 of the farm Swartkop 383 JR. ***It only recently become evident from the Town Planner and Title Deeds of the property that the farm name is Swartkop and not Zwartkop. (Refer to Figure 1: Locality Map and Figure 2: Aerial Map.)*** The size of the property is approximately **41,7622 ha**.

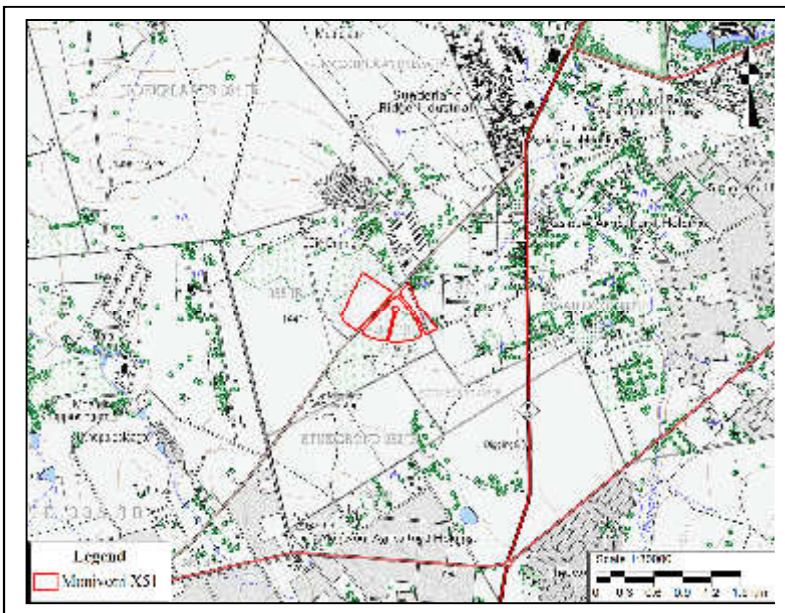


Figure 1 – Locality Map

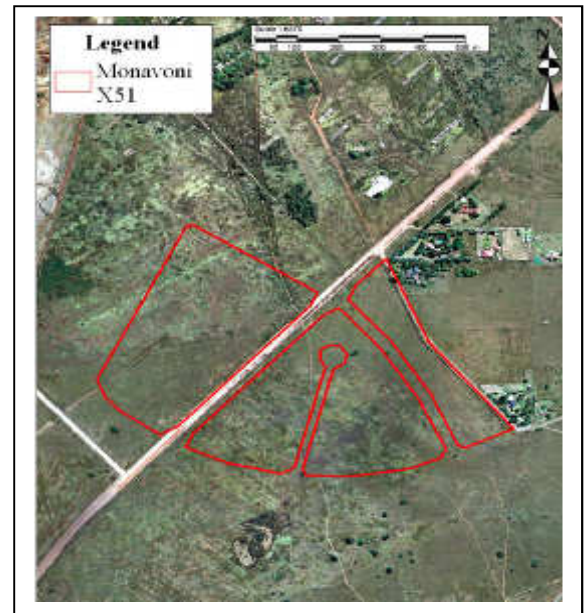


Figure 2 – Aerial Map

Please note: enlarged copies of the figures are included as Annexure A.

The application is made for the establishment of a Residential Township to be known as Monavoni Extension 51 with the following proposed land uses:

- 5 erven zoned “Industrial 2”;
- 10 erven zoned for “Business 2”;
- 5 erven zoned for “Residential 2” purposes with a density of 25 units/ha;

- 5 erven zoned "Private Open Space".

The proposed Monavoni Extension 51 forms part of the larger Monavoni Development done by M&T Development for which a Development Framework had been compiled **(Refer to Figure 3 and Annexure B)**.

The Monavoni Development Framework had been approved by the City of Tshwane (CoT), Environmental Services Department, Environmental Planning and Open Space Management Section subject to the following conditions:

- No further changes can be made to the Open Spaces as discussed and supported.
- A "green servitude" in favor of the Council (not the general public) for purposes of protecting if for open spaces. The change of zoning of these properties will not be supported by the CoT Environmental Management Services Department.
- A site and Landscape Development Plan for each township to be drafted by a qualified Landscape Architect must be submitted to the Department for approval. Such plan must include the following information:
 - At least 4m² per dwelling unit with a minimum of 50m² on a property that shall be developed and maintained as a children's playground.

Refer to correspondence from CoT, dated 09/10/2013, attached as Annexure C.

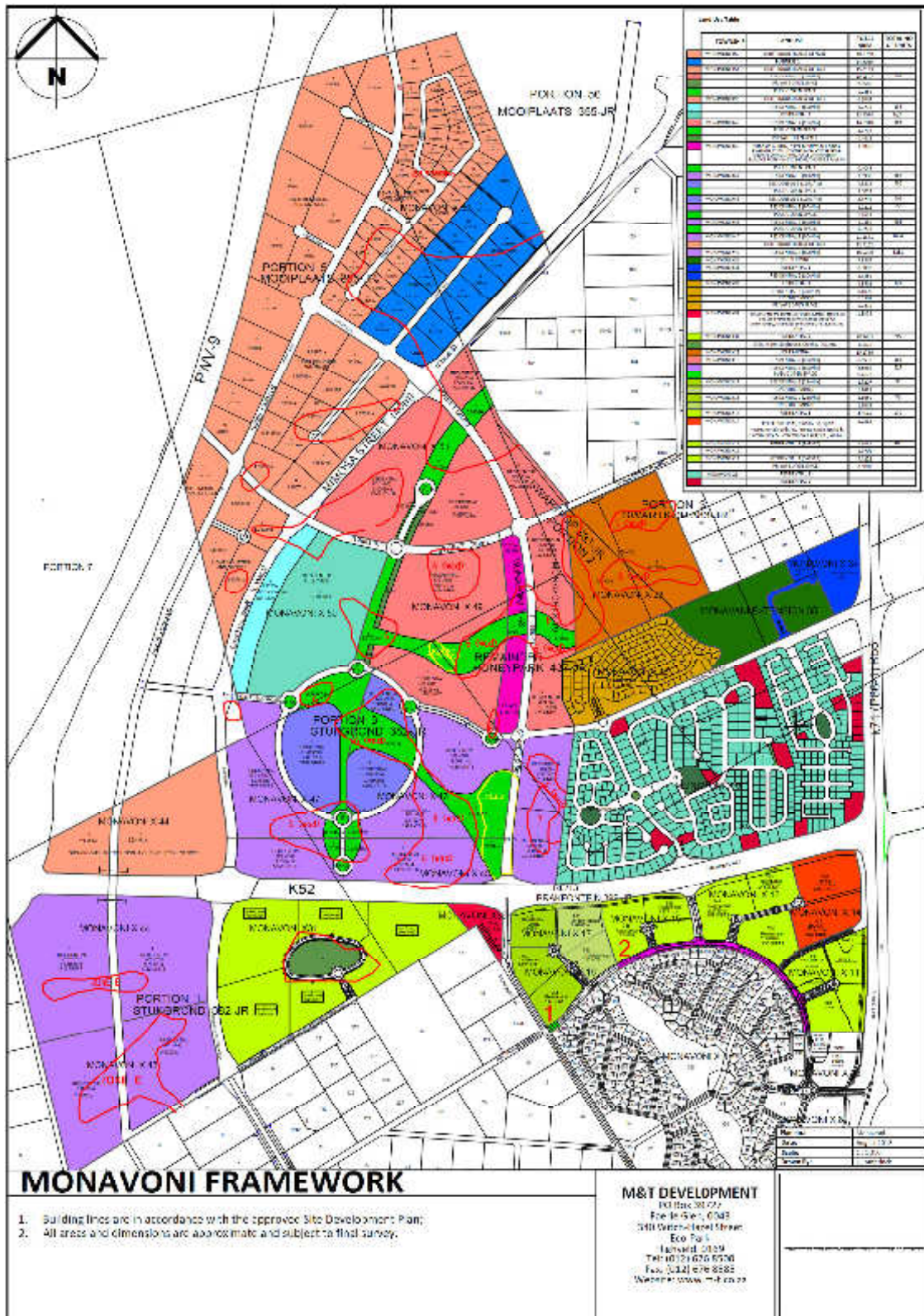


Figure 3: Monavoni Development Framework

1.2 Environmental Assessment Practitioner (EAP) - In Line with Section 32 (2) (a) (i) and (ii)

The Environmental Regulations require that relevant details of the Environmental Assessment Practitioner be included as part of the Scoping Report and EIA. In this regard, attached as **Annexure D**, is a copy of the CV of the EAP for this project, Ms. Lizelle Gregory from Bokamoso Landscape Architects and Environmental Consultants. In summary details of the EAP are indicated below:

- **Name:** Lizelle Gregory
- **Company:** Bokamoso Landscape Architects and Environmental Consultants.
- **Qualifications:** Registered Landscape Architect and Environmental Consultant (degree obtained at the University of Pretoria) with 15 years experience in the following fields:
 - Environmental Planning and Management;
 - Compilation of Environmental Impact Assessments;
 - Landscape Architecture; and
 - Landscape Contracting

Ms. L. Gregory also lectured at the Technicon of South Africa and the University of Pretoria. She is a registered member of the South African Council of the Landscape Architects Profession (SACLAP), the International Association of Impact Assessments (IAIA) and the Institute of Environmental Management and Assessment (IEMA).

1.3 Activities Applied For In Terms of NEMA

The Application for Environmental Authorisation was submitted on the 26th September 2013 in terms of the Amended NEMA EIA Regulations, 2010, which came into effect on 2 August 2010. The reference number, Gaut: 002/13-14/E 0032, has been assigned to the application.

Take note that the 2010 NEMA EIA Regulations were replaced by the Amended 2014 NEMA EIA Regulations on 4 December 2014, but due to the fact that the application was submitted in terms of the 2010 NEMA EIA Regulations, this application will be dealt with in terms of such Regulations. Once the Decision has been issued in terms of the 2010 NEMA EIA Regulations, such Decision will be regarded as a Decision issued in terms of the New 2014 EIA Regulations and all following procedures (i.e. Amendment Applications, Appeals etc. must be made/submitted in terms of the 2014 NEMA EIA Regulations. Refer to Chapter 8 – Transitional Arrangements and Commencement of the 2014 NEMA EIA Regulations.

Regulation 53 (3) of the 2014 NEMA EIA Regulations furthermore states “Where an application submitted in terms of the previous NEMA EIA Regulations, is pending in relation to the activity of which a component of the same activity was not identified under the previous NEMA Notices, but is now identified in terms of Section 24 (2) of the Act, the competent authority must dispense of such application in terms of the previous NEMA regulations and **may**¹ authorise the activity identified in terms of Section 24 (2) as if it was applied for, on condition that all impact of the newly identified activity and requirements of these Regulations have also been considered and adequately assessed.”

Section 24(2) Activities to be considered by GDARD:

We perused the Amended 2014 NEMA EIA Regulations and decided to list the activities that will most probably be triggered in terms of such Regulations (**Refer to Table 128 below**). The activities identified are very similar to that activities applied for in terms of the 2010 NEMA EIA Regulations and we therefore feel confident that all the activities as listed have been assessed.

Due to the fact that the 2014 Regulations are still new, we recommend that GDARD rather dispense this application in terms of the 2010 NEMA EIA Regulations.

¹ Take Note: This is not a must

Table 55: 2014 Amended NEMA EIA Regulations: Listed Activities that will most probably be triggered

Listing Notice 1:		
R.983	Activity 9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.
	Activity 10	The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or (b) where such development will occur within an urban area.
	Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.
	Activity 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

		<p>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding-</p> <p>(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;</p> <p>(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;</p> <p>(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;</p> <p>(dd) where such development occurs within an urban area; or</p> <p>(ee) where such development occurs within existing roads or road reserves.</p>
	Activity 19	<p>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-</p> <p>(i) a watercourse;</p> <p>(ii) the seashore; or</p> <p>(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-</p> <p>(a) will occur behind a development setback;</p> <p>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or</p> <p>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.</p>
	Activity 27	<p>The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-</p> <p>(i) the undertaking of a linear activity; or</p> <p>(ii) maintenance purposes undertaken in accordance with a maintenance management plan</p>
	Activity 45	<p>The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure-</p> <p>(i) has an internal diameter of 0,36 metres or more; or</p> <p>(ii) has a peak throughput of 120 litres per second or more; and</p> <p>(a) where the facility or infrastructure is expanded by more than 1000 metres in length; or</p> <p>(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion-</p> <p>(aa) relates to transportation of water or storm water within a</p>

		road reserve; or (bb) will occur within an urban area
	Activity 46	The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure- (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion- (aa) relates to transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve; or (bb) will occur within an urban area
		The expansion of- . (i) canals where the canal is expanded by 100 square metres or more in size ; (ii) channels where the channel is expanded by 100 square metres or more in size ; (iii) bridges where the bridge is expanded by 100 square metres or more in size; (iv) dams, where the dam, including infrastructure and water surface area, is expanded by 100 square metres or more in size; (v) weirs, where the weir, including infrastructure and water surface area, is expanded by 100 square metres or more in size; (vi) bulk storm water outlet structures where the bulk storm water outlet structure is expanded by 100 square metres or more in size; or (vii) marinas where the marina is expanded by 100 square metres or more in size; where such expansion or expansion and related operation 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 expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion 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 expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads or road reserves	
Listing Notice 2:			
R. 984	Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan	
Listing Notice 3:			
R. 985	Activity 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of required for maintenance purposes undertaken in accordance with a maintenance management plan.	a) In Eastern Cape, Free State, Gauteng, Limpopo, North West and Western Cape provinces: i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or indigenous vegetation is prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; or iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.
	Activity 14	The development of- (i) canals exceeding 10 square metres in size ; (ii) channels exceeding 10 square metres in size;	(a) In Free State, Limpopo, Mpumalanga and Northern Cape: i. In an estuary; ii. Outside urban areas, in:

		<p>(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, or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse</p> <p>excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or</p>	<p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an International Convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (ii) Areas seawards of the development; or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or iii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the; competent authority, zoned for a conservation purpose; or (cc) Areas seawards of the development setback line.</p>
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	harbour.	
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Notice R. 544, R 545, & R 546 of the Amended Regulations list activities that indicate the process to be followed. The Activities listed in Notice No. Notice R. 544 & R 546 require that a Basic Assessment process be followed and the activities listed in Notice No. R 545 requires that the Scoping and EIA process be followed. This application follows a Scoping and EIA process.

In the environmental application process (to be compiled in terms of NEMA) the applicant is applying for the following listed activities:

Activities Applied for in Terms of NEMA

Table 1: Listed activities in terms of Notices R. 544, R. 545 & R. 546

Indicate the number and date of the relevant Government Notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity:
Listing No. 1 R. 544, 18 June 2010	Activity 9	The construction of facilities or infrastructures exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: (a) such facilities or infrastructures are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
Listing No. 1 R. 544, 18 June 2010	Activity 13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.
Listing No. 1 R.	Activity 22	The construction of a road outside urban areas,

544, 18 June 2010		(i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres, or (iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.
Listing No. 1 R. 544, 18 June 2010	Activity 23	The transformation of undeveloped, vacant or derelict land to (i) residential, retail, commercial, recreational, industrial or institutional use, inside an urban area, and where the total area to be transformed is 5 hectares or more, but less than 20 hectares, or (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares; except where such transformation takes place for linear activities.
Listing No. 1 R. 544, 18 June 2010	Activity 24	The transformation of land bigger than 1000 square meters in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule such land was zoned open space, conservation or had an equivalent zoning.
Listing No. 1 R. 544, 18 June 2010	Activity 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Listing No. 1 R. 544, 18 June 2010	Activity 37	The expansion of facilities or infrastructure for the bulk transportation of water where: a. the facility or infrastructure is expanded by more than 1000 metres in length; or b. where the throughput capacity of the facility or infrastructure will be increased by 10% or more – excluding where such expansion: i. relates to transportation of water, sewage or storm water within a road reserve; or where such expansion will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
Listing No. 1 R. 544, 18 June 2010	Activity 47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (i) where the existing reserve is wider than

		<p>13.5 metres; or</p> <p>(ii) where no reserve exists, where the existing road is wider than 8 metres –</p> <p>excluding widening or lengthening occurring inside urban areas.</p>
Listing No. 1 R. 544, 18 June 2010	Activity 56	<p>Phased activities for all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where any one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specific threshold:-</p> <p>Excluding the following activities listed in this Schedule:</p> <p>2; 11 (i)-(vii); 16(i)-(iv); 17; 19; 20; 22(i) & 22(iii); 25; 26; 27 (iii) & (iv); 28; 39; 45(i)-(iv) & (vii)-(xv); 50; 51; 53; and 54.</p>
Listing No. 2 R. 545, 18 June 2010	Activity 15	<p>Physical alteration of undeveloped land, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;</p> <p>Except where such physical alterations takes place for:</p> <p>(i) linear development activities; or agricultural or afforestation where activity 16 in this Schedule will apply.</p>
Listing No. 3 R. 546, 18 June	Activity 4	<p>The construction of a road wider than 4 metres with a reserve less than 13,5 metres.</p>
		<p>(b) In Gauteng:</p> <p>i. A protected area identified in terms of NEMPAA, excluding</p>

			<p>conservancies;</p> <ul style="list-style-type: none"> ii. National Protected Area Expansion Strategy Focus areas; iii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act as adopted by the competent authority; iv. Sites or areas identified in terms of the Ramsar Convention; v. Sites identified as irreplaceable or important in the Gauteng Conservation plan; vi. Areas larger than 2 hectares zoned for use as public open space; vii. Areas zoned for conservation purpose; iii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environmental Conservation Act, 1989 (Act No. 73 of 1989) and the Nature Conservation Ordinance (Ordinance 12 of 1983); <p>Any site identified as land with high agricultural potential located within the Agricultural Hubs or Important Agricultural</p>
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			Sites identified in terms of the Gauteng Agricultural Potential Atlas, 2006.
Listing No. 3 R. 546, 18 June 2010	Activity 13	<p>The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:</p> <p>(1) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list;</p> <p>(2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No.544 of 2010.</p>	<p>(d) In Gauteng:</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989). the Nature Conservation Ordinance (Ordinance 12 of 1983); (v) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites or areas identified in terms of an International Convention; <p>Sites identified as irreplaceable or</p>

			important in the Gauteng Conservation Plan.
Listing No. 3 R. 546, 18 June 2010	Activity 14	<p>The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation, except where such removal of vegetation is required for:</p> <p>(1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes;</p> <p>(2) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list;</p> <p>(3) The undertaking of a linear activity falling below the thresholds in Notice 544 of 2010.</p>	<p>(d) In Gauteng:</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989). the Nature Conservation Ordinance (Ordinance 12 of 1983); (v) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites or areas identified in terms of an International Convention; <p>Sites identified as irreplaceable or</p>

			important in the Gauteng Conservation Plan.
Listing No. 3 R. 546, 18 June 2010	Activity 19	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	<p>(b) in Gauteng:</p> <ul style="list-style-type: none"> i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus areas; iii. Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; iv. Sites or areas identified in terms of an International Convention; v. Any site identified as land with high agricultural potential located within the Agricultural Hubs or Important Agricultural Sites identified in terms of the Gauteng Agricultural Potential Atlas, 2006; vi. All sites identified

			<p>as irreplaceable or important in terms of the applicable Gauteng Conservation Plan;</p> <p>vii. Any declared protected area including Municipal or Provincial Nature Reserves as contemplated by the Environment Conservation Act, 1989 (Act No. 73 of 1989), the Nature Conservation Ordinance (Ordinance 12 of 1983) and the NEMPAA.</p>
Listing No. 3 R. 546, 18 June 2010	Activity 26	Phased activities for all activities listed in this Schedule and as it applies to a specific geographical area, which commenced on or after the effective date of this Schedule, where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.	All the areas as identified for the specific activities listed in this schedule.

JR 209 Investments (Pty) Ltd appointed **Bokamoso Landscape Architect and Environmental Consultants**, as independent environmental consultants, to compile an Environmental Impact Assessment (EIA) for the proposed development and its associated listed activities.

1.4 The Town Planning Process

The Town Planning Application was made in terms of **Section 96(1) of the Town Planning Ordinance (Ordinance 15 of 1986)** for the establishment of a Township on a part of the Remainder of Portion 5 of the farm Mooiplaats 355 JR and part of Portion 2 of the farm Swartkop 383 JR, to be known as **Monavoni Extension 51**

1.5 Scope of Work and Approach to the Study

An application form for environmental authorisation of the relevant activity as well as an Environmental Scoping Report has been submitted to GDARD. The Scoping Report and the Plan of Study for EIA, which was submitted by Bokamoso Landscape Architects and Environmental Consultants and received by the Department on 16 October 2013, had been accepted by the Gauteng Department of Agriculture and Rural Development (GDARD). In addition to the tasks that are outlined in the Plan of Study for the EIA, GDARD required the following information requirements to be addressed in the EIAR (**refer to Annexure E**).

- a. The ecological specialist studies for fauna and flora must meet the Department's Directorate of Conservation requirement for Biodiversity assessments. **Refer to Annexure G.**
- b. In terms of Biodiversity Conservation Plan Version 3 part of the site is designated as an important and Ecological Support area. Therefore the EIAR must report on the possible impacts on the subject site. **Refer to section 6.1.2 for the impact in the Biological environment.**
- c. All relevant stakeholders (Council of Geo-Science and the Local Authority etc.) must be consulted during the EIA process and their comments and/or responses should be included in the EIA Report. **Refer to Annexure H.**
- d. Comments from Hennopsvallei Conservancy must be included in the Final EIA Report as stated in a letter from City of Tshwane metropolitan Municipality:

Environmental Management Services Department dated 26 August 2013. **Refer to Annexure K(v) for the communication to and from I&AP's.**

- e. All comments and issues raised by interested and affected parties must be incorporated into the report. **Refer to comments and issues responses in Annexure K.**

An investigative approach was followed and the relevant physical, social, economic and institutional environmental aspects were assessed. The scope of work includes the necessary investigations, to assess the suitability of the study area and the surrounding environment for the proposed activities. The scoping exercise identified the anticipated environmental aspects in an issues matrix and it also supplied a preliminary significance rating for the impacts identified. The scoping process also assessed the possible impacts of the proposed development on the surrounding environment (including the interested and affected parties).

This document represents the EIA for the proposed development. The EIA must be in line with Section 32 of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) and the Approved Plan of Study for EIA that was submitted as part of the Scoping Report.

The EIA takes into consideration the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity. A description of the property on which the activity is to be undertaken and the location of the activity on the property are described. A description of the proposed activity and any feasible and reasonable alternatives were identified. In addition, a description of the need and desirability of the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have, on the environment and community that may be affected by the activity are included.

An identification of all legislation and guidelines that we are currently aware of is considered in the preparation of this EIA Report. Furthermore a description of environmental issues and potential impacts, including cumulative impacts, are identified

and discussed. Information on the methodology that will be adopted in assessing the potential impacts is furthermore identified, including any specialist studies or specialised processes that were/ should be undertaken. The EIA Report eventually determines whether a proposed project should receive the “go-ahead” or whether the “no-go” option should be followed. If the EAP recommends that the project receive the “go-ahead”, it will (in most cases) be possible to mitigate the issues identified to more acceptable levels. Reference is also made to the mitigation of identified impacts or for further studies that may be necessary to facilitate the design and construction of an environmentally acceptable facility.

Details of the Public Participation Process (in terms of Sub-Regulation 1) are also included. Sub-Regulation 1 requires that the following information be included as part of the Public Participation Section of the EIA report:

- (i) The steps undertaken in accordance with the Plan of Study For EIA,
- (ii) A list of persons, organisations and government organs that were registered as interested and affected parties;
- (iii) A summary of comments received from, and a summary of issues raised by the interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments;
- (iv) Copies of any representations, objections and comments received from the registered interested and affected parties.

The mitigation measures and guidelines that are listed in the EIA Report are also summarised in a user-friendly document named an Environmental Management Plan (EMP). A Draft EMP is also a requirement of the EIA Process (Section 32 and 34 of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998)).

2. REGISTERED OWNERS AND TITLE DEEDS

The registered owner of a Part of the Remainder of Portion 5 of the farm Mooiplaats 355 JR and part of Portion 2 of the farm Swartkop 383 JR, to be known as Monavoni Extension 51 is **JR 209 Investments (Pty) Ltd** held by Deeds of Transfer **T 1735879/2004** and **T 119977/2005**.

3. LOCALITY OF THE PROPOSED DEVELOPMENT – (In line with Section 32 (c))

The study area is located on a Part of the Remainder of Portion 5 of the farm Mooiplaats 355 JR and part of Portion 2 of the farm Swartkop 383 JR , located within the Monavoni area, Centurion. **Refer to Figure 1, Locality Map.**

The proposed Township is situated to the east of the proposed PWV-9, west of the R55, to the north of the M34 (Ruimte Road) and the N14, south of Mimosa Road, south-west of Sunderland Ridge, and to the east of Gardener Ross Golf Estate. The study area falls within the area of jurisdiction of the City of Tshwane Metropolitan Municipality.

4. EXISTING ZONING AND LAND USE AND THE PROPOSED LAND-USE

4.1 Existing Zoning and Land Use

In terms of the Tshwane Town-planning Scheme of 2008, the western side of the property is zoned "Rural Residential area" with many small farming and business operations, to the south and east are some residential estate and situated north is an informal settlement.

4.2 Proposed Zoning And Land Use – (In line with Section 32 (b))

The proposed land use rights and relevant town planning controls could be summarised as follows:

Table 2: Proposed land use

ERVEN 16-18,20 & 21	
Use Zone	Residential 2
Density	20 units per hectare
Height	2 storeys
General: In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Tshwane Town-Planning Scheme, 2008	

ERVEN 6-15	
Use Zone	Business 2
Density	N/A
Height	3 storeys
General: 1) A engineer must be appointed before building plans are submitted, who must submit, together with the building plans, a certificate which states that he has studied the relevant geological report and that he has established the necessary measures with regard to building work, drainage of the buildings and the site and the installation of the wet services so that the whole development is safe as far as possible from a geological point of view. On completion of the buildings he must certify that all his specifications have been met. 2) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Centurion Town-Planning Scheme, 1992.	

ERVEN 1-5	
Use Zone	Industrial 2
Density	N/A
Height	3 storeys
General: 1) A engineer must be appointed before building plans are submitted, who must submit, together with the building plans, a certificate which states that he has studied the relevant geological report and that he has established the necessary measures with regard to building work, drainage of the buildings and the site and the installation of the wet services so that the whole development is safe as far as possible from a geological point of view. On completion of the buildings he must	

certify that all his specifications have been met.

- 2) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Centurion Town-Planning Scheme, 1992.

ERVEN 19 & 22-25

Use Zone	Private Open Space
Density	N/A
Height	N/A
<p>General:</p> <ol style="list-style-type: none"> 1) The erven shall be registered in the name of the Section 21 Company (Home Owners Association) of which all the owners of the security development must be members. 2) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Tshwane Town-Planning Scheme, 2008. 	

ERVEN 28

Use Zone	Special
Density	N/A
Height	In accordance with the site Development Plan
<p>General:</p> <ol style="list-style-type: none"> 1) A engineer must be appointed before building plans are submitted, who must submit, together with the building plans, a certificate which states that he has studied the relevant geological report and that he has established the necessary measures with regard to building work, drainage of the buildings and the site and the installation of the wet services so that the whole development is safe as far as possible from a geological point of view. On completion of the buildings he must certify that all his specifications have been met. 2) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Centurion Town-Planning Scheme, 1992. 	

5. ALTERNATIVES IDENTIFIED – (In line with Section 32 (f) and (h))

Alternatives should be considered as a norm within the Scoping and Environmental Impact Assessment Process. These should include the No-Go Option, locality alternatives, land use alternatives and layout alternatives.

5.1 The “No-Go” Alternative

The developer purchased the properties for development purposes and did not consider the “No-Go” alternative due to the following:

- The study area falls within the Gauteng Provincial Urban Edge **(Refer to figure 6)**;
- The study area falls within an area earmarked for development according to the Monavoni and Western Farms Development Framework 2020;
- According to the GDARD C-Plan version 3 only a section of the study area is regarded as ecologically sensitive **(Refer to figure 4)**;
- The study area does not fall within an Agricultural Hub, an area identified for agricultural uses by GDARD **(Refer to figure 5)**;
- The study area forms part of the larger Monavoni Development for which a Spatial Development Framework has been compiled **(Refer to figure 3)**.

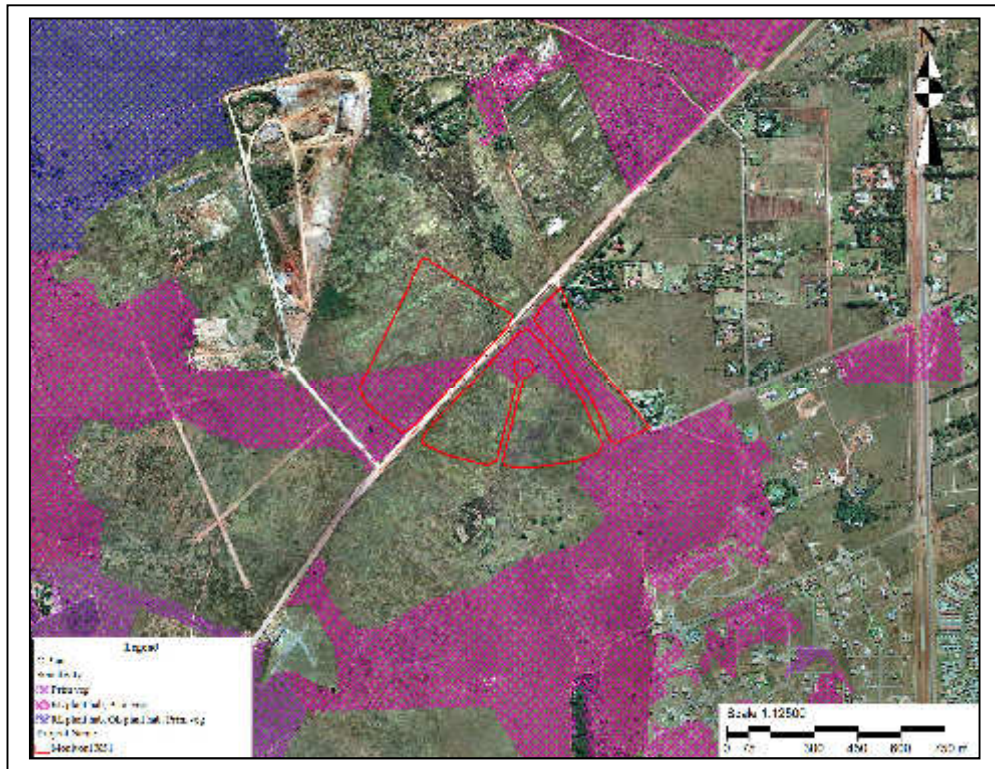


Figure 4 – GDARD C-Plan

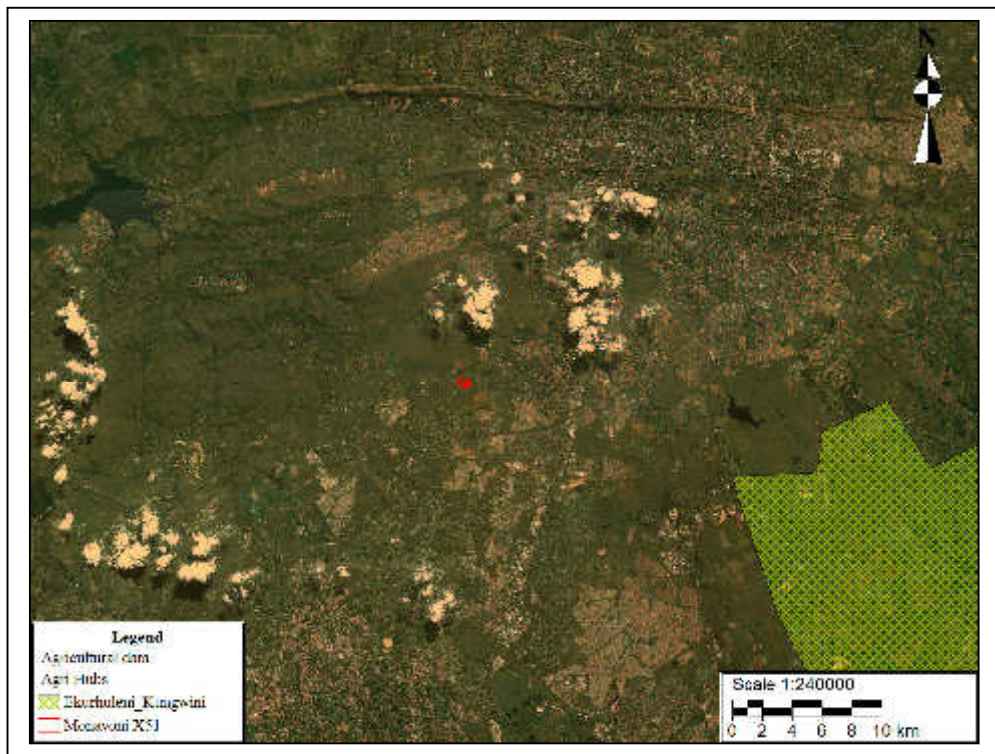


Figure 5– Agricultural Hub

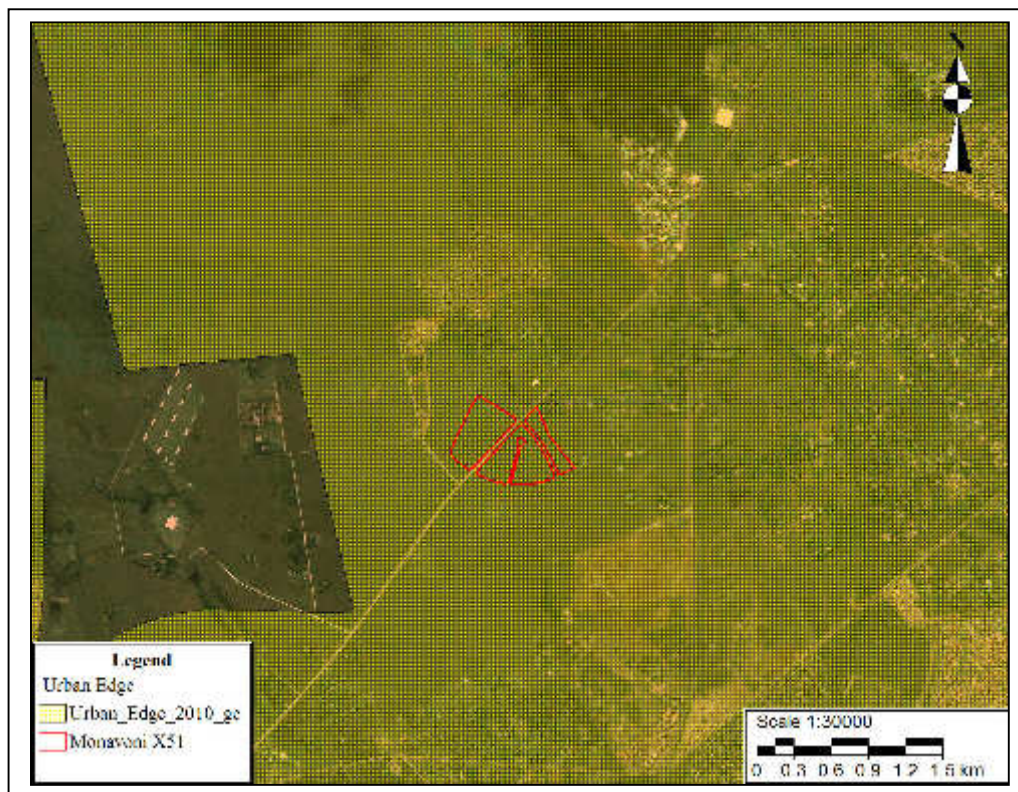


Figure 6– Gauteng Urban Edge

To follow now are tables that represent a comparison between the “No-Go” alternative and the development alternative.

Diagram 1: Environmental Issues - “No-Go” Option

Issue	Short term	Medium term	Long Term	
Geology and soils	[Red bar]			Positive
				Neutral
		[Red bar]		Negative
Most development will have a significant impact on the geology of a study area, especially in the short term. Indirect impacts created by the edge effects of the surrounding developments could however, in the long term, lead to a decrease in vegetative coverage and even to exposed areas. Erosion, siltation and water pollution problems could then be caused.				
Hydrology	[Blue bar]			Positive
				Neutral
		[Blue bar]		Negative

Most development will have a significant impact on the hydrology of a study area, especially in the short term. Indirect impacts created by the edge effects of the surrounding developments could however, in the long term, lead to a decrease in vegetative coverage and even to exposed areas. Erosion, siltation and water pollution problems could then be caused. Changes in the surface drainage patterns could also occur.

Vegetation		Positive
		Neutral
		Negative

If no development take place in the area surrounding the study area, the impacts on the vegetation will not be significant. If development take place adjacent to the study area, the edge effect could, in the long term, have an impact on the ecological potential and bio-diversity of the vegetation of the study area.

Fauna		Positive
		Neutral
		Negative

If no development takes place in the area surrounding the study area, the impacts on the fauna and flora and bio-diversity will not be significant. If development stake place adjacent to the study area the edge effect could, in the long term, have an impact on the ecological potential and bio-diversity of the vegetation of the study area.

Social		Positive
		Neutral
		Negative

A major part of the study area is currently vacant and informal settlements have already established on the study area and surroundings and it will continue to the established on the study area. This has a major impact on the safety of security of the surrounding land owners.












Economic		Positive
		Neutral
		Negative

With no development taking place there will be a significant negative impact on the study area as there will be no economic growth and no job opportunities. The study site will remain vacant and the informal settlements will expand.

Note: The “no-go” option is predominantly neutral in the short and medium term, and turns negative in the long term

Diagram 2: Environmental Issues of the proposed development

Issue	Short term	Medium term	Long Term	
Geology and soils				Positive
				Neutral

	Negative
<p>In the short term (the construction phase), the proposed development will have a negative impact on the geology of the study area. It is, however possible to mitigate the impacts to acceptable levels and manage the impact thereof. It is expected that it will be then positive in the longterm.</p>	
Hydrology	Positive
	Neutral
	Negative
<p>In the short term (the construction phase), the proposed development will have a negative impact on the hydrology of the study area. It is, however possible to mitigate the impacts to acceptable levels. If well planned, the long term impacts on the hydrology will be neutral or even positive. Effective temporary and permanent storm water management and guidelines to reduce impacts on the water courses and wetlands as well as a dolomite risk management plan will have to be implemented during all the development phases. If this is done it is expected that in long-term the impact could be mitigated.</p>	
Vegetation	Positive
	Neutral
	Negative
<p>The proposed development will have a negative impact on the vegetation of the study area in the short and medium term. Some of the natural grassland vegetation will be permanently lost, but the sensitive grassland on dolomite and riparian/wetland vegetation will be conserved. The impact will be mitigated and managed therefore the impact in the medium to long term will be neutral.</p>	
Fauna	Positive
	Neutral
	Negative
<p>The proposed development will have a negative impact on the fauna and bio-diversity of the study area in the short and medium term. Weeds and exotic invaders will be removed on a continuous basis throughout the proposed development. Within the Town Planning Memo it was stated that there will be corridors for movement of fauna species.</p>	
Social	Positive
	Neutral
	Negative
	
<p>From a social point of view, the proposed development will have significant positive impacts. The construction phase could cause some minimal social impacts, but in the long term the surrounding community and the larger region will benefit from the proposed development. During the construction phase there might be some social impacts related to security of the surrounding areas.</p>	
Economic	Positive
	Neutral
	Negative

From an institutional and economical point of view, the proposed development will have significant positive impacts. The surrounding community and the larger region will benefit from the proposed development. The construction and operational phase will also create some temporary and permanent job opportunities and generate and income to the area.

Note: From the investigations that were done, it is anticipated that the proposed development option is predominantly negative in the short term, turns neutral in the medium term and then positive in the long term.

5.2 Land Use Alternatives

The developer considered the following four land use alternatives:

5.2.1 Residential development

Many housing developments are planned for the Centurion West Area and the developer regarded the need for a residential development as high. The involved local authority regards the south-western section of Centurion as one of the primary growth areas and this necessitates urban densification on the existing farm portions and agricultural holdings in the area earmarked for urban development.

The local authority identified the area between the R55 and the Gerhardsville Road suitable for various land-use types and the study area falls within the area that was earmarked for residential development.

Furthermore, the developer already developed some residential properties (with mixed densities) in the area and the market proved to be favourable for residential developments that are in line with the proposed development.

The market research team of the developer and the agents employed by the developer regard the proposed residential land-use as a suitable land-use from an economical and social point of view. The geotechnical engineer of the developer is satisfied with the proposed land-use for the study area and the Town Planners of the developer and the

Town Planning Department of the involved Local Authority regard the proposed land-use as in line with the land-use planning for the area. From an environmental point of view, the study area is also regarded as suitable for residential development.

The proposed Monavoni Ext 51 development would not only promote the optimum utilisation of the available services in the direct vicinity, but will also contribute to the upgrading of existing services. The proposed Township Development is fully compatible with the proposals of the area. However, a residential development only is not regarded as the preferred land use due to the current economic situation.

5.2.2 Mixed Use development (Alternative 2) **(Preferred alternative and represents proposal included)**

A mixed use development consisting of Industrial, Business and Residential land uses were considered as the preferred land use alternative.

The study area is in close proximity to informal settlements and the planned industrial parks and office developments within the proposed development will have a big impact on the informal settlements as it will create work opportunities.

The recent trend has emerged over the last couple of years for offices and industrial properties situated outside of the CBD. The reason for this being that business owners and their workers can live closer to work, and in close proximity to other amenities such as convenient stores. There is also unprivileged work force that can benefit from these job opportunities.

There is a need to provide a diversity of land uses and type of residential units in an area. This proposed development will be situated to the north west of the Sevilla, Silverstone, Silverwood and Thornfield estate of which the erven are full title stands of approximately 500 square meters. The proposed Monavoni Ext51 development caters for sectional title

units and will be developed in such a way as to optimally make use of the surrounding open space areas.

The proposed mixed use development will also include business uses i.e. office developments. There is a need for some office developments in any residential development to provide professional suites, medical suites and other offices that are required to be situated in close proximity to residential erven, but with good access from the region.

The proposed land use complies with numerous planning policies and frameworks for the area (**refer to Section 7.9**).

5.2.3 Agricultural

The GAP 3 (Gauteng Agricultural Potential Atlas) indicates that the study area has a **high agricultural potential**.

Current land use in the area is not restricted to one specific use. Topsoil has been removed from large areas. Very few, if any of the surrounding landowners, use their properties for small-scale or other farming activities. It is clear that none of the surrounding landowners, at this stage or in the recent past have had any intensions of *bone fide* intensive farming activities on their properties.

The study area is situated within an area underlain by dolomitic conditions, and extensive irrigation of such soils is not supported.

Furthermore the study area is not situated within any of the 7 agricultural hubs identified for Gauteng and is located within the Gauteng Provincial Urban Edge.

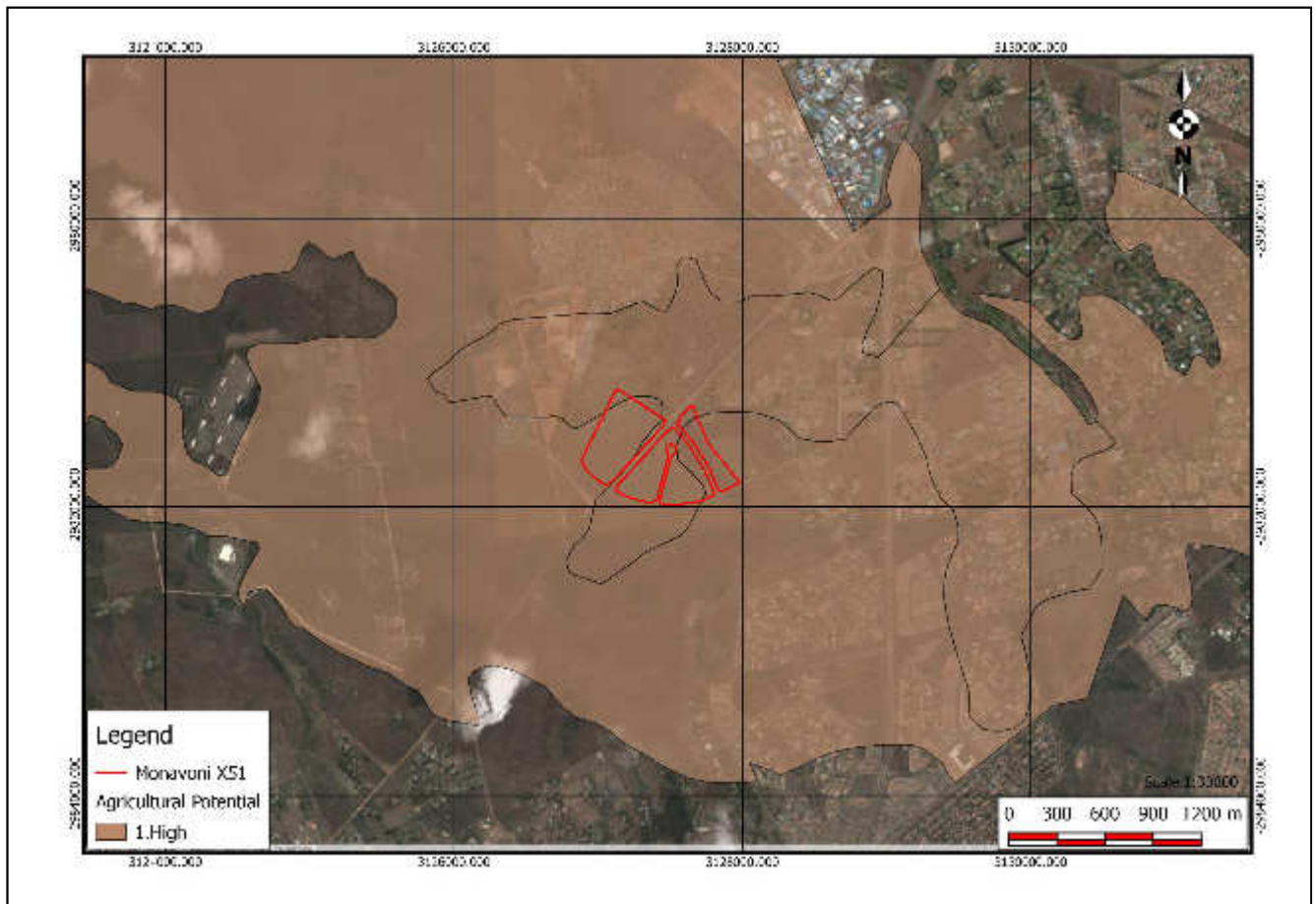


Figure 7: Agricultural Potential

5.2.4 Conservation

The north-western part of the study area site falls within the Hennopsvallei Conservancy. However the study area is not affected by any ridges or drainage lines that could create linkages with open space systems within the conservancy.

In terms of the Tshwane Open Space Framework, the study area is not affected by any green way, blue way, blue node, red node, red way, brown node or brown way. The proposed development Monavoni Ext 51 is however affected by a green node (**Hennops Rivier Conservancy**) and proposed brown node (**Proposed PWV9**).

Although the study area falls within the Hennops Rivier Conservancy the surrounding area is already disturbed by human activities such as a landfill site (Waste Group lies in the Conservancy) north west of the site and an informal settlement (also within the Conservancy) north of the site.

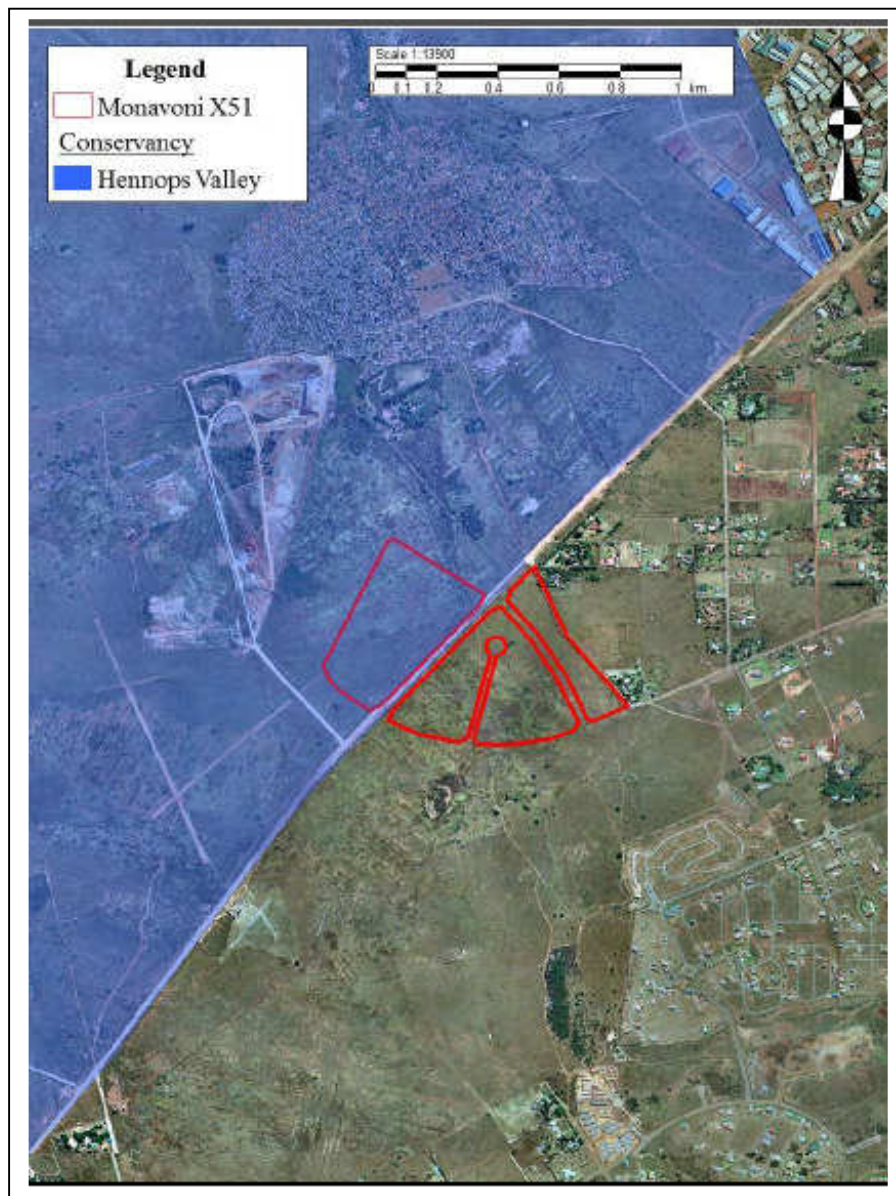


Figure 8: Conservancy Map

The Draft EIA Report was submitted to the Hennops Conservancy for comments on the 5th of February. Bokamoso did not receive any comments or objections for the Hennops Conservancy for the proposed development.

5.3 Locality Alternatives

Developable properties in the south-western section of Tshwane / south-western section of Centurion are very costly, because The City of Tshwane Metropolitan Municipality identified the area between the R55 and the Gerhardsville Road as a future growth area. As already mentioned the study area falls within an area earmarked for commercial and residential development according to the Monavoni and Western Farms Development Framework 2020.

In addition, the study area is located in close proximity to two major highways, the N14 (R28) and the proposed PWV 9. The site is therefore strategically located within the region and sufficient north south and east west links could be provided to ensure adequate distribution of traffic through the area, based on the current development patterns for the area.

It is also important to note that the involved study area forms part of a larger portion of land that was purchased by the developer for development purposes (**Refer to Figure 3, Monavoni Development Framework**). The study area is regarded as suitable for the proposed residential/industrial and office development and no locality alternatives were therefore considered.

5.4 Layout alternatives

Refer to Figure 9 and Annexure F for the Final layout

Although many layout and density alternatives were considered for the study area, the geotechnical conditions of the study area played a major form giving role in the finalized layout. The final layout was also tested against an environmental sensitivity map that was compiled for the study area. (**Refer to Figure 16 for Irreplaceable Site Map**).

The final layout is a product of a multi-disciplinary workshop (during the EIA phase) between the appointed professionals. At the workshops each discipline (including the

environmental consultant) was afforded the opportunity to share his/ her findings with the other members of the project team. The environmental consultants also presented the environmental sensitivity map to the project team during the workshops. **Refer to Figure 9 and Annexure F, Final Layout Plan.**

The Final Layout incorporates two Private Open Space erven in accordance to the Monavoni Framework which had been approved by the CoT Open Space Management Section.

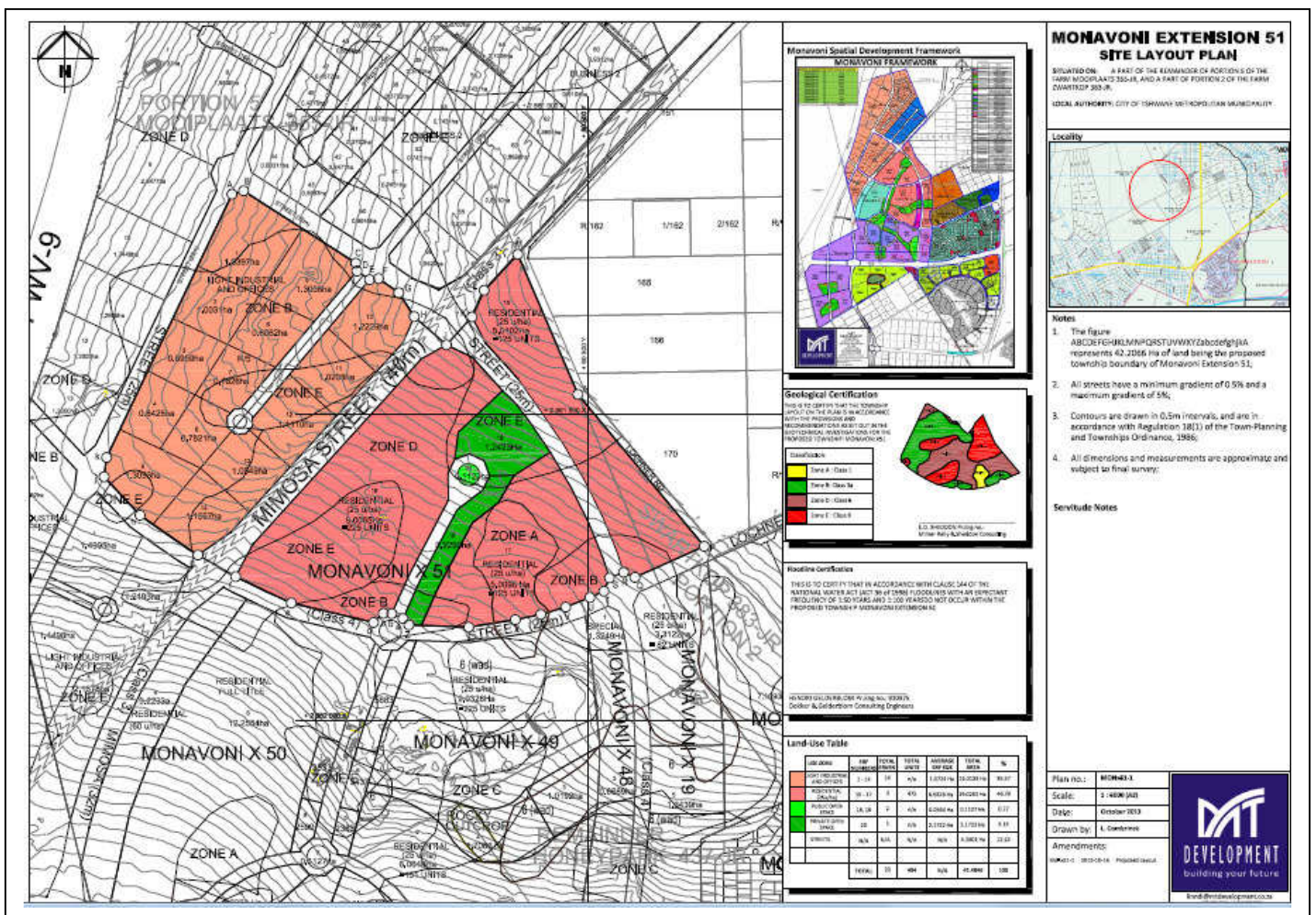


Figure 9 – Final Layout

5.5 Planning Approach

An investigative approach was followed and the relevant biophysical and socio-economic environmental aspects were assessed.

Legislation and guidelines applicable to the application were considered in the preparation of the report.

All available material and literature were collected and used for the purpose of this study and it was further supplemented with discussion with provincial authorities, local authorities, other interested and affected parties, as well as by site surveys and photographic recording.

6. THE DESCRIPTION OF THE BIOPHYSICAL AND SOCIO-ECONOMICAL ENVIRONMENTS – (In line with Section 32 (d))

This section briefly describes the biophysical and socio-economical environments. It also lists the anticipated adverse and beneficial impacts of the proposed development on the environment. Where possible, mitigation measures were supplied for the adverse impacts and the significance of the impacts listed was also indicated in specific impact tables. In some cases the impacts have already (during the planning phase) been addressed to such an extent that it was not regarded as necessary to carry the impacts over to the significance rating section of the report.

Although it was not necessary to mitigate the positive impacts listed in the impacts table, the positive impacts identified in this section of the report will also automatically be carried over to the significance rating section of the report to indicate the specific benefits associated with the proposed development. This will also make it possible to compare the severity of the adverse impacts with the advantages of the beneficial impacts and to eventually make an informed decision regarding the proposed development.

The following section incorporates the most important information supplied by specialist studies and reports.

6.1 THE BIO-PHYSICAL ENVIRONMENT

6.1.1 The Physical Environment

6.1.1.1 Geology and Soils

A Dolomite Stability Investigation was conducted by Relly, Milner and Shedden Consulting Earth Scientists (**Refer to Annexure G2**). The report covers the findings of a detailed dolomite stability investigation carried out for the proposed development.

The objectives of the investigation were to assess the dolomite stability of the site with respect to the formation of sinkholes and/or dolines (compaction subsidences). Information from previously drilled boreholes confirmed the presence of dolimitic sediments below this site.

Previous drilling phases were undertaken by Dolomite Technologies in April 2004 and by VGI Consultants in November 2005. Relly, Milner and Shedden Consulting Earth Scientists were appointed in 2009 and were involved in a single phase of drilling which was undertaken in July 2009.

Geology

According to available information the area is underlain by Dolomite and chert of the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup. The abundance of waddy soil associated with shallow dolomite in the area suggests the dolomite belongs to the top of the Oaktree Formation of the Malmani Subgroup.

The chemical sediments have been intruded by numerous sills and dykes of syenite in this region. The geological map indicates an extensive sill of syenite in the north eastern half of the site. Evidence of syenite was intersected at varying depths in numerous boreholes throughout the application site. The word syenite has been used loosely as a collective term to indicate the presence of igneous intrusive. Some consultants have referred to the intrusive as diorite.

The hard rock geology is mantled by an irregular layer of overburden material comprising both colluvial and residual soils. Dolomite and scattered syenite rock crop out on the site.

Method

The investigation focussed on re-assessing the existing drilling information and initiating further drilling in areas where subsurface information was regarded to be insufficient. A single phase of drilling was undertaken under RMS supervision.

Interpretation of the Geology

The residual gravity map (**Appendix B of Annexure G2**) is characterised by a fairly prominent gravity low through the eastern side in an almost NS direction. Less well-defined gravity low thoughts trend across the site at the northern end and again towards the south-western corner. The majority of the site characterised by "intermediate" plateaus. The gravity lows do not represent deeply weathered syenite as initially interpreted but rather a variety of geological conditions from wad, syenite and dolomite.

In general terms, the gravity lows tend to be areas where irregular subsurface conditions occur compared to the gravity highs or intermediate areas where fairly regular conditions are intersected be it shallow, fractured dolomite or weathered syentie.

The geological picture to emerge from the gravity survey and drilling is on shallow dolomite intruded by concordant and slightly transgressive syenite sills of varying thickness. It's most probable that more than one age intrusive is present but this is of academic importance only since all intrusive sills have a beneficial influence on the stability of a dolomite site.

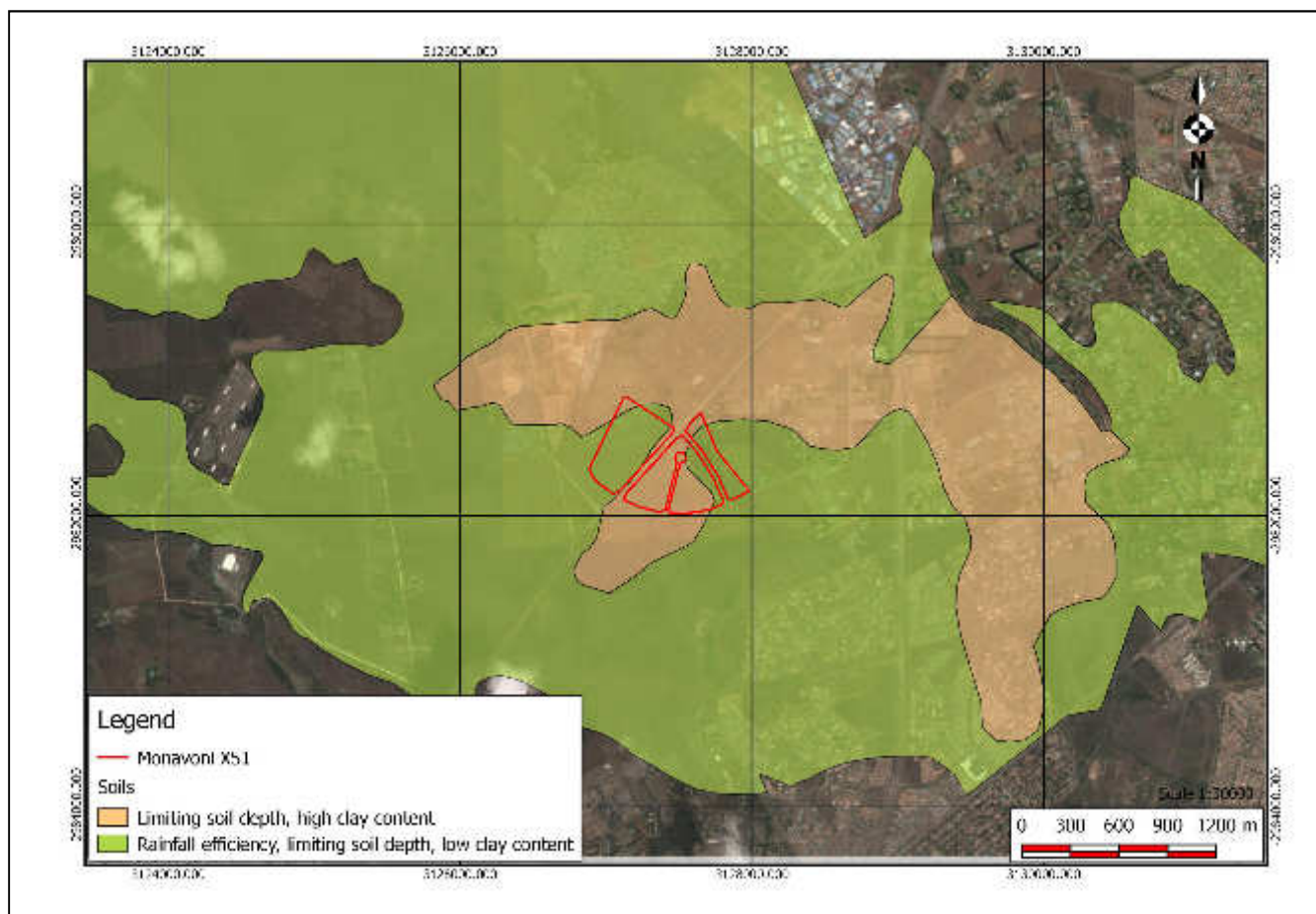


Figure 10 – Soils Map

Stability

The risk classification is based on the results of the gravity survey and the drilling results from 72 percussion boreholes. An assessment of the drilling results favours the site being subdivided into five Inherent Risk zones as dictated by the variation in geological conditions. **(Refer to Figure 10 – Soils Map).**

Zone A (Class 3a):

Risk: A low risk for any size sinkhole forming and a low risk of doline development is the inherent risk classification in both a dewatering and a non-dewatering scenario.

Development Potential: Restrictions are places on the type of development that may be considered on Class 3a land. The developer has indicated his intentions to focus on a mix of commercial and residential developments.

NHBRC Dolomitic Area Designation: This zone is assessed as D 3.

Location: The zone is located at the southern end of both Extension 50 and Extensions 51. The extent of the zone is indicated on the plan in Appendix D.

Zone B (Class 3b(3a,5)):

Risk: A medium to high risk for small size sinkholes forming and medium risk for medium size sinkholes developing and a medium to high risk of dolines developing are the inherent risk characterisations in both a dewatering and non-dewatering scenario.

Development Potential: Residential development may be considered in Zone B provided the recommendations in Table 1 in the draft SANS 1936 document are taken into account. The development potential is similar to Zone A although areas of shallow dolomite (Class 5) have severe restrictions than Class 3.

NHBRC Dolomitic Area Designation: This zone is assessed as D 3.

Location: A large portion of the centre of Extension 50 and two small areas in Extension 51.

Zone C (Class 5):

Risk: A medium to high risk for small size sinkholes and a medium to high risk of dolines developing are the inherent risk classification in both a dewatering and a non-dewatering scenario.

Development Potential: Any development will require footprint investigations for all structures. The presence of residual syenite within the ground profile and granite at depth limits the size of a sinkhole that can be expected along the western boundary. Commercial, retail and / or industrial development may be considered.

NHBRC Dolomitic Area Designation: This zone is assessed as D 3.

Location: Two small areas at the northern end of Extension 50 and a large portion of the western side of Extension 51.

Zone D (Class 6):

Risk: A high risk for small size sinkholes and a medium risk of medium size sinkholes forming and a high risk of dolines developing is the inherent risk classification in both a dewatering and a non-dewatering scenario.

Development Potential: Residential development is not recommended. Zone D is best suited for commercial, retail and industrial development provided additional exploratory work is undertaken to ensure suitable founding conditions.

NHBRC Dolomitic Area Designation: This zone is assessed as D 4 unless proved D3 by additional exploratory work.

Location: Scattered Island within Extension 50 and the eastern side of Extension 51.

The importance of careful water management cannot be over-emphasised as poor water control in one area may lead to some form of instability in another area. It is essential that prospective owners of erven in this development be made aware of the importance of the recommended precautionary measures. An indiscretion on one stand may induce some form of instability on an adjacent property. In an attempt to create and maintain and awareness of the risk of instability in a karst environment, a Risk Management Policy/Plan (**Annexure G2 – Appendix H**), has been drawn up by Relly, Milner and Shedden Consulting Earth Scientists for implementation on this site. The entire community, particularly the Home Owners' Associations, must be informed of the philosophy behind the risk management plan and what it aims to accomplish. The Local Authorities, under whose control the township is, must be aware of the responsibility they face ensuring the implementation of a risk management plan for the entire township. Responsibility for rapid response to instability must be impressed upon senior officials. Protracted delays in the repair and maintenance of bulk services may lead to catastrophic sinkhole development and loss of life. An effective DRMP can greatly reduce the probability of instability occurring within the established township.

Comments from the Council for Geoscience

Refer to Annexure H

The Dolomite Stability Investigation for the proposed Monavoni X 50 and 51 compiled by Relly, Milner and Shedden was submitted to the Council for Geoscience Council (CfG) for comments. According to correspondence from the CfG dated 18 September 2009 the CfG is in broad agreement with the risk assessment of the site. It is however recommended that BH's 44/13 and 6521 (39) (**Refer to Annexure G2**) should be incorporated into Zone D, IRC5.

The CFG supports the proposed Monavoni Ext51 development conditional to the following:

- The implementation of a stringent Dolomite Risk Management Plan is considered essential;

- Design for a 5m loss of support is considered essential;
- Footprint drilling will be required for most structures, as per draft SANS 1936 requirements.

The council has no objection to well founded, multi-storey residential developments. It is our understanding that such structures will be built to withstand the expected sinkhole/doline risk and thus not pose any physical or financial risk to individual homeowners.

6.1.1.1.e Issues and Impacts – Geology and Soils

Table 3: Issues and Impacts – Geology and Soils

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To Mitigate ☀️
1)	Restriction on land use types due to geology.	-	🟢
2)	Risk for formation of sinkholes and dolines	-	🟡
3)	Stability of structures	-	🟢
4)	Excavation problems are likely where dolomite pinnacles are present close to surface and blasting may be required.	-	🟢
5)	Erosion	-	🟡
6)	Stockpile areas for construction materials and topsoil	-	🟡

6.1.1.1.f Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

1) Restriction on land use types due to geology.

The land uses are restricted due to underlying dolomite and the land uses and layout plan for the proposed development must correspond to the stability zonation and development types recommended by the involved geotechnical engineer.

Table 4: Significance of Issue 1 (Restriction on land use types) After Mitigation

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during Planning phase, Construction and/ or Operational phase</p> <p>P / C / O Mitigation</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>P & C</p> <p>The layout and land uses must correspond to the stability zonation and development types recommended by the geotechnical engineer.</p>	<p>L - To be included in EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

2) Risk for formation of sinkholes and dolines

If the NHBCRC precautionary measures for development on dolomite are not implemented there is a risk for the formation of sinkholes and dolines.

Table 5: Significance of Issue 2 (Risk for formation of sinkholes and dolines) After Mitigation

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 😐 Low 🟡</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ☀️</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during Planning phase, Construction and/ or Operational phase</p> <p>P / C / O Mitigation</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 😐</p>	<p>P & C – The NHBRC precautionary measures for development in dolomitic areas must be implemented (Refer to Appendix G, Annexure F).</p> <p>P, C & O – A dolomite risk management plan was compiled for this township in general and copies was submitted to the Council for Geoscience and the NHBRC. This system must be practical with detailed requirements applicable to the township. This can, however, only be confirmed and approved after the township to be established has been approved.</p> <p>P, C & O – The application of strict water precautionary measures for the development is essential. Stormwater management on the study area is extremely important to prevent the concentration of stormwater. No accumulation of surface water is to be permitted and the entire development must be properly drained.</p> <p>P, C & O – During construction the developer must ensure that</p>	<p>H - To be included in EMP</p> <p>H - To be included in EMP</p> <p>H - To be included in EMP</p>

Table 6: Significance of Issue 3 (Stability of structures) After Mitigation

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 😊 Low 🟡</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ⚡</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during Planning phase, Construction and/ or Operational phase</p> <p>P / C / O Mitigation</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 😊</p>	<p>P & C – The precautionary measures for construction on dolomite must be implemented</p> <p>P & C – In Zones A & B where residential development is recommended, additional drilling will have to be conducted to the drilling densities stipulated in the CGS Guideline to Consultants November 2007 document. Thus further footprint investigations will be required for certain categories of development in Zone A. In Zone B residential development may be considered but densities would be limited to between 10 and 25 units per ha. No residential development should be considered in Zones C to E. For the proposed commercial and industrial uses in Zones C, D & E it is recommended that footprint drilling is conducted. The old borrow-pit must be excluded from any form of development because of the lack of exploratory work.</p> <p>P & C – Detailed foundation investigations should be done for large structures because residual dolomite material may</p>	<p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p>

	<p>experience settlements under load or be collapsible.</p> <p>P & C – It is recommended that excavations (for foundations and underground services) be inspected on the site to ensure that conditions at variance to that described can be noted and the necessary adjustments made.</p> <p>P & C – Detailed foundation inspections should be carried out at the time of construction to identify variances and adjust foundation designs accordingly if need be.</p>	<p>M - To be included in EMP</p> <p>M - To be included in EMP</p>
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Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

4) Excavatability problems are foreseen and some blasting exercises may be required

Excavation problems are likely where dolomite pinnacles are present close to surface and blasting may be required.

Table 7: Significance of Issue 4 (Excavatability problems are foreseen and some blasting exercises may be required) After Mitigation

Mitigation Possibilities High 🟢 Medium 🟡 Low 🟠 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during Planning phase, Construction and/ or Operational phase P / C / O Mitigation	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	<p>C – Surrounding residents must be informed of blasting exercises at least one week in advance.</p> <p>C – Blasting operations should</p>	<p>M - To be included in EMP</p> <p>M - To be included in EMP</p>

	be carefully controlled and the necessary safety precautions must be implemented.	
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Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

5) Erosion

Unnecessary clearing of vegetation could lead to exposed soils prone to erosive conditions. Insufficient soil coverage after placing of topsoil, especially during construction where large surface areas are applicable could also cause erosion. To cause the loss of soil by erosion is an offence under the Soil Conservation Act (Act No 76 of 1969). The management of surface water run-off during construction is very important to prevent soils erosion on the site. If construction takes place during the rainy season, sufficient storm water management will be required to manage water runoff. This is especially important due to the dolomite conditions on site. All mitigation measures from the Geotechnical and Risk Management Plan must be adhered to the implemented.

Table 8: Significance of Issue 5 (Erosion) After Mitigation

Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ⚡	Mitigation	Significance of Issue after mitigation
	Already achieved ✓ Must be implemented during Planning phase, Construction and/ or Operational phase P / C / O Mitigation	Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
Medium 🟡	P & C - A storm water management plan was compiled for the construction and operational phases of the proposed development.	M - To be included in EMP

	<p>P & C - The storm water management plan was submitted to the local authority and Council for Geoscience for approval.</p> <p>P & C - Due to the fact that most of the study area is underlain by dolomite no natural channels will be allowed. All open channels and attenuation ponds must be lined with concrete. Concentrated surface drainage is also not permitted.</p> <p>P & C - Large exposed areas during the construction phases should be limited. Where possible areas earmarked for construction during later phases should remain covered with vegetation coverage until the actual construction phase. This will prevent unnecessary erosion and siltation in these areas.</p> <p>P & C - Rehabilitate exposed areas immediately after construction in these areas is completed (not at the end of the project).</p> <p>P & C - Unnecessary clearing of flora resulting in exposed soil prone to erosive conditions should be avoided.</p> <p>P - Specifications for topsoil storage and replacement to ensure sufficient soil coverage as soon as possible after construction must be implemented.</p> <p>P & C - All embankments must be adequately compacted and planted with grass to stop any excessive soils erosion and scouring of the landscape.</p>	<p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>L - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p>
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	<p>C – Storm water diversion measures are recommended to control peak flows during thunder storms.</p> <p>P & C – The eradication of alien vegetation should be followed up as soon as possible by replacement with indigenous vegetation to ensure quick and sufficient coverage of exposed areas.</p>	<p>M - To be included in EMP</p> <p>M - To be included in EMP</p>
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Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

6) Stockpile areas for construction materials and topsoil

Designated areas for stockpiling of construction materials must be specified by the Environmental Control Officer in an area that is already disturbed. Stockpiling in the wrong areas might be detrimental to fauna and flora and will deplete the soil quality. Topsoil should be stockpiled as specified in the EMP to ensure that the soil quality doesn't deplete and that the grass seed remain in the soil for later rehabilitation of the disturbed areas.

In addition to the impact discussed in the paragraph above, rainwater falling onto stockpiles may become polluted with dust originating from aggregate and other construction material, such as bitumen from pre-mix stockpiles. Therefore stockpiles of topsoil should be correctly covered to prevent this as well as loss of topsoil by wind erosion.

Table 9: Significance of Issue 6 (Stockpile areas for construction materials and topsoil) After Mitigation

Mitigation Possibilities	Mitigation	Significance of Issue after mitigation
High 🟢 Medium 😊 Low 🟡	Already achieved ✓	Low/ eliminated L / E
Positive Impact/ Neutral - Not	Must be implemented during	Medium M

<p>Necessary To Mitigate ☠</p>	<p>Planning phase, C Construction and/ or O Operational phase P / C / O Mitigation</p>	<p>High H Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 😊</p>	<p>C - Remove vegetation only in designated areas for construction.</p> <p>C - Rehabilitation works must be done immediately after the involved works are completed.</p> <p>C -All compacted areas should be ripped prior to them being rehabilitated/landscaped.</p> <p>P/C - The top layer of all areas to be excavated must be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. This stockpiled material should be used for the rehabilitation of the site and for landscaping purposes.</p> <p>C - Strip topsoil at beginning of works and store in stockpiles no more than 1,5 m high in designated materials storage area.</p> <p>C - Stockpiles should be covered correctly.</p>	<p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p> <p>M - To be included in EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

6.1.1.2 Hydrology

6.1.1.2.a Surface Hydrology (Refer to Figure 11, Hydrology Map)

Storm water will drain in a north-eastern direction towards a proposed storm water channel. The study area has a gradual slope in a northeasterly direction. It is expected that the slope will be sufficient to allow for natural storm water drainage as well as for the installation of essential services. The topographical characteristics will have no detrimental effect on the development potential of the site. Refer to Figure 11, Hydrology Map.

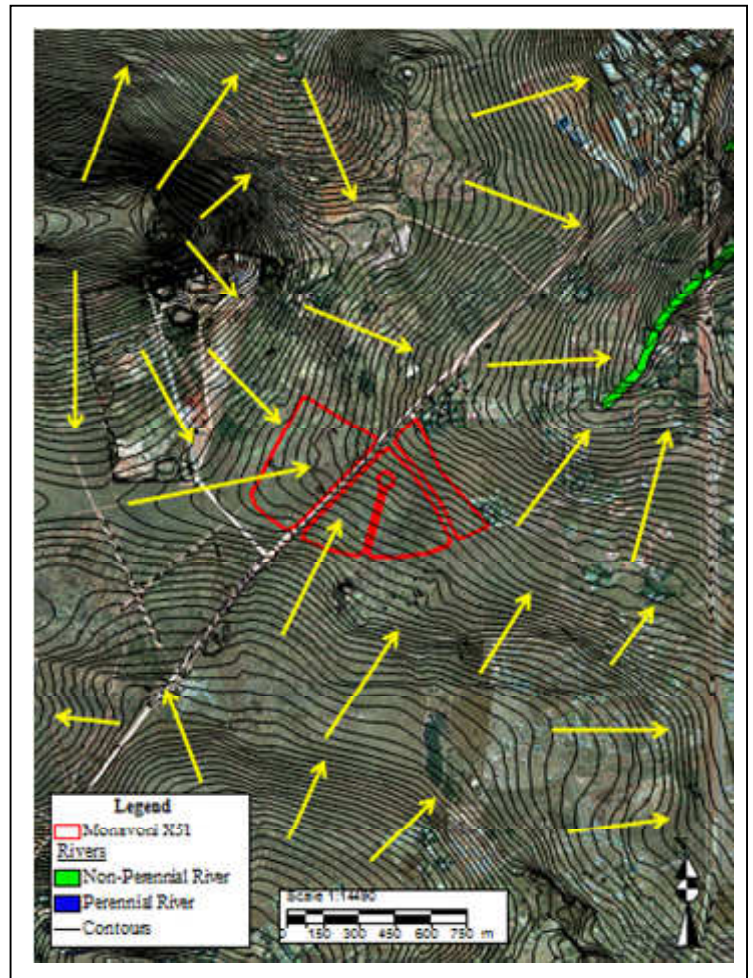


Figure 11 – Hydrology Map

6.1.1.2.b Sub-Surface Hydrology

The groundwater situation of the study area was investigated during the Geotechnical study in order to determine the specific impacts on the proposed development on groundwater and the implications this will have for the proposed development. It was concluded that the dolomitic groundwater rest level in the vicinity of the site has not experienced a natural fluctuation of more than 8m in the past two decades. These circumstances can be expected to continue for as long as no “new” large scale groundwater abstraction (e.g. for irrigation purposes) is developed in proximity to the subject area. Thus groundwater use in the subject area and surrounds is probably limited to domestic water supply, garden irrigation and limited stock watering applications associated with land use activities that are characteristic of small holdings.

Groundwater Occurrence and Yield

The study area is located in the Erasmia compartment as identified by Hobbs (2004). This compartment is formed by roughly north-south trending groundwater divides of which that forming the western boundary as shown in **Figure 9 of Appendix E, Annexure G2**. The divider forming the eastern boundary is located outside the map area.

It is expected that groundwater occurrence within the area will be associated with both dolomitic and intrusive (syenite) strata, i.e. groundwater is likely to be encountered in either or both of these formations. Information presented by Hobbs (1988) indicates borehole yields in the order of 0.8 to 1.3 L/s for dolomite, and 0.1 to 0.6 L/s for syenite.

Groundwater Flow Pattern

The groundwater flow pattern in the subject area is shown by the vector in **Figure 14 of Appendix E, Annexure G2**. This indicates that groundwater drainage locally occurs from southwest to northeast, i.e. out of the granite environment into the dolomitic system. It is also evident, however, that the western margin of the subject area coincides with the groundwater divide that forms the western boundary of the Erasmia compartment. Hobbs (1988) has shown that the regional groundwater flow pattern is centered on the Hennops River. Under these circumstances, the Erasmia compartment drains in a westerly direction, its “decant” position coinciding with the course of the Hennops River.

The groundwater contours across the subject area in **Figure 14 of Appendix E, Annexure G2** describe a hydraulic gradient in the order of 0.020 (1:50). This is slightly shallower than, but similar to, the surface gradient of 0.024 (1:24).

Water Level Fluctuation

An indication of the possible magnitude of groundwater level fluctuation in the region must be inferred from DWA monitoring data. The latter are sourced from monitoring boreholes, and the closer such borehole is to the subject area, the more representative its record will

be. The nearest DWA exploration borehole to the subject area is G37842 located in the Swartkop Nature Reserve close to the intersection of the Hennops River and the R55 road. The position of this borehole has been documented in a number of similar reports to this, e.g. Hobbs (2003 & 2004b).

Borehole G37842 was visited on 30 August 2003 when it was found to be infested by bees, rendering access for water level purposes impossible. Nevertheless, the record for monitoring station G37842 is reproduced, together with the coincident rainfall record. The rainfall record is associated with the Wierda Park gauging station no. 0513232 8. The water level record indicates a difference of 4,52m between the shallowest (-7.35 m) and deepest (-11.87 m) values in the period June 1986 to July 1996. It also indicates a remarkable constancy of water level in the period June 1986 to January 1993.

Although the irregularity of water level measurements militates against a rigorous correlation with the monthly rainfall pattern, it would appear that the rainfall in the period January 1986 to January 1993 did not exhibit any major deviations, i.e. excessively wet or dry periods. The average annual rainfall in this period amounted to 623 mm, which is 85 mm below the long term average value of 708 mm recorded in the period January 1974 to December 2001.

It is also evident that the greater water level depth measured in July 1996 followed an exceptionally wet summer. These circumstances are anomalous in that the opposite response in water level might be expected. As a consequence, not too much significance was afforded this value under circumstances where researching the reason for this anomalous response was not necessary for the purposes of the study.

An additional indication of the magnitude of groundwater rest level fluctuation in the Erasmia compartment is provided by Hobbs (2004a). From a comparison of *circa* 1972 groundwater rest level data reported by Temperley (1978) with 1986 data reported by Hobbs (1988), it is apparent that no change in this parameter was recorded in this 16-year period for three localities to the north-northeast of the subject area.

Within the framework of these discussions, it is considered reasonable to conclude that the natural groundwater level fluctuation in the Erasmia compartment and, therefore, in the vicinity of the subject area, did not experience a vertical variation of greater than about 5m in the 24 –year period from 1972 to 1996. Further, it is reasonable to presume that the subsequent period to the present has not witnessed a markedly different response pattern.

Groundwater Use

Groundwater use in the subject area and surrounds is probably limited to domestic water supply, garden irrigation and limited stock watering applications associated with land use activities that are characteristic of small holdings. The conversion of the subject area from agricultural farm land to residential and commercial land use will no doubt mitigate even these small scale water uses.

Conclusion and Recommendation

It was concluded by the specialist that the dolomitic groundwater rest level in the vicinity of the site has not experienced a natural fluctuation of more than 8m in the past two decades. These circumstances can be expected to continue for as long as no “new” large scale groundwater abstraction (e.g. for irrigation purposes) is developed in proximity to the subject area.

It is recommended that the routine evaluation of groundwater level monitoring data collected by the DWA in the subject area should form part of the risk management plan **(Refer to Appendix H, Annexure G2)** that is implemented for the proposed residential and commercial development. Since the DWA does not routinely evaluate these data, it will be necessary to source this service from a reputable and experienced groundwater scientist. The principal focus in this regard should be directed at borehole G37813. As a consequence, the developers must take every precaution to secure the continued existence of this DWA monitoring station.

6.1.1.2.c Flood Lines

The study area is **not** affected by any rivers, drainage lines or wetlands and therefore is not affected by a flood line with an expected frequency of 1:50 years or 1:100 years.

Refer to Figure 11, Hydrology Map

6.1.1.2.c Issues and Impacts – Hydrology

Table 10: Issues and Impacts – Hydrology

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ☀️
7)	Siltation, erosion and water pollution could occur in the main, unnamed tributary of the Swartbooispruit, especially in the upper section of the main tributary, if a stormwater management plan is not implemented.	-	🟡
8)	Lowering of groundwater	-	🟡
9)	Groundwater pollution	-	🟡
10)	Removal of vegetation coverage, increased hard surfaces and increased erosion, surface water pollution and siltation problems	-	🟢

6.1.1.2.d Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

- 7) Siltation, erosion and water pollution of the unnamed, main tributary of the Swartbooispruit, especially in the upper section of the main tributary, could occur if a storm water management plan is not implemented.

If erosion, siltation and water pollution is not addressed, the sustainability of the drainage especially in the upper section of the main tributary can be negatively impacted by the development.

Table 11: Significance of Issue 7 (Siltation, erosion and water pollution) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🟠</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during Planning phase, Construction and/ or Operational phase</p> <p>P / C / O Mitigation</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 🟡</p>	<p>P / C / O -</p> <p>The storm water design for the proposed development must be designed to:</p> <ul style="list-style-type: none"> - Prevent bank and riparian zone erosion especially in the upper section of the main tributary. - Reduce and/ or prevent siltation, erosion and water pollution. If erosion, siltation and water pollution is not addressed, the sustainability of the drainage and the open 	<p>M - To be included in EMP</p>

	<p>space systems especially in the upper section of the main tributary can be negatively impacted by the development.</p> <ul style="list-style-type: none"> - Storm water runoff should not be concentrated as far as possible and sheet runoff from paved surfaces need to be curtailed. - Runoff from paved surfaces should be slowed down by the strategic placement of berms. - The vegetation must be retained as far as possible, and rehabilitated if disturbed by construction activities to ensure that erosion and siltation do not take place. - No trees should be planted within five meters of the line of the water bearing services. 	
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Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

8) Lowering of groundwater.

Any local or regional artificial lowering of the groundwater may impact negatively on the stability of portions of the site and the surrounding Monavoni area. Although there will be no boreholes on this site boreholes or other activities which could result in the lowering of groundwater may occur on adjacent sites.

Table 12: Significance of Issue 8 (Lowering of groundwater) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 🟡</p>	<p>P / C / O -</p> <ul style="list-style-type: none"> Ongoing monitoring of groundwater levels on and in the immediate vicinity of the site is recommended. Groundwater management will need to form an integral part of the Dolomite Risk Management Strategy. 	<p>M - To be included in EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

9) Groundwater pollution

The dolomitic formation is regarded as the best aquifer in South Africa and it has a very high yielding and storage capacity as well as a high recharge potential. The ground water pollution potential on the study area is regarded as high and if not planned and managed correctly, the construction and operational phases of the proposed road could cause sub-surface water pollution.

The storm water management plan must be designed to:

- Reduce and/ or prevent siltation, erosion and water pollution; and

- Improve the surface and ground water quality of the study area and the lower lying areas within the catchment area.

Table 13: Significance of Issue 9 (Ground water pollution) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 🟡</p>	<p>P/C/O - Compilation of a storm water management plan that will address storm water management during the construction and operational phases of the project</p>	<p>M - To be included in EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

- 10) Removal of vegetation coverage, increased hard surfaces and increased erosion, surface water pollution and siltation problems

At present the study area is covered with vegetation and surface drainage is taking place. The development will add large amount of hard surfaces such as paving and structures with roofs to the study area. The proposed development will also lead to the compaction of soils. The soils layers will thus become less permeable, storm water will be canalised rather than evenly spread. The quantity and speed of the storm water will increase significantly and the quality of the surface water will deteriorate, because of the lack of vegetative coverage. Erosion and siltation will also become a problem.

In order to address this issue, it will be necessary to compile a storm water management plan/ system for the proposed development. The storm water management plan must be designed to:

- Reduce and/ or prevent siltation, erosion and water pollution. If erosion, siltation and water pollution is not addressed, the long-term sustainability of the water bodies and open space systems lower down in the catchment area cannot be guaranteed; and
- Improve the surface and ground water quality of the study area and the lower lying areas within the catchment area.

Table 14: Significance of Issue 10 (Removal of vegetation coverage, increased hard surfaces and increased erosion, surface water pollution and siltation problems) After Mitigation/ Addressing of the Issue

Mitigation Possibilities	Mitigation	Significance of Issue after mitigation
High 🟢 Medium 🟡 Low 🟠 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	P - Compilation of a storm water management plan that will address storm water management during the construction and operational phases of the project	M - To be included in EMP and conditions of approval

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

6.1.1.3 Topography

The slope is gradual and descends in a north-easterly direction. The slope is sufficient to allow for natural storm water drainage as well as for the installation of essential services. **Refer to Figure 12, 3-Dimensional Map.**

The topographical characteristics will have no detrimental effect on the development potential of the site.

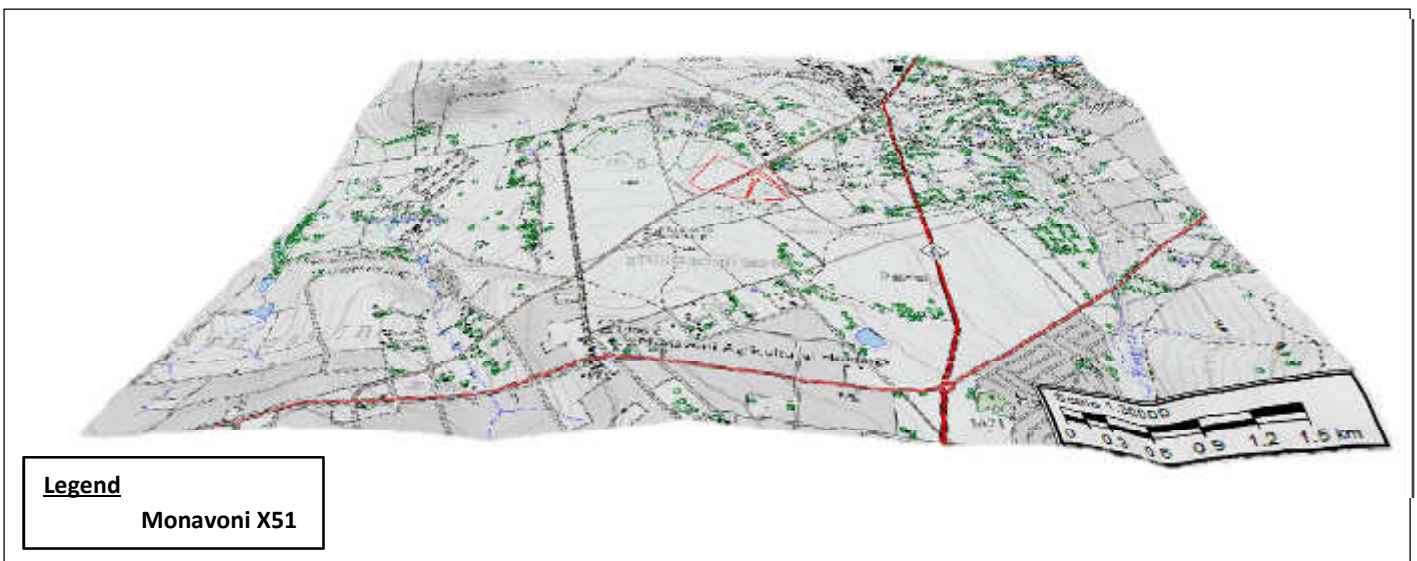


Figure 12: 3 Dimensional Map

6.1.1.4a Issues & Impact Identification – Topography

Table 15: Issues and Impacts – Topography

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To

			Mitigate ☀
11)	Due to the topography the development will be visible from view sheds in the flatter areas around the study area. It will also be visible from the proposed PWV9 adjacent to the site and K52 which traverses the site.	- / + Depending on the architectural style and finishes	☺
12)	If not planned correctly, roofs and parking areas could reflect the sun into the eyes of oncoming traffic and surrounding landowners.	-	☺
13)	If not planned and managed correctly the lights (interior and exterior) and the signage of the development could cause visual pollution.	-	☹

6.1.1.4.b Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

11) Due to the topography the development will be visible from view sheds in the flatter areas around the study area as well as the proposed PWV 9 and K52.

Table 16: Significance of Issue 11 (Parts of the Development will be visible from view sheds in the flatter areas around the Study Area) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High ☺ Medium ☹ Low ☐ Positive Impact/ Neutral - Not Necessary To Mitigate ☀	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
	P - Architectural and	M - To be incorporated as part

<p>Medium ☹️</p>	<p>landscaping guidelines must be supplied in the EMP and the proposed Architectural theme must blend in with the surrounding area.</p> <p>P – The colour scheme should be taken from the palette of colours in the natural surroundings.</p> <p>P – Existing trees should be retained as far as possible on the site in order to soften the impact of the proposed permanent structures and to bring the scale of the higher structures down to a more human scale.</p> <p>P – Landscaping should be done in concurrence with the building construction in order to create an instant visual enhancement of the development. Also be adhere to the Geotechnical conditions,</p> <p>P – The landscaping of the proposed development should blend in with the natural vegetation of the area. Trees, shrubs and groundcovers that are endemic to the area and/or indigenous should preferably be used – landscaping that is in line with the natural vegetation of the area will not only help to reduce the visual impact of the development, but it will also create habitats for fauna and flora species.</p>	<p>of the EMP</p> <p>M – To be incorporated as part of the EMP</p> <p>M – To be incorporated as part of the EMP</p> <p>M – To be incorporated as part of the EMP</p> <p>M – To be incorporated as part of the EMP</p>
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Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

12) If not planned correctly, roofs and parking areas could reflect the sun into the eyes of oncoming traffic and surrounding landowners and hikers.

Although the nuisance factor of this impact is regarded as high, it is easy to mitigate. The roof materials used for buildings and structures must be non-reflective materials and trees with wider canopies should be planted in areas visible from the higher view sheds and shrubs should be planted at strategic points to screen-off cars that are visible from the lower lying surrounding properties. Walls and earth berms could also be used to screen-off the impacts of cars in parking areas. Caution should be taken with the planting of trees etc. and the conditions and the pre cautionary mitigation measures of the Geotechnical report should be adhered to.

Table 17: Significance of Issue 12 (Roofs and Parking Areas Could Reflect the Sun into the Eyes of Oncoming Traffic and Surrounding Landowners) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 🟡</p>	<p>P/C – Roof materials used for buildings and structures must be non-reflective materials and not bright.</p> <p>P – Suitable plant materials should be used at strategic points to screen off impacts caused by roofs and cars in large parking areas.</p>	<p>L - To be included in EMP</p> <p>L – To be incorporated as part of the EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

13) If not planned and managed correctly, the lights of the development (exterior and interior) and the lights of signage could cause visual pollution during the night.

If not planned and managed correctly, the exterior lighting (i.e. flood lights) associated with the development could have a visual impact and especially be of nuisance to traffic on nearby roads. The placement of the exterior lighting and the type of exterior light and globes to be used in the landscape will determine the level of pollution.

Table 18: Significance of Issue 13 (The Lights Of The Development (Exterior And Interior) And The Lights Of Signage Could Cause Visual Pollution During The Night) After Mitigation / Addressing of the Issue

Mitigation Possibilities	Mitigation	Significance of Issue after mitigation
High 🟢 Medium 😊 Low 🟡 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
Medium 😊	P/C – The generation of light by night events, security lighting and other lighting shall be effectively designed so as not to spill unnecessary outward into the oncoming traffic, or into the yards of the neighbouring properties or open spaces.	L - To be included in EMP

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

6.1.1.5 Climate

The climate is typical of the Transvaal Highveld. The summers are mild to hot and the winters are mild with severe frequent winter frosts. The study area falls into a summer rainfall region. The moisture index is between 0-20, indicating a sub-humid area.

Climatic data for the site was taken from the weather station in Irene.

Wind

Summer prevailing winds is in a northwestern direction and winter winds in a southeastern direction.

Temperature °C

In the summer average maximum 26, 7 °C and the minimum 14, 4 °C in summer. During the winter average maximum temperature 18, 2 °C and the minimum 2, 7 °C.

Rain

Maximum annual rainfall for the area is 960 mm, and the minimum 559 mm, with an average of 717 mm.

Lighting

87 Days

Hail

4 Days

Should the construction phase be scheduled for the summer months, frequent rain could cause very wet conditions, which makes construction and environmental rehabilitation works extremely difficult. Such wet conditions often cause delays to building projects and the draining of water away from the construction works (in case of high water tables) into the nearby water bodies, could (if not planned and managed correctly) have an impact on the water quality of these water bodies.

If dry and windy conditions occur during the construction phase, dust pollution could become a problem. During the summer months dust pollution could be carried over other proposed Monavoni developments surrounding it.

6.1.1.5.a Issues & Impact Identification – Climate

Table 19: Issues and Impacts – Climate

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To Mitigate ☀️
14)	Should the construction phase be scheduled for the summer months, frequent rain could cause very wet conditions, which makes it extremely difficult to build in and to do rehabilitation works of disturbed areas.	-	😊
15)	If dry and windy conditions occur during the construction phase, dust pollution could become a problem. The south-eastern winds will most probably carry some dust over the M57. Although this impact will only be a short term impact, mitigation will be necessary during the construction phase.	-	😊

6.1.1.5.b Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

14) Should the construction phase be scheduled for the summer months, frequent rain could cause very wet conditions, which make it extremely difficult to build in and to do rehabilitation works of disturbed areas.

These wet conditions often cause delays to building projects and the draining of water away from the construction works (in the case of high water tables) into the water bodies of the adjacent properties, could (if not planned and managed correctly) have an impact on the water quality of these water bodies.

Table 20: Significance of Issue 14 (Should the construction phase be scheduled for the summer months, frequent rain could cause very wet conditions, which makes it extremely difficult to build in and to do rehabilitation works of disturbed areas) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>P/C – Construction workers and construction vehicles and machinery must stay out of the soggy areas during the wet periods. Barrier tape should be used to demarcate the areas that are drenched with water (especially the ecologically sensitive areas and the areas covered with valuable topsoil) and it should only be removed when the appointed Environmental Control Officer</p>	<p>L - To be included in EMP</p>

	(ECO)/ site supervisor/ project manager/ main contractor regard the conditions in the affected areas as favourable.	
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Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table.

15) If dry and windy conditions occur during the construction phase, dust pollution could become a problem.

The south-eastern winds will most probably carry some dust over the M57. The negative impact of dust is generally associated with the construction phase and is temporary.

Sweeping of the construction site, clearing of builders' rubble and debris as well as the regular watering of the construction site (storage areas, roads etc.) must take place at least once a day.

Table 21: Significance of Issue 15 (Dust Pollution) After Mitigation/ Addressing of the Issue

Mitigation Possibilities	Mitigation	Significance of Issue after mitigation
High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	P/C - Sweeping of the construction site, clearing of builders' rubble and debris as well as the regular watering of the construction site (storage areas, roads etc.) must take place at least once a day.	L - To be included in EMP

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

6.1.2 THE BIOLOGICAL ENVIRONMENT

Refer to Annexure G3 for the Fauna and Flora Survey.

According to GDARD Biodiversity requirements the following biodiversity studies be conducted on the study area: **(Refer to Annexure I)**

- Birds, with specific reference to Whitebellied Korhaan.
- Reptiles, with specific reference to Striped Harlequin Snake.
- Caves
- Vegetation.

No wetland was located during site investigations and therefore no wetland study was conducted.

The study area

According to **Galago Environmental** the site is 2 km south-west of Sunderland Ridge in the Gauteng Province. The Study area is situated at the Grassland Biome and is represented by Carletonville Dolomite Grassland vegetation type (Mucina & Rutherford 2006). Distribution: In South Africa the Carletonville Dolomite Grassland is found in North West, Gauteng and marginally into the Free State Province.

The Carletonville Dolomite Grassland ranges from the region of Potchefstroom to Ventersdorp and Carletonville extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in the Gauteng Province. Altitude ranges from 1360-1620 m, but largely 1500-1560 m (Mucina & Rutherford 2006). Vegetation

and landscape features: Slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (Mucina & Rutherford 2006). Geology and soils: This area occurs almost exclusively on the dolomites of the Malmani Subgroup (Transvaal Supergroup). Climate: Warm-temperate, summer-rainfall region, with overall mean annual precipitation of 560 mm. High summer temperatures. Severe frequent frost occurs in winter (Mucina & Rutherford 2006).

6.1.2.1 Vegetation

Three plant communities were identified on or within 200m of the study area:

- Natural primary grassland;
- Old cultivated fields; and
- Excavated area vegetation.

Medicinal plants

Of the 179 plant species recorded on the site, 29 species with medicinal properties were found.

Alien plants

Thirteen alien plant species, of which two were Category 1 Declared weeds, were recorded on the study site.

Orange-listed species

The habitat of the Natural primary grassland was suitable for only one of the Orange-listed species known to occur in the 2528CC quarter degree grid square. This species, *Hypoxis hemerocallidea* (African potato) was found sparsely scattered over the entire study site. A relocation operation was not considered viable.

Red-listed species

The surface dolomite areas in the Natural primary grassland of the site were suitable for the Red-List legume species known to occur within 5 km of the study site. However, this species was **not** found.

Natural Primary Grassland

The Natural primary grassland was dominated by *Themeda triandra* (Red grass). According to Galago Environmental connectivity with natural grassland existed to the north and east of the site, however, the portions to the north are also currently being considered for development.

The species diversity of the Natural primary grassland was high. Of the 149 species recorded, 147 were indigenous species.

Because this vegetation community was deemed natural primary grassland, it was considered sensitive.

The habitat of the Natural Primary Grassland and the Rocky Outcrop vegetation is regarded as suitable for the Orange-listed *Hypoxis hemerocallidea* (African Potato). Species were found sparsely scattered in these two vegetation communities. These plants should be relocated to a safe, suitable area approved by GDARD. The whole site and its surroundings are undeveloped although ecologically disturbed. It is clear that annual veld fires have taken its toll on the quality of the basal cover, and consequently on biodiversity.

The Natural Primary Grassland (including the Rocky Outcrop) on the site was deemed **sensitive**.

Old cultivated fields

The Old cultivated fields vegetation community comprised secondary grassland, well on its way to recovery and dominated by *Hyparrhenia hirta* (Common thatching grass) and *Cynodon dactylon* (Couch grass). Geophytes and perennial herbaceous species occurred scattered throughout the vegetation community.

Connectivity with the natural grassland to the north and west existed, although these areas are also currently being considered for development. The species diversity was low. Of the 44 species recorded, 35 were indigenous species.

This vegetation community was **not** considered sensitive.

Findings and potential Implications

During the most recent site visit, the specialist found that the study site was unchanged except for a deep services trench that ran along the eastern boundary of the site. Division of the large area of Natural primary grassland into small townships corridors of natural vegetation to facilitate connectivity will result in destruction of the natural plant species diversity of the area.

Conclusions and recommendations made by Galago Environmental:

- **No** Red-listed plant species were found.
- The Natural primary grassland on the site was deemed sensitive.
- The Orange- listed *Hypoxis hemerocallidea* (African potato) was found sparsely scattered in the Natural primary grassland and the Rocky outcrop vegetation habitats. These plants should be relocated to a safe, suitable area approved by GDARD.
- Corridors of Natural primary grassland that have not been disturbed by services trenches should be included in all the planned new townships of Monavoni and on the neighbouring sites that are to be developed together with these sites. These

corridors should be connected to the rocky outcrop on the study site and on the other portions that are being developed and to the *Acacia karroo* vegetation in the eastern part of Monavoni to facilitate connectivity.

- These areas must be properly managed throughout the lifespan of the project in terms of fire, eradication of exotics etc. to ensure continuous biodiversity.

6.1.2.2 Vertebrate Faunal Survey

Mammals

The local occurrences of mammals are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of global distribution ranges. Sight records and information from residents or knowledgeable locals audit such deductions.

There is only one habitat type, terrestrial on the study area. A few termitaria are present and no bat caves occur on the site.

Observed and expected species richness

Of the 28 mammal species expected to occur on the study site, only three species were confirmed during the site visit i.e. *L. saxatilis*, *C. hottentotus*, *C. penicillata*, all of which are widespread and common. With their proven wide habitat tolerance and/or reticent behavior patterns, they display a remarkable ability to co-exist in the close proximity of human activities.

All but three of the species of the resident diversity are common and widespread. All large mammals and many medium-sized disappeared from the study area by initially farming practices, and later urbanization. Range management was geared to cattle farming with

little or no attention to wildlife conservation, hence the low species diversity relative to that of historical times.

From a mammal perspective, the terrestrial habitat was in relatively good condition, in spite of the fact that cattle were grazing it at the time of the survey. Fires are a catastrophic event in the seasonal cycles of small mammal populations, and this is curtailed for the sake of cattle grazing.

The 500 meters of adjoining properties on all sides are in similar state of ecological repair and although there is a high degree of connectivity, the fact that only three Endangered species are recognized on the site relegate this ecological mechanism to a low level of importance.

Threatened and Red Listed Mammal Species

The two dwarf shrew species are listed as potential occupants. They have a tendency to use dead termite mounds as refuges, and these structures are used as a coarse indicator of their presence. Their assigned "Indeterminate" Endangered conservation status is, however, indicative of a lack of field data to ascertain their true global conservation status. Under natural conditions, hedgehogs have no problem with surviving; their "Rare" conservation status is the direct result of human predation. Considering the extent of the site and surrounding undeveloped areas, some individuals must have managed to survive.

It is submitted that no other endangered species could have survived the ravages of farming and urbanization. The white-tailed rat is extremely sensitive to habitat conditions which are not met on this site, while habitat requirements for rough-haired golden moles or other golden moles are absent.

Avifauna

The study site is situated within the Dry Highveld Grassland Bioregion of the Grassland Biome and more specifically within the Carletonville Dolomite Grassland vegetation type

according to Mucina and Rutherford (2006). Egoli Granite Grassland runs past the south of the study site and the grassland on the study can probably be described as a transition area between the two grassland vegetation types.

Within this vegetation type one distinct bird habitat system was identified.

Open Grassland

The entire study site consists of open natural grassland with a few scattered trees, shrubs and old cultivated fields.

A few small areas within this natural grassland area are disturbed through past and present human activities however the largest surface area consists of natural grassland.

The involved fauna specialist stated that open grassland is the most important habitat type for South Africa's threatened bird species in the region with a proportional importance of 27 % (Barnes 200). The highest diversity of threatened bird species occurs within this grassland habitat of which many are in the highest category of threat (Barnes 2000). The presence and abundance of bird species in this habitat will vary from season to season being lush and green in summer after summer rains and dry and brown or burnt during winter. The area will favour ground living bird species such as lap-wings, francolins, pipits, long claws, larks and chats that either hunt for insects or breed on the ground, in burrows in the ground or between the grasses. Weavers and widow-birds will make use of this area for feeding (seeds) during late summer and early winter when the grass is not burnt and widow-birds and cisticolas will also breed in the tall grass during summer. Aerial feeding birds such as martins, swifts and swallows will hunt for insects over the grasslands.

Observed and Expected Species Richness

Of the 314 bird species recorded for the 2518CC q.d.g.c 101 (32.16%) are likely to occur on the study site and 32 (31.6%) of these bird species were actually observed on the study site.

Threatened and Red-listed bird species

Twenty-six Red Data bird species were recorded within the 2528CC q.d.g.c. Thirteen of these have disappeared from the area or were not recorded for this quarter degree grid cell during the time of the southern African Bird Atlas project. It is unlikely that they will ever be seen in this region again except maybe on rare occasions in protected areas. Six of these species used to breed within the said q.d.g.c (Tarboton, 1987) and only one, the African Grass-Owl, has been recorded as a breeding species for the q.d.g.c. during the period of the Southern African bird atlas project. This decline in breeding species is probably due to the large extent of development that took place during a short space of time. As with the African Grass-Owl, the Blue Crane also show a low reporting rate but the habitat on the study site and the level of disturbance will not favour Blue Cranes. The rest of the Red Data species that were recorded shows a very low reporting rate and will more than likely only move through the area on rare occasions.

Reptiles and Amphibians

Method

The list of species which may occur on this site was compiled based on the impressions gathered during this visit, records in the Transvaal Museum, from publications such as the documentation of the herpetofauna of the then Transvaal by Dr. N. H. G. Jacobsen (Unpublished Ph.D. thesis, University of Pretoria, 1989) and his internal departmental report 'The Hepetofauna of Gauteng Province, 1995', including the 'Atlas and Red Data Book of the frogs of South Africa, Lesotho and Swaziland' (Minter, *et al*, 2004). The latest taxonomic nomenclature was used. The vegetation type was analyzed according to Low and Rebelo (1996) and Mucina and Rutherford (2006).

Findings and potential Implications

Mammals: The proposed development will not result in a loss of ecological sensitive and important habitat units, ecosystem function (e.g. reduction in water quality, soil pollution), loss of sensitive faunal habitat, nor of loss/displacement of threatened or protected fauna.

Avifauna: The open grassland on site offers ideal habitat conditions for the Melodius Lark in terms of breeding and foraging purposes. Several displaying male Melodius Larks were observed on the study site.

The Melodius Lark (*Mirafra cheniana*)

The Melodius Lark is listed in the Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland (Barnes 2000) but has been removed from GDARD list of priority species. It appears to be sensitive to overgrazing (Barnes 2000) and land-use changes in the grasslands may severely impact this species (Stattersfield *et al.* 1998)

White-bellied Korhaan (*Eupodotis senegalensis*)

Criteria for IUCN threatened category: A1c; A2c; C1. Status: Vulnerable

Within Gauteng habitat loss through crop farming, overgrazing, burning and high human densities are the main reasons for the population decline of this species. Even where suitable habitat exists, it is often modified by inappropriate fire regimes and grazing practices (Barnes 2000). The genetic integrity of this species may be threatened as a result of severely fragmented distribution (Barnes 2000).

Habitat: According to Barnes (2000) it inhabits relatively tall vegetation, typically fairly dense grassland in either open or lightly wooded regions. It seems to be most abundant in hilly areas at the interface between the grassland and savannah biomes (Tarboton *et al.* 1987). They occur in low abundance in severely grazed and recently burnt sites (Barnes 2000).

Although no observations were made of White-bellied Korhaan on the study site the habitat could favour this species.

Reptiles and Amphibians

The vegetation type of the study site is Carletonville Dolomite Grassland (Mucina *et al*, 2006) on a fairly homogeneous clayey to stony substrate of the Timeball Hill Formation (Kent, 1980). The greater part of this site consists of arable land, which was ploughed in the past. The northeastern tip is too stony and was not ploughed and there is a presence of termitaria. Of these, some are dead and provide suitable retreats for small animals, including dry-land amphibians and reptiles. Nevertheless, species diversity and population densities are not expected to be high.

Parts of the terrain, especially the previously ploughed areas, appear suitable as dispersal area for the Near Threatened Giant bullfrog (*Pyxicephalus adspersus*) as the substrate is suitable for burrowing, but no specific sites for the formation of breeding ponds were noticed. Odd individuals from adjacent areas may occasionally occur but the terrain does not appear suitable for the full lifecycle. The intensive development in the general area precludes the future presence of the Giant Bullfrog.

The striped Harlequin Snake (*Homoroselaps dorsalis*), a very rarely recorded species (Only 12 recorded for Gauteng, Jacobsen, 1995) and consequently a Red Data species, has been recorded from Farm Swartkop 383-JR in this quarter degree grid cell. As it is a cryptic species, mostly living underground or in dead termitaria, it is extremely difficult to confirm its presence on a site without destroying every suitable dead termitarium, thereby annulling the possibility of its future existence in the area. It would also be impossible to apply conservation measures which would have a noticeably positive effect. It is fortunate that this species has a relatively wide range of distribution in northeastern areas of South Africa, which should assure its survival.

Conclusion and Recommendations:

Mammals: Most, if not all the species listed as potential occupants of the site, will be displaced as a result of the proposed development. This will have no effect on the conservation status of most of the species. However, the loss of the three Red Listed species (dwarf shrews and hedgehog) is regrettable, although when expressing the magnitude of the loss in statistical terms it would most probably be negligible.

Birds: Although the habitat on the study site could still favour White-bellied Korhaan, it is doubtful if they will make use of the open grassland due to the human presence. The open grassland habitat on the site offers suboptimal habitat for the Melodious Larks. This species has however been removed from GDARD list of priority species. The proposed development should not have a negative effect on any of the other Red Data bird species listed above due to the high level of human disturbance on site. There's a lack of sufficient breeding, foraging and breeding habitat for the mentioned Red Data bird species.

Reptiles and Amphibians: The site appears to have a limited number of possible amphibian and reptile species. High-density residential development does not allow the survival of viable populations, except for a few commensal species, such as the Speckled Skink, which are able to live in association with humans and their structures.

A specimen of the Striped Harlequin Snake (*Homoroselaps dorsalis*), a Red Data Species, has been recorded from the farm Swartkop 383-JR (Jacobsen, 1995), of which a section west of the R55 is adjacent to the site under investigations. This proves the presence of the species in this area but it is practically impossible to confirm this record. As this snake tends to live underground in burrows or tunnels, where it feeds exclusively on Thread Snakes (*Leptotyphlops spp.*), it is usually only found accidentally when dead termitaria are destroyed. To attempt to confirm the presence of this species in an area, it would be necessary to destroy a large number of dead termitaria, which would reduce the suitability of the area for the survival of this snake and other reptiles. It appears that this species occurs in relatively low densities and it is recommended that should this snake be encountered during the construction phase of the development, then it must be properly

recorded, sent to the Transvaal Museum (if dead) or moved to other areas suitable for its preservation.

The following mitigation measures were proposed by the fauna and flora specialists:

- Should hedgehogs be encountered during the construction and operational phase of the development, these should be relocated to natural grassland areas in the vicinity.
- The contractor must ensure that no fauna species are disturbed, trapped, hunted or killed during the construction phases. Conservation-orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliance.
- It is important to note that the trenches for the water pipelines and even those for sewage lines do not need to be wide, which means that the environmental damage caused by the actual digging can be reduced to a minimum. However, while they are open their presence will mean that wildlife of any may fall into them, from where it will be difficult to escape and death may be caused by drowning, excessive exposure to the sun or by being buried alive during the final construction work.
- Environmental damage caused by these trenches may be kept to a minimum by good forward planning and thereby reducing the actual length of time that they are open. Possible damage to wildlife is in direct proportion to the time that these trenches are open and may destroy amphibian and reptilian species.
- The design of the stormwater lines is not known. If large diameter cement pipes are used and the trenches are closed again, potential danger become reduced by filling in the trenches. Open stormwater channels are dangerous, as they will continuously contribute to wildlife destruction.

The following mitigation measures were developed by GDARD (previously GDACE) (Directorate of Nature Conservation, GDACE, 2008) and are applicable to the study site.

- All areas designated as sensitive in a sensitivity mapping exercise (see *Sensitivity Mapping Rules for Biodiversity Assessments*) should be incorporated into an open

space system and registered against the title deeds as a conservation servitude. Development should be located on the areas of lowest sensitivity.

- Development structures should be clustered as close as possible to existing development.
- An independent suitably qualified individual registered in accordance with the Natural Scientific Professions Act (No. 27 of 2003) should act as the environmental control officer.
- An appropriate management authority (e.g. the body corporate) that is contractually bound to implement the Environmental Management Plan (EMP) and Environmental Authorization during the operational phase of the development should be identified.
- An ecological management plan for the open space system should be compiled by a specialist registered in accordance with the Natural Scientific Professions Act (No. 27 of 2003) in the fields of Botanical / Ecological / Zoological Science. This ecological management plan should form part of the EMP.
- The ecological management plan should:
 - include a fire management programme to ensure persistence of grassland
 - include an ongoing monitoring and eradication programme for all non-indigenous species, with specific emphasis on invasive and weedy species
 - ensure the persistence of all Red and Orange List species
 - include a monitoring programme for all Red and Orange List species
 - facilitate/augment natural ecological processes
 - provide for the habitat and life history needs of important pollinators
 - minimize artificial edge effects (e.g. water runoff from developed areas & application of chemicals)
 - include management recommendations for neighbouring land, especially where correct management on adjacent land is crucial for the long-term persistence of sensitive species present on the development site
 - result in a report back to the Directorate of Nature Conservation on an annual basis
 - investigate and advise on appropriate legislative tools (e.g. the NEMA: Protected Areas Act 57 of 2003) for formally protecting the area (as well as adjacent land

where it is crucial for the long-term persistence of sensitive species present on the development site)

- a copy of the ecological management plan should be provided to all neighbouring landowners.
- A funding mechanism that will cover the cost of implementing the ecological management plan should be established.
- All areas earmarked for development should be fenced off from the open space system prior to construction commencing (including site clearing and pegging). All construction-related impacts (including service roads, temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment/building materials/vehicles or any other activity) should be contained within the fenced-off development areas. Access of vehicles to the open space system should be prevented and access of people should be controlled, both during the construction and operational phases. Movement of all indigenous fauna should however be allowed (i.e. no solid walls, e.g. through the erection of palisade fencing), unless otherwise specified in another condition.
- Compacting of soil should be avoided in areas to be included in the open space system.
- Connectivity between the open space system and adjacent natural vegetation / open space systems should be ensured.
- Only species indigenous to South Africa should be used for landscaping / gardens within 200m of the open space system. Plant species indigenous to the natural vegetation of the area are preferred. As far as possible, plants naturally growing on the development site, but would otherwise be destroyed during clearing for development purposes, should be incorporated into landscaped areas. Forage and host plants required by pollinators should also be planted in landscaped areas.

General mitigation measures:

- Where possible, trees naturally growing on the site should be retained as part of the landscaping, with specific emphasis on the following species: *Acacia erioloba*,

Boscia albitrunca, *Combretum imberbe*, *Pittosporum viridiflorum*, *Prunus africana*, *Sclerocarya birrea* subsp. *caffra*. Measures to ensure that these trees survive the physical disturbance from the development should be implemented. A tree surgeon should be consulted in this regard.

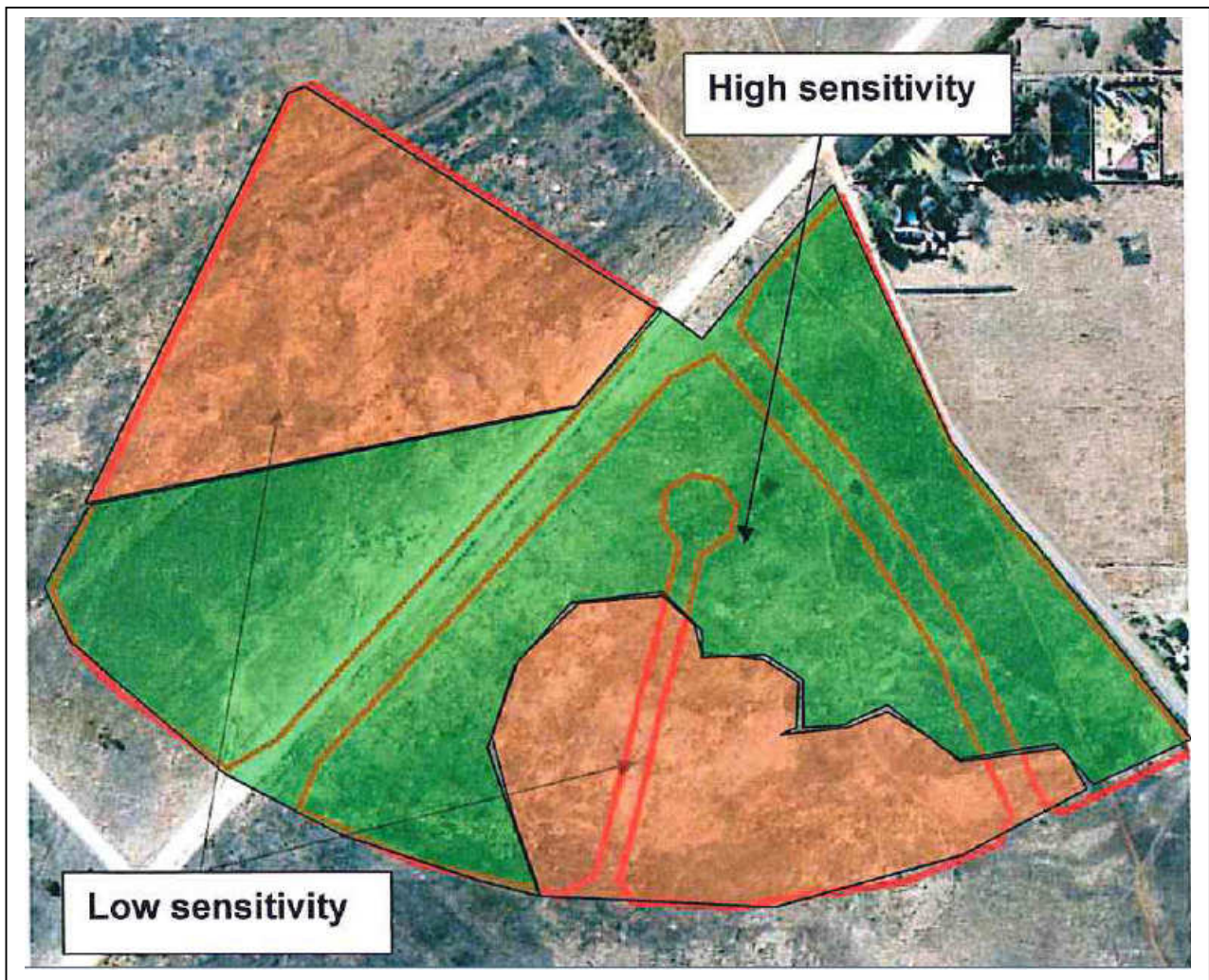


Figure 13: Ecological Sensitivity Map

6.1.2.3 Presence of caves

According to Relly, Milner and Shedden engineers there are no known caves of significance on the site. Mr. Shedden stated that he had been involved in dolomite

investigations in this general region for the past 30 years and that he is unaware of any significant caves on or in the immediate vicinity of the study area. **Refer to Annexure J for correspondence from Relly, Milner and Shedden engineers.**

6.1.2.1.a Issues & Impact Identification – Flora

Table 22: Issues and Impacts – Flora

	Issue/ Impact	Positive/ Negative / Neutral ±	Mitigation Possibilities High 😊 Medium 😐 Low ☹️ Positive Impact - Not Necessary To Mitigate ☀️
16)	Loss of natural grassland areas	-	☹️
17)	The loss of orange listed plants.	-	😊
18)	The eradication of weeds and exotic invaders.	+	☀️
19)	If the entire area to be developed is cleared at once, smaller birds, mammals and reptiles will not be afforded the chance to weather the disturbance in an undisturbed zone close to their natural territories.	-	😊
20)	Noise of construction machinery could have a negative impact on the fauna species during the construction phase.	-	😊
21)	During the construction and operational phase (if not managed correctly) fauna species could be disturbed, trapped, hunted or killed.	-	😊

22)	Loss of habitat can lead to the decrease of fauna numbers and species.	-	☑
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6.1.2.1.b Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

16) The loss of natural grassland areas.

Some of the sensitive natural primary grassland on the site will be lost due to the proposed development. However, a Monavoni Development Framework plan had been compiled to ensure the protection of corridors of Natural primary grassland in the larger Monavoni development (**Refer to Figure 3**).

Table 23: Significance of Issue 16 (Loss of natural grassland areas) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High ☑ Medium ☹ Low ☑ Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
Low ☑	P/C/O - Although some disturbed natural grassland and natural primary grassland areas will be lost due to the proposed development the sensitive natural primary grassland on shallow dolomite will be conserved and will be linked to the larger regional open space system.	H - To be included in EMP

Result:

Although issue can be mitigate, the significance of the impact should be determined / confirmed and assessed in the Significance Rating Table

17) The loss of orange listed plants.

Some Orange-listed *Hypoxis hemerocallidea* (African potato) found sparsely scattered in the Natural primary grassland and the Rocky outcrops will be lost due to the proposed development.

Table 24: Significance of Issue 17 (The loss of orange listed plants) After Mitigation/ Addressing of the Issue

Mitigation Possibilities	Mitigation	Significance of Issue after mitigation
High 🟢 Medium 🟡 Low 🟠 Positive Impact/ Neutral - Not Necessary To Mitigate ⚙️	Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
Low 🟠	P – These plants should be relocated to a safe, suitable area approved by GDARD.	H -To be included in EMP

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

18) The proposed development will result in the eradication of exotic invaders and weeds.

Category 1 Declared weeds, Category 2 Declared invaders and one Category 3 Declared invader occurred on the study area and must be eradicated prior to construction and throughout the operational phase of the development.

Table 25: Significance of Issue 18 (The proposed development will result in the eradication of exotic invaders and weeds.) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	<p>P/C/O –Category 1 Declared weeds, Category 2 Declared invaders and one Category 3 Declared invader occurred on the study area and must be eradicated prior to construction and throughout the operational phase of the development.</p> <p>P/C/O – No plants not indigenous to the area, or exotic plant species, especially lawn grasses such as Kikuyu and other ground-covering plants, should be introduced in the communal garden / landscaping of the proposed development, as they might spread into the areas of natural vegetation.</p> <p>P/C/O – Forage and host plants required by pollinator species in the area should also be used in landscaped areas.</p>	<p>H -To be included in EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

19) If the entire area to be developed is cleared at once, smaller birds, mammals and reptiles will not be afforded the chance to weather the disturbance in an undisturbed zone close to their natural territories.

Table 26: Significance of Issue 19 (If the entire area to be developed is cleared at once, smaller birds, mammals and reptiles will not be afforded the chance to weather the disturbance in an undisturbed zone close to their natural territories.) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ⚙️</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Positive Impact - Not Necessary To Mitigate ⚙️</p>	<p>Where possible, work should be restricted to one area at a time.</p>	<p>M -To be included in EMP</p>

Result:

Positive impact, the significance of the impact should still be determined / confirmed and assessed in the Significance Rating Table

20) Noise of construction machinery could have a negative impact on the fauna species during the construction phase

If not managed correctly, noise pollution (i.e. by machinery without noise muffing devices) could have a negative impact on the surrounding residents and the fauna and birds in the area. This will however only be a short-term impact and it is expected that many of the birds will return to the area during the operational phase.

Table 27: Significance of Issue 20 (Noise of construction machinery could have a negative impact on the fauna species during the construction phase) After Mitigation/ Addressing of the Issue.

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ☸</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>P / C - Noise should be kept to a minimum and the development should be done in phases to allow faunal species to temporarily migrate into the conservation areas in the vicinity.</p>	<p>L -To be included in EMP</p>

Result:

Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

21) During the construction and operational phase (if not managed correctly) fauna species could be disturbed, trapped, hunted or killed.

There is always a risk that construction personnel or new residents of the development may disturb, trap, hunt or kill fauna on the study area. This will have a detrimental impact on the local biodiversity and will decrease fauna numbers. The issue can be mitigated if this issue is included in conservation-orientated clauses that may be built into contracts of construction personnel and residents and if council prosecute offenders of these actions.

Caught animals should also be relocated to conservation areas in the vicinity.

Table 28: Significance of Issue 21 (During the construction and operational phase (if not managed correctly) fauna species could be disturbed, trapped, hunted or killed) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🟠</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>C / O - Should hedgehogs be encountered during the construction and operational phase of the development, these should be relocated to natural grassland areas in the vicinity.</p> <p>C / O - should the Harlequin snake be encountered during the construction phase of the development, it must be properly recorded, sent to the Transvaal Museum (if dead) or moved to other areas suitable for its preservation.</p> <p>C / O - The integrity of remaining wildlife should be upheld, and no trapping or hunting by construction personnel should be allowed. Caught animals should be relocated to the conservation areas in the</p>	<p>L -To be included in EMP</p>

	<p>vicinity. Council shall prosecute offenders.</p> <p>P - Conservation-orientated clauses should be built into contracts for construction personnel as well as buyers of property within the new development complete with penalty clauses for non-compliance.</p> <p>P/C – The trenches for the water pipelines and sewage lines should be as narrow as possible. Environmental damage caused by these trenches may be kept to a minimum by good forward planning and thereby reducing the actual length of time that they are open. Possible damage to wildlife is in direct proportion to the time that these trenches are open and may destroy amphibian and reptilian species.</p> <p>P/C – The design of the stormwater lines is not known. If large diameter cement pipes are used and the trenches are closed again, potential danger become reduced by filling in the trenches. Open stormwater</p>	
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	<p>channels are dangerous, as they will continuously contribute to wildlife destruction. Refer to section 6.1.1.1 Geology and soils for the recommendations made by the Geotechnical specialist.</p>	
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

22) Loss of habitat can lead to the decrease of fauna numbers.

All mitigation measures for impacts on the indigenous flora of the area should be implemented in order to limit habitat loss.

Table 29: Significance of Issue 22 (Loss of habitat can lead to the decrease of local fauna numbers and species) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
Medium 🟡	P / C / O – All mitigation measures for impacts on the indigenous flora of the area should be implemented in order to limit habitat loss and maintain and improve available habitat, in order to maintain and possibly increase	L - In terms of local fauna population

	<p>numbers and species of indigenous fauna.</p> <p>C \ O - Should hedgehogs be encountered during the construction and operational phase of the development, these should be relocated to natural grassland areas in the vicinity.</p>	
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

6.2 DESCRIPTION OF THE EXISTING SOCIO-ECONOMIC ENVIRONMENT

6.2.1 Archaeology/Cultural History

Refer to Annexure G4 for the Archaeology Survey

Introduction

An independent heritage consultant (Dr. Johnny van Schalkwyk) was appointed to conduct a survey to locate, identify, evaluate and document sites, objects and structures of cultural importance found within the boundaries of the study area.

Cultural heritage resources are broadly defined as all non-physical and physical human-made occurrences, as well as natural occurrences that are associated with human activity. These include all sites, structures and artifacts of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development.

The objectives were to:

- Identify possible archaeological, cultural and historic sites within the proposed development areas;
- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend measures to mitigate any negative impacts on areas of archaeological, cultural or historical importance.

Field survey

A field survey was done according to generally accepted archaeological and was aimed to locating all possible sites, objects and structures. The area that had to be investigated was identified by Bokamoso by means of maps. The area was investigated by walking across it in a number of transects. Special attention was given to topographical occurrences such as trenches, holes, outcrops and clusters of trees were investigated.

Identified sites

- **Stone Age**

No sites, features or objects dating to the Stone Age were identified.

- **Iron Age**

No such sites, objects or features dating to the Iron Age were identified.

- **Historic period**

No sites, objects or features dating to historic times were identified.

Issues & Impact Identification – Cultural and Historical

Table 30: Issues and Impacts – Cultural and Historical

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡

			Low 🟡 Positive Impact - Not Necessary To Mitigate ✨
23)	If any cultural or historical artefacts are found during construction it may be destroyed by construction activities.	-	😊

Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

23) If any cultural or historical artefacts are found during construction it may be destroyed by construction activities.

Table 31: Significance of Issue 23 (If any cultural or historical artefacts are found during construction it may be destroyed by construction activities.) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 😊 Medium 😐 Low 🟡 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Positive ✨ Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 😊 - In the longer term	P / C / O - It should be noted that in terms of the South African Resources Act (Act 25 of 1999) Section 35(4) no person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or	L – To be included in the EMP

	<p>palaeontological site or material.</p> <p>P/ C/ O - Also important is that Section 34(1) of this act states that no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit, issued by the relevant provincial heritage resources authority.</p>	
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

6.2.2 Agricultural Potential

The GAPA (Gauteng Agricultural Potential Atlas) indicates that the study area has a **high agricultural potential (Refer to Figure 7, Agricultural Potential Map)**.

Current land use is not restricted to one specific use. Topsoil has been removed from large areas. Very few, if any of the surrounding landowners, use their properties for small-scale or other farming activities. It is clear that none of the surrounding landowners, at this stage or in the recent past have had any intensions of **bone fide** intensive farming activities on their properties.

The application site is situated within an area underlain by dolomitic conditions, and extensive irrigation of such soils is not supported. The Geotechnical stability investigations and Comments from the CGS, this proposed site is suitable for residential and commercial development.

Furthermore the study area is situated within the provincial urban edge (Refer to Figure 4) and is not situated within any of the 7 agricultural hubs identified for agricultural use in Gauteng (Refer to Figure 6).

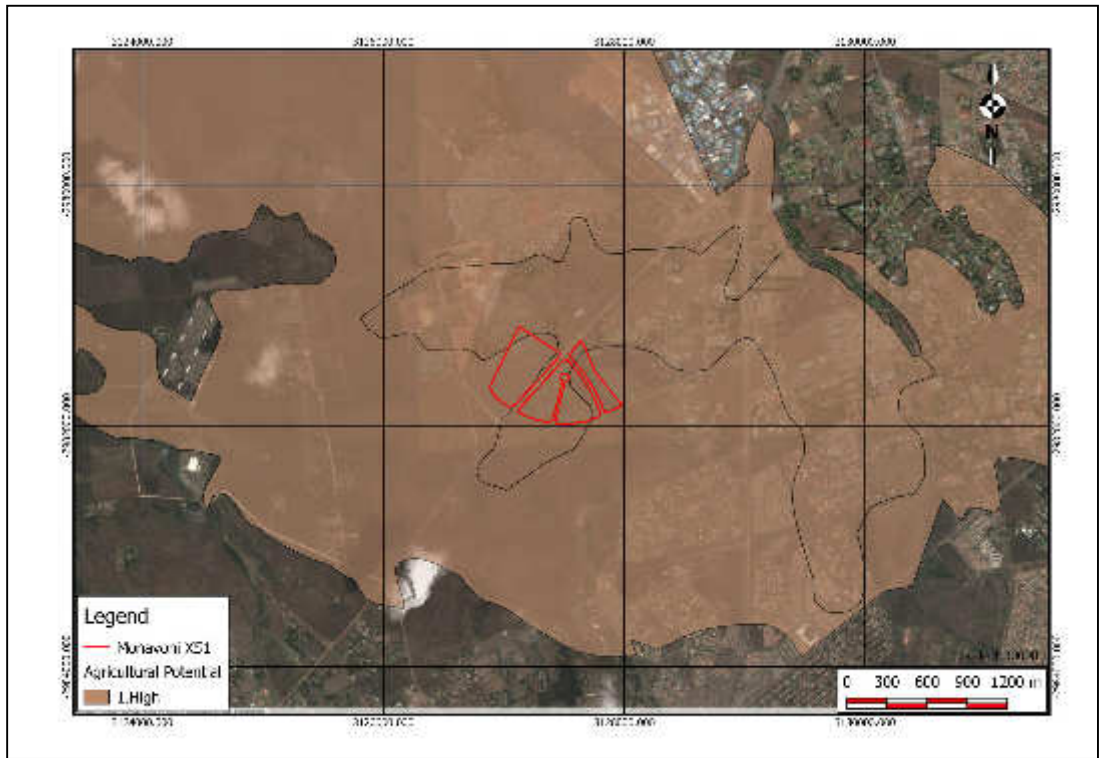


Figure 7 – Agricultural Potential

Surrounding developments and activities

The area is bordered by a number of housing developments or existing small holdings to the south and west. To the north the area is bordered by a landfill site as well as an informal settlement. There is no indication of any agricultural activities in the area.

6.2.2.a Issues & Impact Identification – Agricultural Potential

Table 32: Issues and Impacts – Agricultural Potential

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To

			Mitigate ☀
24)	Some agricultural land will be lost.	-	☐

Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

24) Some agricultural land will be lost.

Some agricultural land will be lost as a result of the development. However, very few if any of the surrounding landowners, use their properties for small-scale or other farming activities. In fact the area is characterised by typical urban intrusions such as group housing developments etc. In addition the study area falls within the provincial urban edge and does not fall with an Agricultural Hub identified for agricultural use in Gauteng.

Table 33: Significance of Issue 24 (Loss of Agricultural Land) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ☀</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during Planning phase, Construction and/ or Operational phase</p> <p>P / C / O Mitigation</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Low 🔴</p>	<p>Due to the low agricultural potential of most of the soils and security and agricultural factors of the high potential area, agricultural use would not be economically viable on the study area.</p>	<p>L – in terms of economical environment.</p>

Result:

Although the impact is low, the significance of this impact still needs to be determined/confirmed and assessed in the Significance Rating Tables.

6.2.3 Existing Land Use

6.2.3.a Surrounding Area

Refer to Figure 3, Monavoni Spatial Development Framework

The following land uses are found surrounding the area:

- The proposed Monavoni Extension 52 development (Commercial and Very Light Industrial) is situated north-west of the study area.
- The proposed Monavoni Extension 44 development (Commercial and High density Residential) is situated south-west of the study area.
- The south-east of the site is an approved school development known as Monavoni Extension 23, and more south is an approved mixed land use development Monavoni Extension 39 (Shops, Restaurants, Banks, Showrooms, Medical Suites and etc.)

6.2.3. b The Study Area

In terms of the Centurion Town-planning Scheme, 1992, the study area is zoned "Agricultural" and is vacant. The people (residents) in the area are already aware of the future planning for the area and some are selling their properties for large sums of money.

6.2.3.c Proposed Zoning and Land Use

As already mentioned the proposed **Monavoni Extension 51** development will consist of the following land uses:

- ❑ 5 erven zoned "**Industrial 2**";

- 10 erven zoned for “**Business 2**”;
- 5 erven zoned for “**Residential 2**” purposes with a density of **25 units/ha**
- 5 erven zoned “**Private Open Space**”

6.2.4 Need and Desirability

Note: Input Supplied By M & T Development Town Planning

Need

M&T Development owns a substantial amount of property within the area of the application site, and has developed various developments in the area. With the developments M&T spent a considerable amount of money to obtain engineering services to the adjacent townships. The already installed services will therefore be optimally utilized as was planned from the previous developments that M&T developed in the adjacent area of the application site.

It was therefore always the idea to expand the Monavoni precinct. The market demand is the main factor that the township has not yet been proceeded with. In the last two years the development market has slowed down considerably with the global recession. Indicators and previous recessions have shown that the recession will end in the near future, therefore, the development will be at the end stages when the recession is over.

The application site is also located within the urban edge. This is an important aspect to take cognisance of, the reason being that there is limited space available within the urban edge for new developments. It is therefore important to develop new developments within the urban edge, to combat urban sprawl, to save valuable agricultural land.

The application site is in close proximity to informal settlements. The planned industrial parks and office developments within the proposed development will have a big impact on the informal settlements as it will create work opportunities and have a mixed use development close to the informal settlement, that will enhance the sense of place of the area.

The recent trend has emerged over the last couple of years for offices and industrial properties situated outside of the CBD. The reason for this being that business owner and their workers can live closer to work, and in close proximity to other amenities such as convenient stores. There is also unprivileged work force that can benefit from jobs.

There are three residential erven within the development, and in recent years the residential market has grown significantly to provide for a growing number of home owners. The growth in the residential market can be contributed to a few factors, which include favourable interest rates, a larger amount of investors in residential property as a result of increasing house prices and more potential home owners. Cost of residential property have increased continuously for the last five years and even though the market has slowed down some in the last 2 years, in line with a decline in the global economy, indications are that the residential market is recovering and house prices are again starting to increase as banks are approving more home loans and people again start to invest in property and property development. Interest rates have again reduced substantially which will ensure a renewed interest in residential development.

A trend in residential development that has not changed is a need for smaller, more affordable residential units, where you can buy a lock-up-and-go unit in close proximity to amenities.

There is a need to provide a diversity of land uses and type of residential units in an area. This proposed development will be situated to the north west of the Sevilla, Silverstone, Silverwood and Thornfield estate. The erven in this development is full title stands of approximately 500 square meters. Most of the erven in this estate is exclusive and with the establishment of this development you can live at the right address in a secure environment with all the surrounding amenities, but at much more affordable rates. This development caters for sectional title units and will be developed in such a way as to optimally make use of the surrounding open space areas.

This residential development will provide the opportunity for the first home buyer to own a unit within a group housing development without having to bear the high costs. The development will also be very attractive for the pensioner, who wishes to retire in a smaller residential unit, within a secure environment, and still having the benefits of a beautiful and peaceful environment.

The north western erven in the development, situated directly adjacent to the proposed Mimosa Street will be developed for offices. There is a need for some office developments in any residential development to provide professional suites, medical suites and other offices that are required to be situated in close proximity to Residential erven, but with good access from the region. This will also contribute towards a sense of place by having a mixed use zoning.

This township is part of a large property where development up to now, was mainly used for agricultural purposes. Most of the property can be developed at high densities, due to minor environmental sensitivities, such as ridges and important waterways. This property has no sensitivity areas and is not affected by a 1:50 or 1:100 year floodlines, but the creation of open space green lungs through the development will still be provided. The open space areas provide for a green lung through the development where residents can interact with the surrounding natural environment, to create a sense of place.

Security has become the number one priority for new home owners. Throughout South Africa there has been a general move towards safer and secure neighbourhoods. This has also been proven by the amount of street closures for security purposes in traditional neighbourhoods and the fact that most of the new residential and office developments throughout South Africa include security and access control as the main attraction point for new home buyers.

This proposed residential development will provide in a need for secure development where a lifestyle with peace of mind will be established. The development will have 24 hour interactive security, an electric perimeter fence around the development, and manned access control point will be provided at the entrance.

The park area will be retained in its natural state and where landscaped, it will be in line with a detailed master landscaping plan. Some walkways and other recreational facilities within a natural environment will be created for the residents.

The erven in this development will be set in a pleasant environment, with good access to work opportunities. The development will be attractive to a wide range of homeowners, and businesses with added benefit of security and have access to amenities close by.

Desirability

(Information obtained from M & T Development Town Planning)

Several factors will contribute towards the desirability of the proposed development and these aspects will be discussed in more detail. As will compliance with regards to the Development Facilitation Act and the IDP of Centurion. The quality and desirability of the living environment which is proposed will also be addressed.

Desirability of land uses

This proposed development is situated in an area that has a very moderate climate and which lends itself to an outdoor lifestyle. The central theme and the main focus of this development is a generous open space system which represents a portion to the total area of the township. The residential group housing developments will face onto the open space area. These aspects will contribute towards maintaining the rural character of the estate and will ensure that this development will optimise and promote an outdoor lifestyle for the residents residing in the residential estate, making the most of the picturesque setting of development.

The communal open space area will be landscaped to ensure a pleasant environment for the residents of the environment, and the open space will be open landscaped for the reticulation of stormwater. The proposed township is situated within a node of estate

development such as Stone Ridge Country Estate, Silver Wood Estate, Silver Wood Estate, Raslow Lifestyle Estate, and Heuwelsig Estate that already constitutes a node for development in the area and this proposed development will complement the existing residential node in the area. The developer has already invested in bringing services to this area and these existing services should be utilised optimally. The development should also facilitate the sensible and economic growth of the area. All the above elements will contribute towards the creation of a unique lifestyle environment which will be in harmony with the surrounding area and natural elements of the site.

6.2.5.a Issues & Impact Identification – Proposed Land-Use

Table 34: Issues and Impacts – Proposed Land-Use

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 😊 Low 🟡 Positive Impact - Not Necessary To Mitigate ☀️
25)	Upgrading of municipal services	+	☀️
26)	Upgrading of provincial and local roads	+	☀️
27)	Economical injection to local businesses	+	☀️
28)	Creation of temporary and permanent jobs	-	😊
29)	Increase in adjacent land-values	+	☀️
30)	Rates and taxes payable to the local authority	+	☀️
31)	The supply of much needed housing in close proximity to employment opportunities	+	☀️

32)	Possibility of illegal settlements and increased security problems	-	😊
33)	Traffic increase in the area, will have an impact on the traffic flow.	-	😬
34)	Damage to the existing services and infrastructure during the construction phase and disruptions in services (i.e. electricity, water, damage to Telkom cables) during the construction phase.	-	😊
35)	Dangerous excavations	-	😊

Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

28) Creation of temporary and permanent jobs

The development will create temporary job opportunities during the construction phase and temporary and permanent job opportunities during the operational phase. Should local communities not benefit from these opportunities, it could lead to an influx of people from other areas. Only employing people from the local community could mitigate the potential adverse impact.

Table 35: Significance of Issue 28 (Creation of temporary and permanent jobs) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 😊 Medium 😬 Low 🚫</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ☸</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
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<p>High 🟢</p>	<p>C / O – In order to limit the influx of people from other areas, it is recommended that (where possible) only people from the local communities are employed.</p>	<p>L – To be included in the EMP</p>
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

32) Possibility of illegal settlements and increased security problems in the area mainly associated with the construction phase. During the construction phase, the possibility always exists of illegal settlements being established on and around the study area. This causes a security risk to residents on the surrounding properties in the form of possible theft and other crime related activities.

Table 36: Significance of Issue 32 (Possibility of illegal settlements and increased security problems) After Mitigation/Addressing of the Issue.

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🟠</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>C - With the exception of the appointed security personnel, no other workers, friend or relatives will be allowed to sleep on the construction site (weekends included)</p>	<p>L – To be included in the EMP</p>

	<p>C - Presence of law enforcement officials at strategic places must be ensured.</p>	<p>L - To be included in the EMP</p>
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

33) Traffic increase during the construction and operational phases of the development will have an impact on traffic flow and the tranquility of the area. The impact of additional traffic during the construction phase, especially heavy construction vehicles that can slow traffic down, can be mitigated to a certain extent by not allowing construction vehicles to use public roads during peak traffic times, as well as to avoid construction activities on public roads during peak traffic times.

Table 37: Significance of Issue 33 (Traffic increase in the area, will have an impact on the traffic flow and the tranquility of the area) After Mitigation/ Addressing of the Issue

Mitigation Possibilities	Mitigation	Significance of Issue after mitigation
<p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ⚡</p>	<p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>Medium 🟡</p>	<p>P / C - Construction vehicles and activities to avoid peak hour traffic times</p> <p>P / C - The recommended road upgrades should be implemented.</p>	<p>M - To be included in the EMP</p>

Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

34) Construction of the new development may cause damage to the existing services and infrastructure and will disrupt service provision (i.e. electricity, water, Telkom cables) to local residents on surrounding properties during the construction phase.

Table 38: Significance of Issue 34 (Damage to existing services) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation: Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	P / C – Determine areas where services will be upgraded and relocated well in advance. Discuss possible disruptions with affected parties to determine most convenient times for service disruptions and warn affected parties well in advance of dates that service disruptions will take place.	M – To be included in the EMP

Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

35) Dangerous excavations could pose a safety risk to surrounding residents, pedestrians and construction workers.

Table 39: Significance of Issue 35 (Dangerous excavations) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>P / C - Although regarded as a normal practice, it is important to erect proper signs indicating the danger of the excavation in and around the development site. Putting temporary fencing around excavations where possible.</p>	<p>M – To be included in the EMP</p>

Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

6.2.5 Institutional Environment

The capital costs for the development will essentially be borne by the developer. Relative to this, however there lies an obligation with the local authority to support proposals in its interest (expansion of its tax base) as well as those in the interest of the community (investment and ensuring sustainability of development over time) and the environment.

According to the developer and the market research team, the proposed development will be a significant addition to the **economical environment** of the Ekurhuleni Metropolitan Municipality.

6.2.5.1 On an International Level

Relevant International Conventions to which South Africa is party:

- **Convention relative to the Preservation of Fauna and Flora** in their natural state, 8 November 1993 (London);
- **Convention on Biological Diversity**, 1995
(provided and added stimulus for a re-examining and harmonization of its activities relating to biodiversity conservation. This convention also allows for the in-situ and ex-situ propagation of gene material); and
- **Agenda 21** adopted at the United Nations Conference on Environment and Development (UNCED) in 1992.
(An action plan and blueprint for sustainable development).

6.2.5.2 On a National Level

The Development Facilitation Act, 1995 (Act 67 of 1995)

Information supplied by M & T Development Town Planning

In light of skewed and ineffective spatial functionality National Government provided certain specific guidelines in order to steer development and urban planning into a new direction. Within Chapter 1 of the Development Facilitation Act reference is made to the general principles for land development:

“... (1) The following general principles apply, on the basis set out in section 2, to all land development:

(c) Policy, administrative practice and laws should promote efficient and integrated land development in that they-

- (i) promote the integration of the social, economic, institutional and physical aspects of land development;
- (ii) promote integrated land development in rural and urban areas in support of each other;
- (iii) promote the availability of residential and employment opportunities in close proximity to or integrated with each other;
- (iv) optimize the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;
- (v) promote a diverse combination of land uses, also at the level of individual erven or subdivisions of land;
- (vi) discourage the phenomenon of "urban sprawl" in urban areas and contribute to the development of more compact towns and cities;
- (vii) contribute to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs; and
- (viii) encourages environmentally sustainable land development practices and processes

As eminent from the above stipulations the sustainable paradigm of development is enforced by the national government as a direct attempt to correct past skewed development patterns and to lay the foundations for well-functioning cities and regions. Sound planning principles that emanate relate to the concentration and containment of development within a context conducive to overall integration and more dynamic interfacing. As can be expected the golden thread of sustainability reoccur within most provincial and local policies and as result the concept of localized sustainable development are dealt with in more detail.

The National Environmental Management Act; 1998 (Act 107 of 1998)

The Application for Environmental Authorisation was submitted on the 26th September 2013 in terms of the Amended NEMA EIA Regulations, 2010, which came into effect on 2 August 2010. The reference number, Gaut: 002/13-14/E 0032, has been assigned to the application.

Take note that the 2010 NEMA EIA Regulations were replaced by the Amended 2014 NEMA EIA Regulations on 4 December 2014, but due to the fact that the application was submitted in terms of the 2010 NEMA EIA Regulations, this application will be dealt with in terms of such Regulations. Once the Decision has been issued in terms of the 2010 NEMA EIA Regulations, such Decision will be regarded as a Decision issued in terms of the New 2014 EIA Regulations and all following procedures (i.e. Amendment Applications, Appeals etc. must be made/submitted in terms of the 2014 NEMA EIA Regulations. Refer to Chapter 8 – Transitional Arrangements and Commencement of the 2014 NEMA EIA Regulations.

*Regulation 53 (3) of the 2014 NEMA EIA Regulations furthermore states “Where an application submitted in terms of the previous NEMA EIA Regulations, is pending in relation to the activity of which a component of the same activity was not identified under the previous NEMA Notices, but is now identified in terms of Section 24 (2) of the Act, the competent authority must dispense of such application in terms of the previous NEMA regulations and **may**² authorise the activity identified in terms of Section 24 (2) as if it was applied for, on condition that all impact of the newly identified activity and requirements of these Regulations have also been considered and adequately assessed.”*

Section 24(2) Activities to be considered by GDARD:

*We perused the Amended 2014 NEMA EIA Regulations and decided to list the activities that will most probably be triggered in terms of such Regulations (**Refer to Table 128 below**). The activities identified are very similar to that activities applied for in terms of*

² Take Note: This is not a must

the 2010 NEMA EIA Regulations and we therefore feel confident that all the activities as listed have been assessed.

This act addresses issues relating to environmental administration and it promotes sustainable development.

If the involved authorities do not take the principles of NEMA into consideration when evaluating an environmental report/ document, the involved authority can be held responsible for any damage to the environment (social, ecological and economical).

National Environmental Management: Air Quality Act (Act No. 39 of 2004)

This act replaced the Atmospheric Pollution Prevention Act (Act No. 45 of 1965), however Part 2 of the act is still applicable. Part 2 deals with the control of noxious or offensive gases and has relevance to the proposed development.

The purpose of the Act is "To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incident thereto".

It is not foreseen that the proposed development would contribute significantly in terms of pollution by smoke as it is a mixed use development consisting of residential, commercial, light industry and business uses. Dust pollution could be a concern primarily during the construction phase of the proposed project. Dust control would be adequately minimised during this phase by way of water spraying and possible dust-nets, when working close to existing residential dwellings.

6.2.4.3 On a Provincial Level

Gauteng Planning and Development Act – (No 3 of 2003)

Information supplied by M & T Development Town Planning

The Provincial Act provides a spatial development framework for the entire Gauteng Province, and focuses on growth and development on a broad level. In brief, this document identifies several spatial development components of which the following areas are relevant to the proposed development:

- Centurion is identified as a *Growth area*.
- The application site is situated *within the provincial Urban Edge* where growth should be stimulated and encouraged.

The GSDF also lists so-called interventions of which the following area is applicable to the proposed Monavoni Extension 51.

Development should promote spatial restructuring and development. Key amongst these is that the Province shall encourage development and land use which “...promotes the more compact development of urban areas and the limitation of urban sprawl and the protection of agricultural resources” and development that “results in the use and development of land that optimises the use of existing resources such as engineering services and social facilities...”

In summary, the key objectives that are pursued in the existing and proposed legal and policy framework are to:

- Minimise urban sprawl;
- The promotion of a compact town as the dominant model of development;
- Densification of settlements and ensure filling in and mixing of land uses;
- Develop and strengthen public transport-orientated activity corridors (which can only function with a minimum critical mass of users);
- Increase economic efficiency and productivity of urban form and functions.

The need to promote compaction and to combat sprawl suggests a number of types of actions:

- Promoting smaller average site sizes: large lot sprawl is a major form of sprawl in South Africa;
- Encouraging dwellings to go up – to take walk-up forms;
- Promoting various forms of implosion or infill policies, where new growth is encouraged to occur within the existing urban fabric as opposed to beyond the existing edge.

In general the new South African planning ethos, as described in planning policy documents on national and provincial level, provides for the important guiding principle for spatial planning to be provided in a dynamic concentrated development format. Within the context of regional and local spatial planning a true acknowledgement and acceptance needs to exist that the distorted spatial environment should be addressed effectively.

6.2.4.4 On a Local Level

Information supplied by M & T Development Townplanning

Integrated Development Plan (IDP)

The Integrated Development Plan (IDP) for the City of Tshwane was approved by the MEC: Gauteng Department of Planning and Local Government in May 2002. In terms of development, the IDP provides broad strategies and visions for a city, and is done in conjunction with the community through a public participation process.

The proposed development falls within Planning Zone 3 of the IDP, within an area indicated as “*Higher Development Priority Area*”. The site is furthermore situated within the urban edge.

The IDP perceives the vacant land and vast areas of holdings/farmland as prominent character of Centurion. This can be recognized as a weakness due to the security threat that vacant land imposes, as well as the negative influence it has on the image of a neighbourhood, specifically, a residential area. The vacant land, which implies lower residential densities, makes the provision of essential municipal services less viable and more expensive to provide. By developing the existing land within the municipal boundaries and within existing residential developments with higher densities, the phenomenon of urban sprawl can be curbed and the development of urban fibre can be stimulated.

The IDP identifies certain objectives for which compliance therewith is self-explanatory and can be summarized as follows:

- Strengthen and develop nodes of mixed land-use patterns;
- The optimal use of the existing road network, as well as other existing infrastructure;
- The integration, infill and densification of land to ensure the viability of services; and
- The management of development in an environmentally sustainable manner.

The proposed land use for the application site correlates to the envisaged development for the area and utilise these principles listed as important considerations.

Metropolitan Spatial Development Framework (MSDF)

The MSDF provides the overall spatial framework and is structured around five concepts. These concepts are:

- Smart Growth;
- Metropolitan Activity Areas;
- Movement Systems;
- The Urban Lattice; and
- The Environmental Structuring Concept.

The Smart Growth Concept:

Smart Growth describes a collection of urban development strategies aimed at reducing sprawl and promoting growth. One of the strategies have been developed in order to promote Smart Growth within the city, this includes:

- The Densification and Compaction Strategy and

The Densification and Compaction strategy is specifically focussed on addressing development within the urban area and is therefore specifically relevant in as far as Monavoni Extension 51 is concerned.

Tshwane Densification and Compaction Strategy

The Densification and Compaction strategy is specifically relevant in as far as Monavoni Extension 51 is concerned.

The following aspects are considered to be key directives for the Tshwane Densification and compaction Strategy:

- Minimise unmanaged or unfocussed urban growth;
- Create opportunities for the densification of existing low density areas;
- Promote higher density and integrated environments with typical urban characteristics to counteract suburban developments;
- Ensure that residents have access to a range of choices with regard to housing typologies as well as locations;
- Integrate residential development, movement systems, social facilities and employment opportunities;
- Focus residential densification around areas of opportunity (economic opportunity, transport opportunities etc.).

Within the document the sentiment is raised that densification and infill development are sound urban development principles to pursue. Mention is however made that caution should be taken in respect of the incorporation of high density developments in areas not planned to accommodate such scale of development.

Within the document certain recommendations are also provided in terms of where densification should be supported. These include:

- As close as possible to the CBD;
- Close to metropolitan core areas and services;
- In the proximity of areas with job opportunities; and
- Close to public transportation facilities.

Within the strategy it is suggested that densities of 25 units per hectare throughout the metropolitan area should be accepted as low density. Unfortunately the strategy is not specific about what amount of units per hectare is regarded as optimal. Lower densities (25u/ha) should be accommodated in areas with a special low-density character, but should be the exception rather than the rule. The proposed density of the township is 20 dwelling units per hectare.

The position and concentration of buildings may however be dictated by the underlying soil conditions. The SDF states that the underlying dolomite in the region, the sensitive and ridges tend to direct and inform urban development." This clearly shows that the underlying soil conditions in the area do play a major role in the development of sites.

This unequal positioning of buildings may give rise to differing housing typologies, which is in line with the spatial Development Strategy: 2010 and beyond; as well as the Densification and Compaction Strategy (May 2005) (CDS) stating:

"Ensure balance and diversity in the range of housing options, densities and typology to serve in the needs, desires and income abilities of all residents of the city."

The SDF and CDS describe development trends as directly opposing the aims and objectives for compacting and densifying the city with critical issues that needed to be addressed, viz:

- An overemphasis on single erf-single house developments; and
- Low coverage and low height restrictions.

The proposed layout aims to rectify these concerns by providing for both higher coverage and heights by providing for group housing developments. Furthermore, it is also envisaged that a communal open space and recreational facilities be incorporated into the township.

The development nodes are placed onto a lattice to emphasis on development occurring in a linear fashion along linear activity systems. The lattice development concept consists of an interconnected system of development corridors along mobility spines and activity spines that serve as pull factors in a network. The existing R55 and PWV9 road has been identified as such a node and is located in close proximity to the site.

The SDF further states that the metropolitan role and function for the southern region is to provide residential opportunities for all income groups and to accommodate new residential development in a sustainable form.

It is important to note that the geological conditions in the study are only allowing the developer to develop 20 units/ha and 2 storey buildings. This is in support of the Geotechnical conditions.

Spatial Development Framework: Southern Region

The location of the site of application spatially demarcates the area to form part of Tshwane's Southern Region.

The urban development framework for this area is based on an integrated urban lattice on which densification and intensification of development can take place in an integrated manner. A set of linear systems from the framework of the urban development lattice and relays urban energy from the traversing highways to lower order roads where it can be converted into physical development and economic growth.

A system of activity nodes is placed onto the development lattice to provide thrust to development occurring in a linear fashion along highways or other linear activity systems.

The lattice development concept consists of an interconnected system of development corridors along highways, mobility spines, mobility roads, activity spines and activity streets as well as strategically placed nodes serving as pull factors in the network. The development that is placed alongside these roads is enhanced by the activity nodes that are placed on the lattice where there is most access.

Accordingly the urban lattice is based on the four following elements:

- A latticed configuration- maximising access, movement and development choices;
- A Nodal Structure- guiding intense development to specific locations and linked to increased accessibility
- A Precinct Strategy-creating a diverse character along the spines
- Integrated and phased-in public transport- creating opportunities for multiple connections

The existing R55 road linking Pretoria West with Sandton and the future PWV – 9 are deemed to be existing and potential development corridors. These two roads could in combination provide energy in the future for the development of the third development corridor in Centurion. The extension of Sunderland Ridge in a northern direction to accommodate light and high-tech industries is proposed for this section of the new development corridor.

An extremely powerful development lattice is in the process of being established in the immediate vicinity which in future might in prominence challenge corridors such as the N1 and R21. The development lattice is being structured by:

North-South Lattice Components:

- Proposed PWV 9 – Highway
- R55 (Voortrekker Road) – Mobility Spine (Optimal mobility)
- Mona / Mimosa Road (Linkage) – Mobility Road

East –West Lattice Components:

- N14 (R28)– Highway
- M34 Ruimte Road – Mobility Spine
- Proposed K52 – Mobility Spine
- Lochner Road

The road network and road interchanges within the Region must support planning and is an important mechanism to unlock development potential. High intensity areas are located along major routes. Residential densification along the development corridors along highways, mobility spines, mobility roads, activity spines and activity streets are proposed at medium or high density.

In terms of the SDF the potential of the Region is specified as, inter alia, being the development of the PWV 9 as well as residential development in a westerly direction.

Weaknesses of the area are listed as being the insufficient provision of bulk infrastructure and the underlying soil conditions that dictate the intensity of development as well as residential typologies.

It is furthermore mentioned that the area has a relatively low residential density. Residential development in the area should be guided by the principles of the Tshwane Compaction and Densification Strategy which promotes the provision of appropriate higher density at

appropriate locations. Densification is said not to be an end in itself but a means to achieve an overall efficient, integrated and sustainable metropolitan area.

From the relevant policy documents the following considerations are relevant in so far as land-use in the Centurion West area (Monavoni) is concerned:

- Potential exists in the western areas for the provision of residential facilities
- PWV 9 combined with the R55 has the potential to capture a vast amount of energy that can be transferred to the local area and promote the sustainability of employment opportunities;
- Acts and policies strongly enforce the concept of integrated land-use in order to foster sustainability by means of reducing travelling time, energy and costs.
- The spatial form should furthermore be founded on a development lattice on which densification and intensification of developments can take place in an integrated manner.

Within the Monavoni landholdings the past number of years has seen a systematic extension of the residential precincts from across the R 55 (Raslouw and Celtisdal) into the Monavoni area.

The process of overall land-use establishment in the Monavoni area currently seem to correctly provide for residential development in an east to west direction. As promoted within the local SDF intense land-use should be captured adjacent to the proposed PWV 9. As mentioned this should be attained and promoted by means of providing a parallel mobility spine which can facilitate access to these planes. The advantages of the location of the property adjacent to the N1 freeway and the R21.

Micro Development Context

From a micro contextual perspective Monavoni Extension 51 is located on the edge of a vast proposed residential development at an easily accessible intersection. The site is

situated to the west of the intersection of the proposed K52 and Mona Road and the proposed PWV 9. The location can thus be considered to be prominent yet orientated towards the proposed type of land-use.

Factors in support of the above statement include, firstly, the fact that the future planning of the area shall imply an extensive increase in the residential opportunities in order to ensure the feasibility of the envisaged BRT routes and community facilities in the area as well as employment opportunities in the node that is envisaged for the area. All current guidelines promote this interface of residential and commercial land-uses in close vicinity. Secondly, the proposed K52 is classified as a mobility spine with the capability of forming part of the public transportation network by means of the inclusion of the road in bus transport planning. An application for a school site has also been submitted to council, which location is east of the application site.

The desirability of the proposed development can be derived from the design principles that were applied during the compilation of the township layout plan:

- Controlled entrance to enable the development of walled in a security village;
- The location of the application site is in close proximity to planned social amenities such as schools;
- The close proximity of the application site in relation to the planned commercial node that will provide employment opportunities;
- The close proximity of the application site in relation to the planned BRT route and planned bus-top; and
- The planned provision of various housing typologies as a result of the various densities across the application site.

The inclusion of a site development plan and landscape development plan as pre-requisites to the approval of building plans enables the Municipality to see to it that a proper development, with consideration to the neighbouring developments, will take place.

Taking into account the contextual characteristics of the area and the high accessibility of the application site, the proposed township for which there is a need, could be regarded as desirable and strategically situated within a developing area.

The council has implemented a Densification Strategy within the Tshwane area. The principle of this is to obtain optimal concentrations of residential developments in order to enable the provision of economic and social opportunities in an integrated, vibrant, high-intensity, mixed use as well as to make optimal use of infrastructure. The vast number of proposed residential developments in the area clearly indicates the need for the planning of needed social amenities.

Planning responsibilities of the involved Local Authority

The prerogative to plan development within its jurisdictional area has always constitutionally, in terms of the Development Facilitation Act, 1995, the Local Government Transitional Act, 1993 and recently the Municipal Systems act, 2000 vested in the local authority involved.

In order to ensure that the proposed developments comply with the standards and requirements of the involved local authority, the relevant officials were involved in the planning of the project from the start.

Monavoni and Western Farms Development Framework 2020 (November 2008)

Information supplied by M & T Development Town Planning Division

A development framework was drafted in terms of which areas were earmarked for urban expansion during the period 2008 to 2020. A Development Edge was also proposed in terms of this framework to provide a guideline for the type of land uses that can be allowed inside and outside the Development Edge.

The properties that form part of this application fall within the boundaries of the Development Edge. This area was further divided into a number of Land use Management zones. The aim of these zones is to promote the development of a specific land use character through the application of land use mix and density.

The proposed development must comply with all the relevant legislation and it must strive to comply with the development frameworks, policies and guidelines for the area. The finalized layout must also take cognizance of the applicable institutional framework.

Issues & Impact Identification – Institutional

Table 40: Issues and Impacts – Institutional

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To Mitigate ☀️
36)	The proposed development will be in line with the international, national, provincial and local legislation, planning frameworks, guidelines, policies etc.	+	☀️

6.2.7 Qualitative Environment

6.2.7.1 Visual Analysis

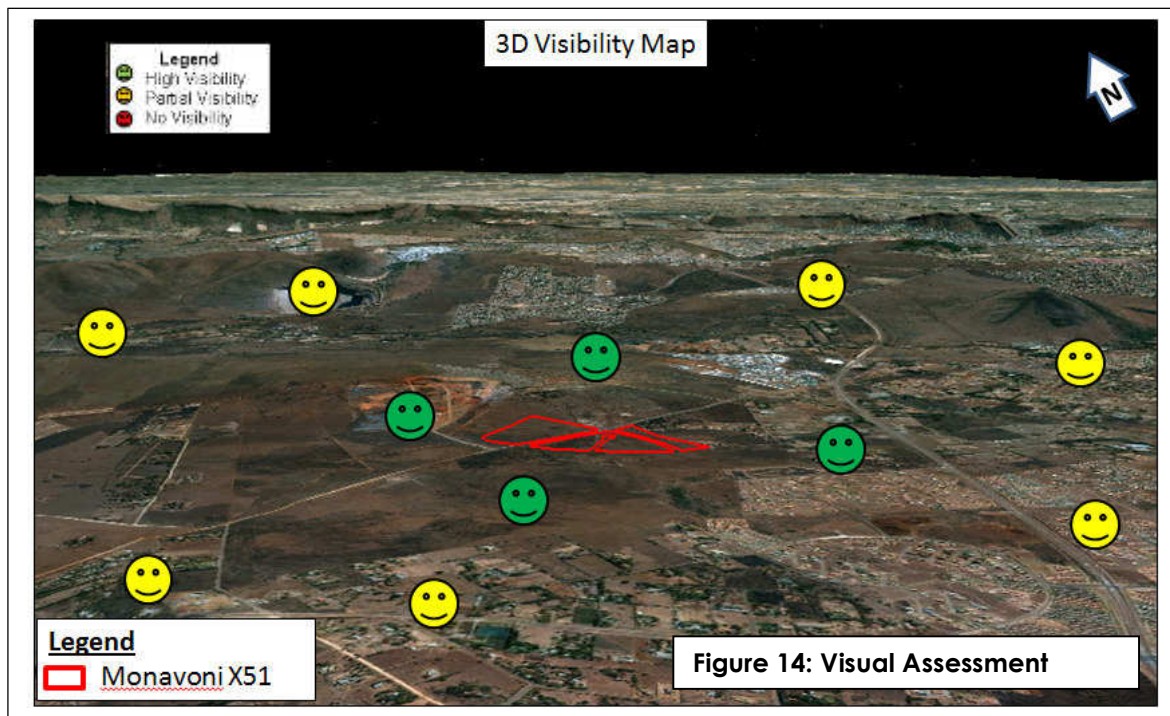
The following preliminary visual assessment criteria have been used to determine the impact of the proposed Monavoni Ext51 development on the state of the environment – the significance is indicated by the respective colour coding for each of the impacts, being high, medium and low:

TABLE 41: VISUAL IMPACT

CRITERIA	IMPACT		
	HIGH	MEDIUM	LOW
Visibility	A prominent place with an almost tangible theme or ambience	A place with a loosely defined theme or ambience	A place having little or no ambience with which it can be associated
Visual quality	A very attractive setting with great variation and interest – no clutter	A setting with some visual and aesthetic merit	A setting with no or little aesthetic value
Compatibility with the surrounding landscape	Cannot accommodate proposed development without the development appearing totally out of place – not compatible with the existing theme	Can accommodate the proposed development without it looking completely out of place	The surrounding environment will ideally suit or match the proposed development
Character	The site or surrounding area has a definite character/ sense of place	The site or surrounding environment has some character	The site or surrounding environment exhibits little or no character/ sense of place
Visual Absorption Capacity	The ability of the landscape not to accept a proposed development because of a uniform texture, flat slope and limited vegetation cover	The ability of the landscape to less easily accept visually a particular type of development because of less diverse landform, vegetation and texture	The ability of the landscape to easily accept visually a particular type of development because of its diverse landform, vegetation and texture
View distance	If uninterrupted view distances to the site are > 5Km	If uninterrupted view distances to the site are < 5Km but > 1Km	If uninterrupted view distances to the site are > 500m and <

			1000m
Critical Views	Views of the site seen by people from sensitive view sheds i.e. farms, nature areas, hiking trails etc.	Some views of the site from sensitive view sheds	Limited or partial views of the site from sensitive view sheds
Scale	A landscape with horizontal and vertical elements in high contrast to human scale	A landscape with some horizontal and vertical elements in some contrast to human scale	Where vertical variation is limited and most elements are related to the human and horizontal scale

As illustrated on the preliminary visual assessment below the study area is highly visible from the surrounding view sheds due to the topography



The site is regarded as homogeneous to the surrounding environment and the construction of a new township might cause a visual impact. However, as already mentioned in this report a global development framework was developed for the ±500 ha of land purchased by M & T Development. The visual impact can however be mitigated to some extent by following certain guidelines that will give the proposed development an aesthetic value.

Some of the guidelines that are suggested:

- Rooftops should be designed to blend in with the natural colours of the surrounding environment instead of standing out and creating a high visual impact.
- Existing trees should be retained at all costs in order to prevent the high visual impact of removed trees. The proposed development will also have an added aesthetical value if the trees are retained, which will in turn add to the market value of the development.
- Landscaping should be of a high standard. As many trees as possible should be planted at early stages of the development in order to ensure a mature look in the near future.

6.2.7.2 Sense of Place and Place Structure

The concept of “a Sense of Place” does not equate simply to the creation of picturesque landscapes or pretty buildings, but to recognize the importance of a sense of belonging. Embracing uniqueness as opposed to standardization attains quality of place. In terms of the natural environment it requires the identification, a response to and the emphasis of the distinguishing features and characteristics of landscapes. Different natural landscapes suggest different responses. Accordingly, settlement design should respond to nature.

In terms of the human made environment, quality of place recognizes that there are points where elements of settlement structure, particularly the movement system, come together to create places of high accessibility and these places are recognized in that they become the focus of the public investment, aimed at making them attractive, user-friendly and comfortable to experience. The landscape is usually experienced in a sensory, psychological and sequential sense, in order to provide a feel and image of place (genius loci).

A landscape is an integrated set of expressions, which responds to different influences. Each has its unique spirit of place, or “genius loci”. Each landscape has a distinct

character, which makes an impression in the mind, an image that endures long after the eye has moved to other settings.

If planned correctly the proposed development could enhance the genius loci of the broader area by establishing a residential township and open spaces.

Sense of Place is the subjective feeling a person gets about a place, by experiencing the place, visually, physically, socially and emotionally. The Sense of Place of a property/ area within the boundaries of a city is one of the major contributors to the Image of a City /City Image.

City Image consists of two main components, namely **place structure** and **sense of place**. Place structure refers to the arrangement of physical place making elements within a space, whereas sense of place refers to the spirit of a place. It could be defined as follows:

- **Place Structure** refers to the arrangement of physical place making elements within a unique structure that can be easily legible and remembered.
- The **Sense of place** is the subjective meanings attached to a certain area by individuals or groups and is closely linked to its history, culture, activities, ambience and emotions the place creates.

The study area does not have a strong sense of place and the place structure is also not very strongly defined. The larger area with the Schurweberg in the background does however have a sense of place and it should be retained.

6.2.7.3 Noise Impact

The alignment of the proposed K52 traverses the study area and the alignment of the proposed PWV 9 along the western boundary of the study area could have a noise impact and must be taken into consideration during the planning and design of the proposed Monavoni Ext51 development.

The construction phase could have a noise impact on the surrounding residents.

The following represent a summary of the mitigation measures to be implemented during the construction and operational phase to reduce the anticipated impact of noise pollution. **Refer to Annexure N, EMP.**

Mitigation measures for the anticipated noise impact during the construction phase:

- The construction site yard, workshop, concrete batching plant and other noisy fixed facilities should be located well away from noise sensitive areas;
- All construction vehicles, plant and equipment are to be kept in good repair;
- Truck traffic should be routed away from noise sensitive areas where possible;
- Blasting Operations (if required) are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timing of explosions;
- Construction activities are to be contained to reasonable hours during the day and early evenings. Night-time activities near noise sensitive areas should not be allowed. No construction should be allowed on weekends from 14h00 on Saturday afternoons to 06h00 the following Monday morning;
- With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities;
- As construction workers operated in a very noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993) and Gauteng Noise Control Regulations, 1999. Where necessary ear protection gear should be worn.

Mitigation measures for the anticipated noise impact during the operational phase of the proposed development

The following noise specific mitigation measures will need to be considered:

- The design, placement and orientation of the extractor fans for the ventilation of the buildings must take the noise impact aspect into consideration. Equipment with the best noise rating must be used. Roof mounted fans may further require attenuators and need to be screened from noise sensitive areas;
- High quality air-conditioning equipment should be installed. Equipment with the best noise rating should be used;
- Where required, high quality refrigeration compressors should be installed. Equipment with the best noise rating should be used. Exterior building installations should be acoustically encapsulated;
- All mechanical equipment is to be well maintained;
- The noise levels must comply with the Gauteng Noise Control Regulations, 1999

6.2.5.4 Light Pollution

As mentioned above, the alignment of the proposed K52 traverses the study area and must be taken into consideration during the planning and design of the proposed development with regard to lighting.

Street and security lighting must be designed in order not to spread light into the eyes of oncoming traffic on the proposed K52 and PWV 9. Internal streets and security lighting should also be designed not to disturb residents at night. Light beams must face downwards and not higher than a 45 degree angle from the ground. **Refer to Annexure N, EMP.**

6.2.5.5 Air Quality / Dust

Some dust pollution may occur during the construction phase if dry and windy conditions occur, but will only be temporary and will not occur during the operational phase. Dust suppression techniques such as sprinkling the construction site regularly with water and by putting up dust nets will mitigate this impact to an acceptable level. **Refer to Annexure N, EMP.**

Issues & Impact Identification – Qualitative Environment

Table 42: Issues and Impacts – Qualitative Environment

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To Mitigate ☀️
13)	If not planned correctly, roofs and parking areas could reflect the sun into the eyes of oncoming traffic and surrounding landowners - Please refer to Section 6.1.1.3		
14)	If not planned and managed correctly the lights (interior and exterior) and the signage of the development could cause visual pollution - Please refer to Section- 6.1.1.3		
37)	Construction works cause visual pollution during the construction phase	-	😊
38)	If not planned and managed correctly, the proposed development could have a negative impact on the “Sense of Place” of the study area and its surroundings.	-	😄

15)	If dry and windy conditions occur during the construction phase, dust pollution could become a problem - Please refer to Section 6.1.1.4	-	😊
39)	If not planned correctly the proposed K52 and PWV 9 could have a noise impact on the residential component of the development	-	😐
40)	The construction phase of the development could have a noise impact on the surrounding residents	-	😐

Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

37) Construction works cause visual pollution during the construction phase.

Table 43: Significance of Issue 37 (Visual Pollution during construction phase) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 😊 Medium 😐 Low 🛑</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 😐</p>	<p>P / C -All equipment and materials should be stored in a designated area indicated by the ECO.</p> <p>C - All areas must be kept neat</p>	<p>M - To be included in the EMP</p> <p>M - To be included in the EMP</p>

	and tidy and no waste should also be stored in the designated areas and removed on a weekly basis	
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

38) The study area and its surroundings do not have a unique “Sense of Place” and the design and layout of the development should take this into consideration. The architectural theme of the proposed development should blend in and compliment the surrounding environment fitting into the area.

Table 44: Significance of Issue 38 (If not planned and managed correctly, the proposed development could have a negative impact on the “Sense of Place” of the study area and its surroundings) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation	Significance of Issue after mitigation
	Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	P - Building material and finishes should preferably consist of raw materials and earthy colours should be used; P -The Schurweberg in the background should be taken into consideration during the design phase of the project.	E – To be included in the EMP

	<p>P/C/O - If planned and managed correctly, the proposed development will enhance the "Sense of Place" and value of the study area and its surroundings.</p>	
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Result: The issue is eliminated by implementing the mitigation measures and can also be turned into a positive impact the significance of this positive impact still need to be determined confirmed/assessed in the significance rating table.

Table 45: Significance of Issue 39 (If not planned and managed correctly, the proposed K52 and PWV 9 could have a noise impact on the residential component of the development) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ⚙️</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P/C/O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L/E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>P – The alignment of the K52 must be taken into consideration during the design of the proposed development.</p>	<p>E – To be included in the EMP</p>

Result: The issue is eliminated by implementing the mitigation measures and can also be turned into a positive impact the significance of this positive impact still need to be determined confirmed/assessed in the significance rating table.

Table 46: Significance of Issue 40 (The construction and operational phase of the proposed development could have a noise impact on the surrounding residents) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ☀️</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P / C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
<p>High 🟢</p>	<p>C -</p> <ul style="list-style-type: none"> - The construction site yard, workshop, concrete batching plant and other noisy fixed facilities should be located well away from noise sensitive areas; - All construction vehicles, plant and equipment are to be kept in good repair; - Truck traffic should be routed away from noise sensitive areas where possible; -Blasting Operations (if required) are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timing of explosions; - Construction activities are to be contained to reasonable hours during the day and early evenings. Night-time activities near noise sensitive areas should not be allowed. No construction should be allowed on weekends from 14h00 on Saturday afternoons to 06h00 the following Monday morning; - With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, 	<p>M – To be included in the EMP</p>

	<p>the contractor should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities;</p> <ul style="list-style-type: none"> - As construction workers operated in a very noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993) and Gauteng Noise Control Regulations, 1999. Where necessary ear protection gear should be worn. <p>O-</p> <ul style="list-style-type: none"> - The design, placement and orientation of the extractor fans for the ventilation of the buildings must take the noise impact aspect into consideration. Equipment with the best noise rating must be used. Roof mounted fans may further require attenuators and need to be screened from noise sensitive areas; - High quality air-conditioning equipment should be installed. - Equipment with the best noise rating should be used; - Where required, high quality refrigeration compressors should be installed. Equipment with the best noise rating should be used. Exterior building installations should be acoustically encapsulated; - All mechanical equipment is to be well maintained; 	
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M – To be included in the EMP

Result: *The issue is eliminated by implementing the mitigation measures and can also be turned into a positive impact the significance of this positive impact still need be determined confirmed/assessed in the significance rating table.*

6.2.8 Services

CES compiled a Master Plan for Services in the City of Tshwane. The proposed Monavoni Ext51 development was taken into consideration for the Master Plan that was compiled in June 2004/2005. **Refer to Annexure G5, Services Master Plan.**

6.2.7.a Water

Water Distribution System

Distribution Zone

According to the master planning the proposed Monavoni development area should be accommodated in the Mnandi reservoir and the future Mooiplaats reservoir zones (**refer to Annexure G5**).

The involved engineers stated that the proposed Monavoni development is situated outside the water priority area and the developer will have to install/construct certain link services and external bulk services and make pro-rata contributions for services provided by other developers.

Water Demand

According to the original water analysis for the master plan the total annual average daily Demand (AADD) for the development is 6 050 kl/d.

Present situation

The proposed Monavoni development falls within the existing Mnandi reservoir and future Mooiplaats reservoir zones. CES stated that the proposed development can be supplied by the Mnandi reservoir as an interim solution until the Mooiplaats reservoir is constructed. (It is assumed that the temporary 450mm/400mm Ø supply pipe from the Pretoriusrand reservoir site to Mnandi reservoir is operational).

Some upgradings are required to accommodate the development and to comply with the criteria as set out in the master plan (**refer to Section 1.3, Annexure G5**).

Master Plan

According to CES adjustments to the proposed master plan items of July 2004 are required to accommodate the proposed development (**refer to Section 1.4, Annexure G5**).

6.2.7.b Sewerage

Drainage area

The proposed development was taken into consideration for the June 2005 Master Plan. CES stated that the proposed development falls within the existing Rietspruit drainage area as indicated on **Figure 2, Annexure G5**.

According to CES the proposed development falls outside the Tshwane sewer priority area and the developer will have to install certain link services and make pro-rata contributions for services provided by other developers.

Sewer flow

According to CES the estimated future PDDWF calculated in the master planning study for the proposed development was 3620 kl/d and that the PDDWF for the proposed Monavoni development was calculated at 6726 kl/d for this re-analysis. **Refer to Section 1.2, Annexure G5** for the anticipated flows for the sub-drainage system which drains towards the proposed development.

Sewer Master Plan

Adjustments to the proposed master plan items are required to accommodate the proposed Monavoni Ext51 development and other developments. CES stated that the proposed development will have a pro rata effect on the required items downstream of its connections (**refer to Section 1.3, Annexure G5**).

CES stated that the Sunderland Ridge WCW is already operating beyond capacity and needs to be upgraded to accommodate the proposed Monavoni development.

Accommodation of the development in the present sewer system

In order to accommodate the proposed development in the present system the implementation of some master plan items are required **(Refer to Section 1.4, Annexure G5)**.

The Sunderland Ridge WCW is already operating beyond capacity and needs to be upgraded to accommodate this and future developments. According to information a phased upgrading is in progress.

6.2.7.c Stormwater Management

. The storm water systems of the development will be designed and installed to the standards and specifications of the relevant authorities, ensuring compliance with the specific requirements related to developments in dolomitic areas.

All storm water to be discharged directly into the sewer system must comply with the requirements of the City of Tshwane and DWA. The Storm water Management Plan will be supplied to City of Tshwane and DWA for approval.

6.2.7.d Solid Waste

(Refer to the Annexure G6, Waste Management Plan)

Local Authorities manage solid waste collection through private contractors. The collected solid waste is then transported to landfills via transfer stations which is managed and maintained by the government through private contractors.

The following norms and statutory requirements are utilised where applicable:

- National Solid Waste Management Plan (NSWMP) – 1994

- Government Solid Waste Management Strategy – to minimize solid waste by recycling and composting.

Waste storage and processing systems

A solid waste compactor is envisaged. The waste generated will be temporary stored in different operational waste containers or bins. Waste will be dumped into the static compactor to be provided. The waste will be collected from the waste generating sites and taken directly to the compactor. The compacted waste slugs will be stacked in a container for proposed weekly removal or if required removed daily per arrangement in smaller quantities.

6.2.7.e Electricity

The land on which this township is proposed lies within the licensed electricity supply area of the City of Tshwane. The City of Tshwane will in future be responsible for the network modifications that will be required to supply it from the future Monavoni substation.

6.2.8.f Traffic

Refer to **Annexure G7** for the **Monavoni Master Plan** conducted by ITS Engineers (Pty) Ltd in August 2009.

Objectives

The objective of the study was to determine the impact of the additional traffic that will be generated by the larger Manavoni development proposed by M & T Development on the adjacent (existing) road network (**Refer to Figure 15, Master Plan Study Area**). The expected trip generation, distribution and assignment, as well as the required road upgrades to accommodate the proposed development trips, are discussed in the report.

The traffic generated by the latent rights in the vicinity of the proposed developments was also taken into consideration for the analysis.

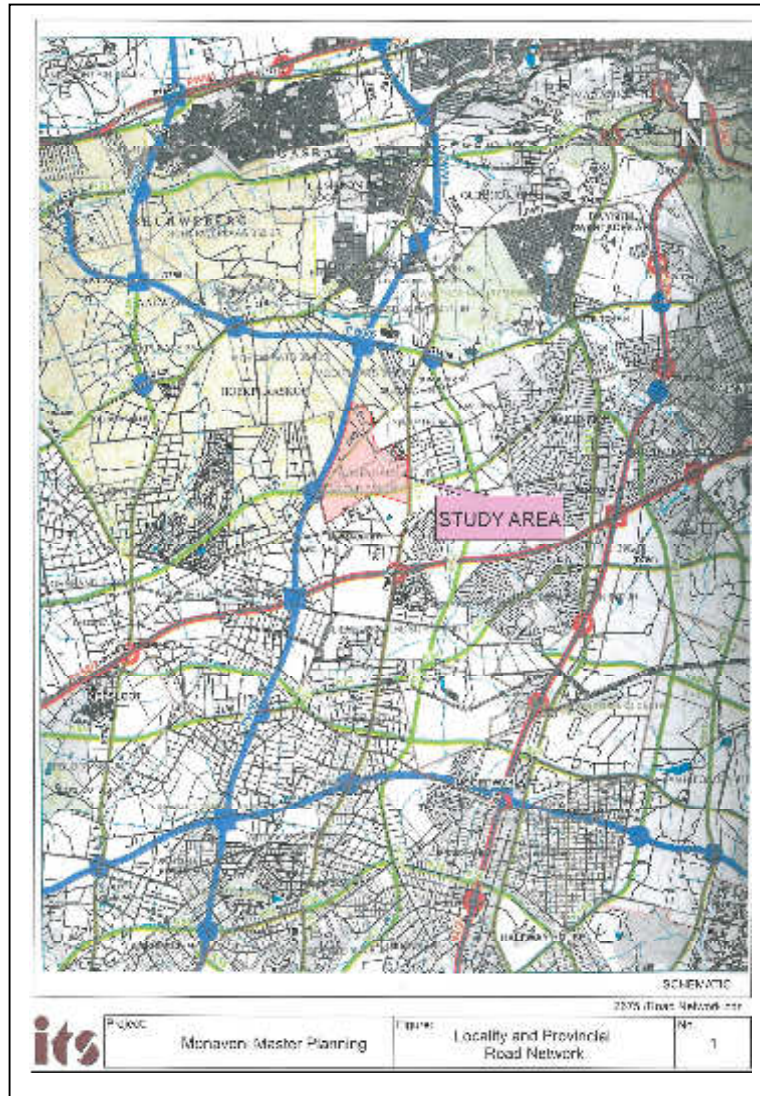


Figure 15 – Study Area: Monavoni Master Plan

Trip Generation

According to ITS Engineers the larger Monavoni development will generate 9 292 trips during the weekday AM and PM peak hours if the adjustment factor of 0.8 is applied to indicate that 20% of trips will use public transport (**refer to Annexure G7, Appendix A, Table 1a, 1b and 1c**).

Expected Trip Distribution and Trip Assignment

The additional vehicle trips that will be generated by the proposed development were distributed to the adjacent road network. ITS Engineers based the trip distribution for the study area on the examination of the existing traffic flow patterns in the area, surveys conducted in the previous studies, as well as local knowledge of the area. **Refer to Annexure G7 Figure 3a, 3b, 3c, 3d and 3e for the expected trip distribution.**

According to ITS Traffic Engineers there are five alternatives in terms of trip distribution and the aim was to check the most suitable trip distribution that will resolve the capacity especially on K71. The following alternatives were investigated:

- Alternative 1: All traffic towards south will use K71
- Alternative 2: 40% of traffic towards south to use PWV9
- Alternative 3: 40% of traffic towards south to use PWV9 until at N14, then 25% will join N14 to join K71 south (PWV9 will be constructed until N14)
- Alternative 4: 20% of traffic towards south to use R511 via Ruimte (P102-1)
- Alternative 5: 25% of traffic towards south to use PWV9 until at N14, then 10% will join N14 to join K71 south (PWV 9 will be constructed until N14), also 15% towards south will use D49.

ITS Engineers used Alternative 5 for the purpose of this study as it will reduce chances of adding more traffic on K71 because K71 will not have spare capacity by the time most of the developments will be developed.

Road Upgrades:

The following road upgrades are required to accommodate the larger Monavoni development:

Table 47: Monavoni Masterplan – external road upgrades

Nr.	Route	Section	Upgrade
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1	K71	North of Wierda (K103)	Additional through lanes for both directions
2	PWV9	K52 to N14	Construction of 1 lane per direction, Bridge and Ramps to the east
3	K52	K71 to Ruimte (P102-1)	1 lane per direction, new road
4	D49/Magalies	Intersection	1 lane per direction, reconstruction
5	Theron	Ruimte to Von Willich	1 lane per direction, reconstruction
6	K52	K71 to PWV9	1 lane per direction, new road

ITS Engineers stated that the proposed road upgrades will not take place at once, but will be phased with the different extensions of the proposed townships. In addition, it is foreseen that the proposed upgrades are used as a planning guideline and that as individual townships are established, a more detailed traffic impact study be carried out to determine the detail of the upgrades.

Access

Access to the property will be obtained via a public road that will run through the proposed township Monavoni. This road in turn connects to Mona Road. Erven 3 and 4 will obtain access via a proposed bridge or tunnel over the proposed provincial road K52. This will be finalised at a later stage. Mona road connects to the proposed Road K52 and the existing and planned road network of the Monavoni area. A line-of-no-access has been indicated along Mona Road.

Conclusion and recommendations by ITS Engineers







- The Monavoni Master Plan should not be regarded as a detailed traffic impact study but as a guideline to determine macro level road upgrades that will be required to accommodate the development
- The road network where the proposed Monavoni developments will be located will require substantial upgrades to accommodate the extent of traffic volumes.

- The upgrades proposed will provide adequate regional capacity that will be able to accommodate the traffic generated by the development.
- ITS Engineers recommended that the proposed Monavoni developments can proceed from a macro planning point of view.

Issues & Impact Identification – Services

Table 48: Issues and Impacts – Services

	Issue/ Impact	Positive/ Negative/ Neutral ±	Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact - Not Necessary To Mitigate 🌞
41)	Stormwater The proposed development will lead to increased hard surfaces and the quantity and the speed of the storm water across the study area and into the water bodies and adjacent properties will increase.	-	🟢
42)	Surface water flows will be altered during the construction phase.	-	🟢
43)	The use of insufficient drainage systems during the construction phase (i.e. sub-surface drainage systems & no mechanisms to break the speed of the surface water)	-	🟢
44)	Some upgrading to the Services Master Plan (Sewer and Water) compiled by CES are required in order to accommodate the proposed development	+	🌞

45)	Electricity The availability of electricity for the development to be confirmed	-	
46)	Traffic The proposed development will lead to the increase in traffic on local and provincial roads–	-	
45)	The proposed development will contribute largely to the upgrading of local and provincial roads	+	
47)	Waste Management The construction and operational phases of the proposed development will create large quantities of builder's and domestic waste to be accommodated by local legal landfill sites.	-	
48)	The involved local authority will be responsible for the removal of the domestic waste – increased rates and	+	
34)	General Temporary disruption of services due to relocation and installation of services	-	

Discussion of issues identified, possible mitigation measures and significance of issue after mitigation

41) The proposed development will lead to increased hard surfaces and the quantity and the speed of the storm water across the study area and into the water bodies and adjacent properties will increase.

Should contaminated storm water run-off from roads not be managed, it could lead to surface water and ground water pollution. Bio-swale and bio-filters could be installed to minimize the risk of pollutants entering the natural drainage system of the area. This will also raise flood levels of water bodies in the area, if storm water is not managed correctly. This is

very important that the mitigation measures are followed due to the dolomite this is a very sensitive impact.

Table 49: Significance of Issue 41 (The proposed development will lead to increased hard surfaces and the quantity and the speed of the storm water across the study area and into the water bodies and adjacent properties will increase) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 🟢 Medium 🟡 Low 🔴 Positive Impact/ Neutral - Not Necessary To Mitigate ⚡	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	P/ C - Surface storm water generated as a result of the development must not be channeled directly into any natural drainage system or wetland. P - The storm water management plan should be designed in a way that aims to ensure that post development runoff does not exceed predevelopment values in: •Peak discharge for any given storm; •Total volume of runoff for any given storm; •Frequency of runoff; and •Pollutant and debris	L - To be included in the EMP

	<p>concentrations reaching water courses.</p> <ul style="list-style-type: none"> •No open structures for stormwater.; •Cement structures are required. <p>P/ C - Bio-swale and bio-filters could be installed to minimize the risk of pollutants entering the natural drainage system of the area.</p>	
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

42) Due to the excavations that will take place (there will be trenches and topsoil as well as subsoil mounds in and around the study area) the topography of the study area will temporarily be altered. This will however only be a short-term impact and if the levels are restored to normal (the surface drainage patterns from the new levels should not differ too much from the surface water drainage of the original levels) once the construction phase is completed.

Table 50: Significance of Issue 42 (Surface water flows will be altered during the construction phase) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🔴</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p> <p>P/ C / O</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p> <p>Not possible to mitigate, but not regarded as a fatal flaw NP</p>
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<p>High 🟢</p>	<p>P/C – Construction activities should preferably take place during the winter months.</p> <p>P/C - If it is not possible for construction activities to take place during the winter months, construction activities should take place in phases in order to prevent large exposed areas that will cause an increase in the speed of surface water.</p> <p>P - When storm water planning is done, every attempt possible should be made to keep the post construction and pre-construction flows similar.</p>	<p>M – To be included in the EMP</p>
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Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

43) The use of insufficient drainage systems including sub-surface drainage systems and no mechanisms to break the speed of surface water during the construction phase.

Table 51: Significance of Issue 43 (The use of insufficient drainage systems during the construction phase (i.e. sub-surface drainage systems & no mechanisms to break the speed of the surface water) After Mitigation/ Addressing of the Issue

<p>Mitigation Possibilities</p> <p>High 🟢 Medium 🟡 Low 🟠</p> <p>Positive Impact/ Neutral - Not Necessary To Mitigate ✨</p>	<p>Mitigation</p> <p>Already achieved ✓</p> <p>Must be implemented during planning phase, construction and/ or operational phase</p>	<p>Significance of Issue after mitigation</p> <p>Low/ eliminated L / E</p> <p>Medium M</p> <p>High H</p>
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	P / C / O	Not possible to mitigate, but not regarded as a fatal flaw NP
High 🟢	<p>C – Implement temporary storm water management measures that will help to reduce the speed of surface water. These measures will also assist with the prevention of water pollution, erosion and siltation.</p> <p>P/C - In order to prevent large exposed areas, it is recommended that the construction of the development be done in phases. Each phase should be rehabilitated immediately after the construction for that phase has been completed. The rehabilitated areas should be maintained by the appointed rehabilitation contractor until a vegetative coverage of at least 75% has been achieved.</p> <p>C - No excavated materials should be dumped in or near drainage channels.</p>	L – To be included in the EMP

Result: Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table

47) During the construction and operational phases waste would be generated on site. The waste may consist of the following waste streams, namely:

- Liquid waste from vehicles;
- Solid domestic waste; and
- Solid construction waste.

Disposal of some of the above waste streams may lead to soil, water and aesthetic pollution of the site. The soil and water pollution should be localised with little impact on the surrounding environment. Waste disposal on site may stimulate the surrounding population to also dispose domestic waste on the site. This may lead to an uncontrolled situation that would be aesthetically unacceptable to future occupants and costly to rehabilitate.

The disposal of large quantities of waste during both the construction and operational phases would place a burden on landfill sites in the area to accommodate the additional volumes. Although this waste is inert in most cases, it may be of significant proportions and will contribute to the saturation of the formal landfill sites in the area.

Table 52: Significance of Issue 47 (The construction and operational phases of the proposed development will create large quantities of builder's and domestic waste and liquids) After Mitigation/ Addressing of the Issue

Mitigation Possibilities High 🟢 Medium 🟡 Low 🟠 Positive Impact/ Neutral - Not Necessary To Mitigate ✨	Mitigation Already achieved ✓ Must be implemented during planning phase, construction and/ or operational phase P / C / O	Significance of Issue after mitigation Low/ eliminated L / E Medium M High H Not possible to mitigate, but not regarded as a fatal flaw NP
Medium 🟡	C – Prevent unhygienic usage on site and pollution of the natural assets. Develop a	L – To be included in the EMP

	<p>central waste temporary holding site to be used during construction. (Near the access entrance). This site should comply with the following:</p> <ul style="list-style-type: none"> - Skips for the containment and disposal of waste that could cause soil and water pollution, i.e. paint, lubricants, etc.; - Small lightweight waste items should be contained in skips with lids to prevent wind littering; - Bunded areas for containment and holding of dry building waste. - THESE AREAS SHALL BE PREDETERMINED AND LOCATED IN AREAS THAT IS ALREADY DISTURBED. THESE AREAS SHALL NOT BE IN CLOSE PROXIMITY OF DRAINAGE CHANNELS. <p>C - Workers will only be allowed to use temporary chemical toilets on the site.</p> <p>C - No French drain systems</p>	
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	<p>may be installed.</p> <p>C - No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site;</p> <p>All waste must be removed to a recognized waste disposal site on a weekly basis. No waste materials may be disposed of on or adjacent to the site. The storage of solid waste on site, until such time that it may be disposed of, must be in the manner acceptable to the Local Authority</p> <p>C - Keep records of waste reuse, recycling and disposal for future reference. Provide information to ECO. (Environmental Control Officer)</p>	
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Result: *Although issue can be mitigated, the significance of the impact should still be determined / confirmed assessed in the Significance Rating Table*

6.2.9 Public Participation

Refer to Annexure K

Public participation is an important aspect of the EIA Process. The principles of the National Environmental Management Act govern many aspects of environmental impact assessments, including public participation. These include provision of sufficient and

transparent information on an ongoing basis to stakeholders to allow them to comment and ensuring the participation of previously disadvantaged people, women and youth.

Effective public involvement is an essential component of many decision-making structures, and effective community involvement is the only way in which the power given to communities can be used efficiently. The public participation process is designed to provide sufficient and accessible information to interested and affected parties (I&AP's) in an objective manner to assist them to:

- Raise issues of concern and suggestions for enhanced benefits.
- Verify that their issues have been captured.
- Verify that their issues have been considered by the technical investigations.
- Comment on the findings of the EIA.

Five persons registered as Interested and Affected parties during the public participation process for the Scoping Phase.

Stakeholders (I&AP's) were notified of the Environmental Evaluation Process through:

- 1) A site notice that was erected (at a prominent point on the study area) on 16 May 2013 **(Refer to Annexure K i for proof of notice)**.
- 2) Notices were distributed to the surrounding land-owners and interested and affected parties by means of faxes, hand delivery and e-mail **(Refer to K ii for proof of public notice)**; and
- 3) An advertisement was placed in the Beeld newspaper on 23 May 2013 **(Refer to Annexure K iii for proof of advertisement)**.

Five people registered as Interested and Affected parties for the project during the EIA phase **(refer to Annexure K (iv) for a list of Interested & Affected Parties)**.

- 1) A site notice that was erected (at a prominent point on the study area) on 7 February 2014 **(Refer to Annexure K i for proof of notice)**.

- 2) Notices were distributed to the surrounding land-owners and interested and affected parties by means of faxes, hand delivery and e-mail (**Refer to K ii for proof of public notice**); and
- 3) An advertisement was placed in the Beeld newspaper on 7 February 2014 (**Refer to Annexure K iii for proof of advertisement**).

The Interested and Affected parties (including Ekurhuleni Metropolitan Municipality, DWA, SAHRA, SANRAL, Gautrans, ESKOM, Transnet and Telkom) were notified that the draft EIA Report was available for review for a period of 30 days. The report was also available on Bokamoso's website. In addition the draft EIA Report was submitted to DWA and Ekurhuleni Metropolitan Municipality for comments.

The following comments were received from City of Tshwane on the 26th of August 2013:

- a) A Dolomite Stability study (Geotechnical survey) must be conducted to confirm the presence of dolomite on the proposed study area. The study should not only include mitigation and precautionary measures, but also recommendations on the structural design.

Response:

Refer to Annexure G1 for the Dolomite Stability Report compiled by Relly, Milner and Shedden Consulting Earth Scientists.

- b) A Traffic Impact Study must be included within the EIA Report. This Report should aim to address expected traffic volumes and the expected noise impact of the proposed development.

Response:

Refer to Sections 6.2.7.f and **Annexure G7**, Traffic Master Plan.

- c) GDARD Biodiversity comments should be included within the final EIA Report. Any issues as identified by the GDARD Biodiversity Section must be addressed within the final Report.

Response:

GDARD Biodiversity comments are included within the EIA Report. The issues as identified by the GDARD Biodiversity Section are addressed within the Report.

- d) Comments from the Hennopsvallei Conservancy must be included in the final EIA Report. Any issue related to this project from the conservation department must be addressed before the final EIA report is submitted.

Response:

The Draft EIA Report was submitted to the Hennops Conservancy for comments, but no positive or negative comments were received.

- e) A Storm water Management Plan must be included within the EIA Report. The plan should aim to prevent pollution, erosion and siltation during both the construction and operational phases. The increase in speed, quantity and quality of surface storm water should also be addressed.

Response:

Refer to **Section 6.2.7.c and EMP, Annexure N**. Bokamoso recommend that the submissions and approval of a Storm water Management Plan to DWA and CoT be included as a condition in the authorization.

- f) An Environmental Management Plan should be included within the final EIA Report. The EMP should address impacts and mitigation measures for the pre-construction, construction and post-construction activities. All issues and recommendations as indicated above should be included within the final and approved EMP. An Environmental Control Officer and contact details should also be included within the EMP.

Response:

Refer to **EMP, Annexure N**.

- g) A Rehabilitation plan shall be included in EIA Report and should aim to prevent erosion and aid the return of natural, endemic and indigenous vegetation cover to at least 80% of the rehabilitated area. Any disturbance to the "Private Open Space" shall be rehabilitated to at least 80% coverage of the rehabilitated area. The proposed rehabilitation plan should be included within the finalized and approved EMP in detail.

Response:

Refer to **EMP, Annexure N**. It is recommended that this rehabilitation plan be submitted to GDARD prior to construction activities taking place on site. It is recommended that this be made a condition of the E.A.

The following comments were received from City of Tshwane on the 8th of November 2013:

- a) The Department noted the specialist reports to be undertaken during the EIA phase and recommends that a thorough investigation be conducted for the proposed development site.

Response:

All required specialist reports was undertaken and included in the EIA Report. **Refer to Annexure G** for all the specialist reports.

- b) The plan of study for EIA as provided in annexure E of the final scoping report is supported.

The following comments were received by City of Tshwane on the **Draft EIA Report** on the 25th of February 2015:

The Department supports the draft EIA Report subject to the specific recommendations. The Department has no objection to the proposed development. **Refer to Annexure K, for the comments and issues register.**

7. SIGNIFICANCE ASSESSMENT

7.1 Description of Significance Assessment Methodology

The significance of Environmental Impacts was assessed in accordance with the following method:

Significance is the product of probability and severity. Probability describes the likelihood of the impact actually occurring, and is rated as follows:

- | | | | |
|--------------------------|-----------------|---|--|
| <input type="checkbox"/> | Improbable | - | Low possibility of impact to occur either because of design or historic experience.
Rating = 2 |
| <input type="checkbox"/> | Probable | - | Distinct possibility that impact will occur.
Rating = 3 |
| <input type="checkbox"/> | Highly probable | - | Most likely that impact will occur.
Rating = 4 |
| <input type="checkbox"/> | Definite | - | Impact will occur, in the case of adverse impacts regardless of any prevention measures.
Rating = 5 |

The **severity factor** is calculated from the factors given to “intensity” and “duration”. Intensity and duration factors are awarded to each impact, as described below.

The **Intensity factor** is awarded to each impact according to the following method:

- Low intensity - natural and man made functions not affected – Factor 1
- Medium intensity - environment affected but natural and man made functions and processes continue - Factor 2
- High intensity - environment affected to the extent that natural or man made functions are altered to the extent that it will temporarily or permanently cease or become dysfunctional - Factor 4

Duration is assessed and a factor awarded in accordance with the following:

- Short term - <1 to 5 years - Factor 2
- Medium term - 5 to 15 years - Factor 3
- Long term - impact will only cease after the operational life of the activity, either because of natural process or by human intervention - factor 4.
- Permanent - mitigation, either by natural process or by human intervention, will not occur in such a way or in such a time

span that the impact can be considered transient - Factor 4.

The **severity rating** is obtained from calculating a severity factor, and comparing the severity factor to the rating in the table below. For example:

$$\begin{aligned}
 \text{The Severity factor} &= \text{Intensity factor X Duration factor} \\
 &= 2 \times 3 \\
 &= 6
 \end{aligned}$$

A **Severity factor** of six (6) equals a Severity Rating of Medium severity (Rating 3) as per table below:

Table 53: Severity Ratings

RATING	FACTOR
Low Severity (Rating 2)	Calculated values 2 to 4
Medium Severity (Rating 3)	Calculated values 5 to 8
High Severity (Rating 4)	Calculated values 9 to 12
Very High severity (Rating 5)	Calculated values 13 to 16
Severity factors below 3 indicate no impact	

A Significance Rating is calculated by multiplying the Severity Rating with the Probability Rating.

The **significance rating** should influence the development project as described below:

- Low significance (calculated Significance Rating 4 to 6)
 - Positive impact and negative impacts of low significance should have no influence on the proposed development project.

- Medium significance (calculated Significance Rating >6 to 15)
 - Positive impact:
 - Should weigh towards a decision to continue

- Negative impact:
Should be mitigated to a level where the impact would be of medium significance before project can be approved.

- High significance (calculated Significance Rating 16 and more)
 - Positive impact:
Should weigh towards a decision to continue, should be enhanced in final design.

 - Negative impact:
Should weigh towards a decision to terminate proposal, or mitigation should be performed to reduce significance to at least medium significance rating.

7.2 Significance Assessment of Anticipated Impacts

Impacts indicated under each section of the environment were each assessed according to the above methodology. **Table 60** below contains the results of the significance assessment.

Table 54: Results of significance assessment of impacts identified to be associated with the proposed development (after mitigation)

Impact	Probability Rating	Severity Rating		Severity Factor	Severity Rating	Significance Rating
		Intensity	Duration			
CONSTRUCTION PHASE						
Beneficial Impacts						
18. The eradication of weeds and exotic invaders.	5	4	3	12	4	20 High
11. Due to the topography the development will be visible from view sheds in the flatter areas around the	4	2	4	8	3	12 Medium

study area. It will also be visible from the proposed PWV9 adjacent to the site and K52 which traverses the site.						
28. Creation of temporary Job opportunities.	5	4	2	8	3	15 Medium
Adverse Impacts						
1. Restriction on land use types due to geology.	5	4	4	16	5	25 High
2. Risk for formation of sinkholes and dolines if precautionary measures for construction on dolomite are not followed and if an effective storm water management plan is not implemented.	4	4	4	16	5	20 High
3. Stability of structures if foundation requirements from geotechnical engineer and precautionary measures for construction on dolomite are not followed.	3	4	4	16	5	15 Medium
4. Excavation problems are likely where dolomite pinnacles are present close to surface and some blasting may be required.	3	4	4	16	5	15 Medium
5. Erosion may be caused by the construction activities on site.	3	4	2	8	3	9 Medium
6. Incorrect topsoil stockpiling may cause a loss of topsoil or pollution and stockpile areas for construction materials may cause soil and visual pollution.	4	2	4	8	3	12 Medium
7 & 9 Siltation, erosion and ground water pollution could occur if a stormwater management plan is not implemented.	4	2	4	8	3	12 Medium
10. Erosion, surface water pollution and siltation problems due to removal of vegetation coverage and increased hard surfaces.	4	2	4	8	3	12 Medium

11. Due to the topography the development will be visible from view sheds in the flatter areas around the study area. It will also be visible from the proposed PWV9 adjacent to the site and K52 which traverses the site.	4	2	4	8	3	12 Medium
14. Construction during the wet season could cause very wet conditions, which makes it extremely difficult to build in and to do rehabilitation works of disturbed areas.	3	2	2	4	2	6 Low
15. Construction during the dry and windy season may cause dust pollution. Although this impact will only be a short term impact, mitigation will be necessary during the construction phase.	3	2	2	4	2	6 Low
16. The loss of natural primary grassland	5	4	4	16	5	25 High
17. Loss of orange listed plant species.	3	4	3	12	4	12 Medium
19. If the entire area to be developed is cleared at once, smaller birds, mammals and reptiles will not be afforded the chance to weather the disturbance in an undisturbed zone close to their natural territories.	3	4	3	12	4	12 Medium
20. Noise impact of construction machinery could have a negative impact on the fauna species during this phase.	3	2	2	4	2	6 Low
21. During the construction and operational phase (if not managed correctly) fauna species could be disturbed, trapped, hunted or killed.	3	4	3	12	4	12 Medium
22. Loss of habitat can lead to the decrease of fauna numbers and species, especially the Melodius Lark (<i>Mirafra cheniana</i>), the hedgehog and the Harlequin Snake.	5	4	4	16	5	25 High

23. Structures of cultural significance may be destroyed.	3	2	2	4	2	6 Low
32. Possibility of illegal settlements and increased security problems.	3	2	2	4	2	6 Low
33. Traffic increase in the area, will have an impact on the traffic flow and the tranquility of the area	5	2	4	8	3	15 Medium
34. Damage to the existing services and infrastructure during the construction phase and disruptions in services (i.e. electricity, water, damage to Telkom cables) during the construction phase.	3	4	4	16	5	15 Medium
35. Dangerous excavations	3	4	4	16	5	15 Medium
37. Construction works cause visual pollution during the construction phase.	3	4	4	16	5	15 Medium
38. If not planned and managed correctly, the proposed development could have a negative impact on the "Sense of Place" of the study area and its surroundings)	3	2	2	4	2	6 Low
42. Surface water flows will be altered during the construction phase	3	2	2	4	2	6 Low
43. The use of insufficient drainage systems during the construction phase (i.e. sub-surface drainage systems & no mechanisms to break the speed of the surface water)	3	2	2	4	2	6 Low
47. The creation of large quantities of builder's and domestic waste to be accommodated by local legal landfill sites.	4	4	2	8	3	12 Medium
OPERATION PHASE						
Beneficial Impacts						
11.	4	2	4	8	3	12

Due to the topography the development will be visible from view sheds in the flatter areas around the study area. It will also be visible from the proposed PWV9 adjacent to the site and K52 which traverses the site.						Medium
25. Upgrading of municipal services	5	4	4	16	5	25 High
26. Upgrading of provincial and local roads	5	4	4	16	5	25 High
27. Economical injection to local businesses	4	2	4	8	3	12 Medium
28. Creation of temporary and permanent jobs	5	4	4	16	5	25 High
29. Increase in adjacent land-values	3	4	4	16	5	15 Medium
30. Rates and taxes payable to the local authority of the new residents will increase the income of the local authority.	5	4	4	16	5	25 High
31. The supply of much needed housing in close proximity to employment opportunities and supply of needed offices and industrial development.	5	4	4	16	5	25 High
36. The proposed development will be in line with the international, national, provincial and local legislation, planning frameworks, guidelines, policies etc.	5	4	4	16	5	25 High
Adverse Impacts						
1. Restriction on land use types due to geology: only sections of the site are suitable for residential structures.	5	4	4	16	5	25 High
2. Risk for formation of sinkholes and dolines if precautionary measures for construction on dolomite are not followed and if an effective storm water management plan is not	4	4	4	16	5	20 High

implemented.						
8. Risk of the lowering of groundwater	3	4	4	16	5	15 Medium
9. Possible ground water pollution.	3	4	4	16	5	15 Medium
11. Due to the topography the development will be visible from view sheds in the flatter areas around the study area. It will also be visible from the proposed PWV9 adjacent to the site and K52 which traverses the site.	4	2	4	8	3	12 Medium
12. If not planned correctly, roofs and parking areas could reflect the sun into the eyes of oncoming traffic and surrounding landowners.	2	2	4	8	3	6 Low
13. If not planned and managed correctly the lights (interior and exterior) and the signage of the development could cause visual pollution.	2	2	4	8	3	6 Low
16. Loss of primary grassland areas.	5	4	4	16	5	25 High
17. Loss of orange listed plant species.	3	4	4	16	5	15 Medium
22. Loss of habitat can lead to the decrease of fauna numbers and species.	3	2	2	4	2	6 Low
24. Some agricultural land will be lost.	4	2	4	8	3	12 Medium
33. Traffic increase in the area, will have an impact on the traffic flow of the area	5	2	4	8	3	15 Medium
38. If not planned and managed correctly, the proposed development could have a negative impact on the "Sense of Place" of the study area and its surroundings)	3	2	2	4	2	6 Low
41. Increased surface water run-off to storm water management system from hard surfaces such as roofs and	2	2	4	8	3	6 Low

paved areas may impact on surface and ground water.						
45. The availability of electricity for the development to be confirmed.	5	4	4	16	5	25 High
47. The creation of large quantities of industrial and domestic waste to be accommodated by local legal landfill sites.	4	4	2	8	3	12 Medium
39. Noise impact from the proposed K52 on the residential component of the development.	4	4	2	8	3	12 Medium

7.3 Discussion of Significance Assessment

Twelve beneficial impacts associated with the proposed development are anticipated, of which seven have a high significance rating. The Environmental Management Plan (**Refer to Annexure N**) contains measures to achieve maximum gain from the above beneficial impacts. Twelve of the anticipated beneficial impacts are Socio-economic related, and one relate to the bio-physical environment. This indicates that the proposed development should contribute to an improvement in the quality of life of the people residing in the broader area and the quality of the physical environment.

Of the forty four anticipated adverse impacts associated with the construction and occupation phases of the proposed development eight of the anticipated impacts have a high significance rating, twenty three have a medium significance rating and thirteen have a low significance rating.

Measures that are recommended in this report and the Environmental Management Plan (*including the precautionary measures for development on dolomite and Risk Management Plan*) could mitigate the medium anticipated adverse impacts to an acceptable level. No “fatal flaw” adverse impacts, or adverse impacts that cannot be

adequately mitigated, are anticipated to be associated with the proposed development of Monavoni Extension 51.

8. CONCLUSION

The purpose of the EIA (Environmental Impact Assessment) process was to investigate the Biophysical and Socio-economic environments by means of specialist studies to identify further issues/impacts of the proposed Monavoni Ext51 development on these environments. Further, it was aimed to provide mitigation measures for adverse impacts and to assess the significance of these impacts over the short and long term.

The most significant issues that were identified are the following: **Refer to Figures 16, Irreplaceable Sites Map.**

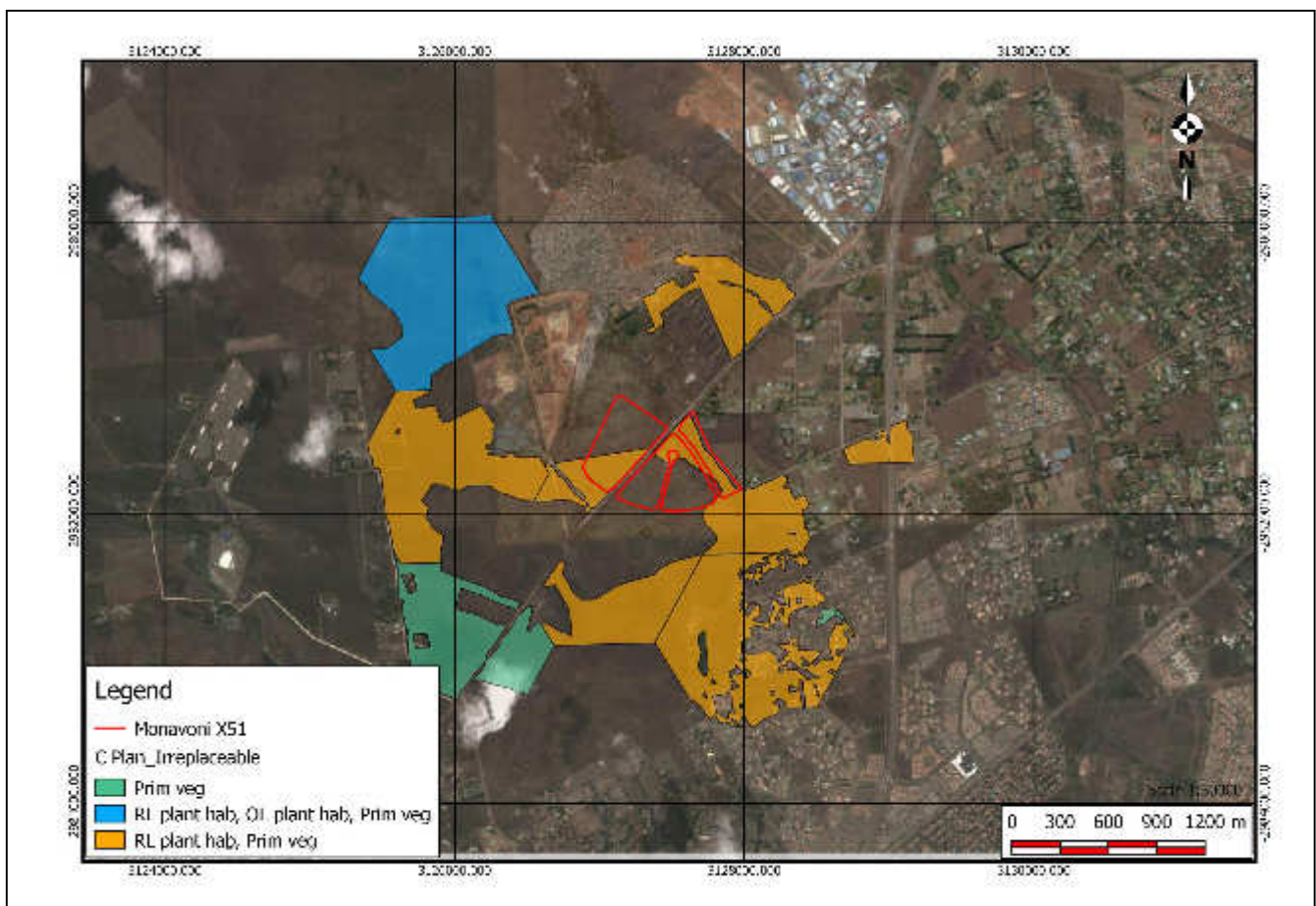


FIGURE 16 – Irreplaceable Sites Map

Biophysical Environment:

- 1) The study area is underlain by dolomite and there is a risk for the formation of sinkholes and dolines.
- 2) There may be a possible impact of the development on the ground water and surface water quality in the catchment area and a Dolomite Risk Management Plan will have to be implemented.
- 3) The proposed development will result in the loss of primary grassland areas. However, M&T Development compiled a Monavoni Development Framework for the larger Monavoni development to ensure the protection of corridors of Natural primary grassland in the larger Monavoni development (**Refer to Figure 3**). As already mentioned the Monavoni Development Framework had been approved by the CoT Environmental Planning and Open Space Management Section (**Refer to Annexure C for correspondence in this regard**). It is recommended that the rocky outcrop be excluded from the development.

Social and Economical Environment:

- 1) The developer will deliver a large contribution to the infrastructure in the area.
- 2) The proposed development will provide a large number of job opportunities both during the construction and the operational phases of the development.
- 3) The proposed development will contribute to rates and taxes payable to City of Tshwane.
- 4) The proposed mixed use development falls within an area earmarked for development and will contribute largely to the economy in the area.
- 5) The loss of agricultural land.

According to the GAPA 3 the site is characterised by "high" agricultural potential soils. However the study area falls within the provincial urban edge and does not fall within any Agricultural Hub, identified for agricultural use by GDARD (**Refer to figure 5**).

9. RECOMMENDATIONS

It is believed that the impacts identified have not been of such a nature that short and long term mitigation cannot occur and therefore it is recommended that the proposed development be approved subject to:

- 1) The implementation of the mitigation measures contained in the Environmental Management Plan (**Annexure N**) to achieve maximum advantage from beneficial impacts, and sufficient mitigation of adverse impacts;
- 2) The implementation of the NHBRC precautionary measures provided for construction on dolomite;
- 3) The implementation of a Dolomite Risk Management Plan;
- 4) The provision of Open Spaces according to the approved Monavoni Development Framework and the implementation of a maintenance plan for these open space areas.
- 5) The implementation of a Stormwater Management Plan approved by the local authority and DWS;
- 6) Confirmation regarding the availability of essential services from the relevant departments of City of Tshwane and the implementation of the upgradings as recommended in the CES Report to be included as a condition in the Authorisation (if authorisation is granted); and
- 7) The implementation of a Solid Waste Management Plan.



Annexure A

ENLARGEMENTS OF FIGURES



Figure 1: Locality Map



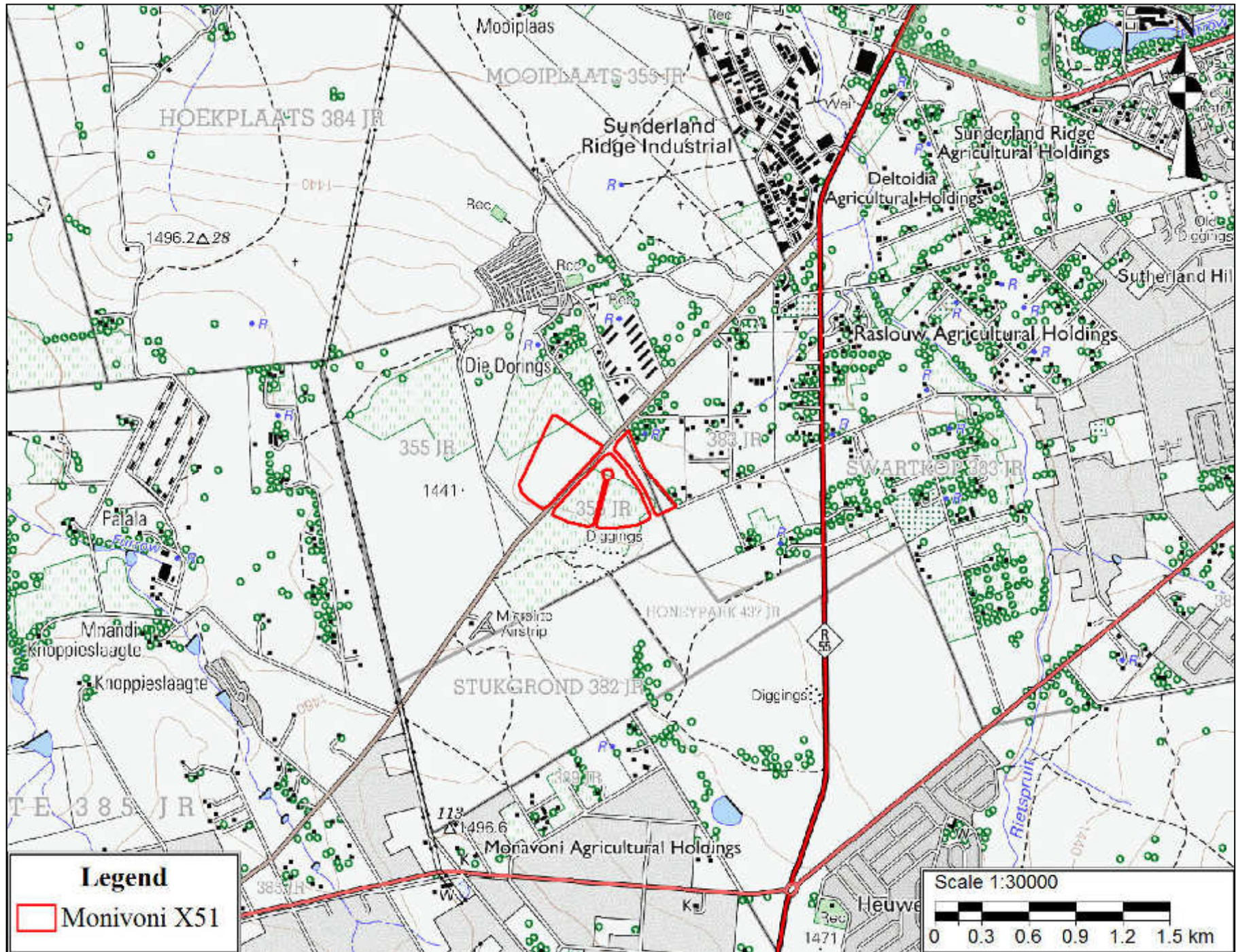
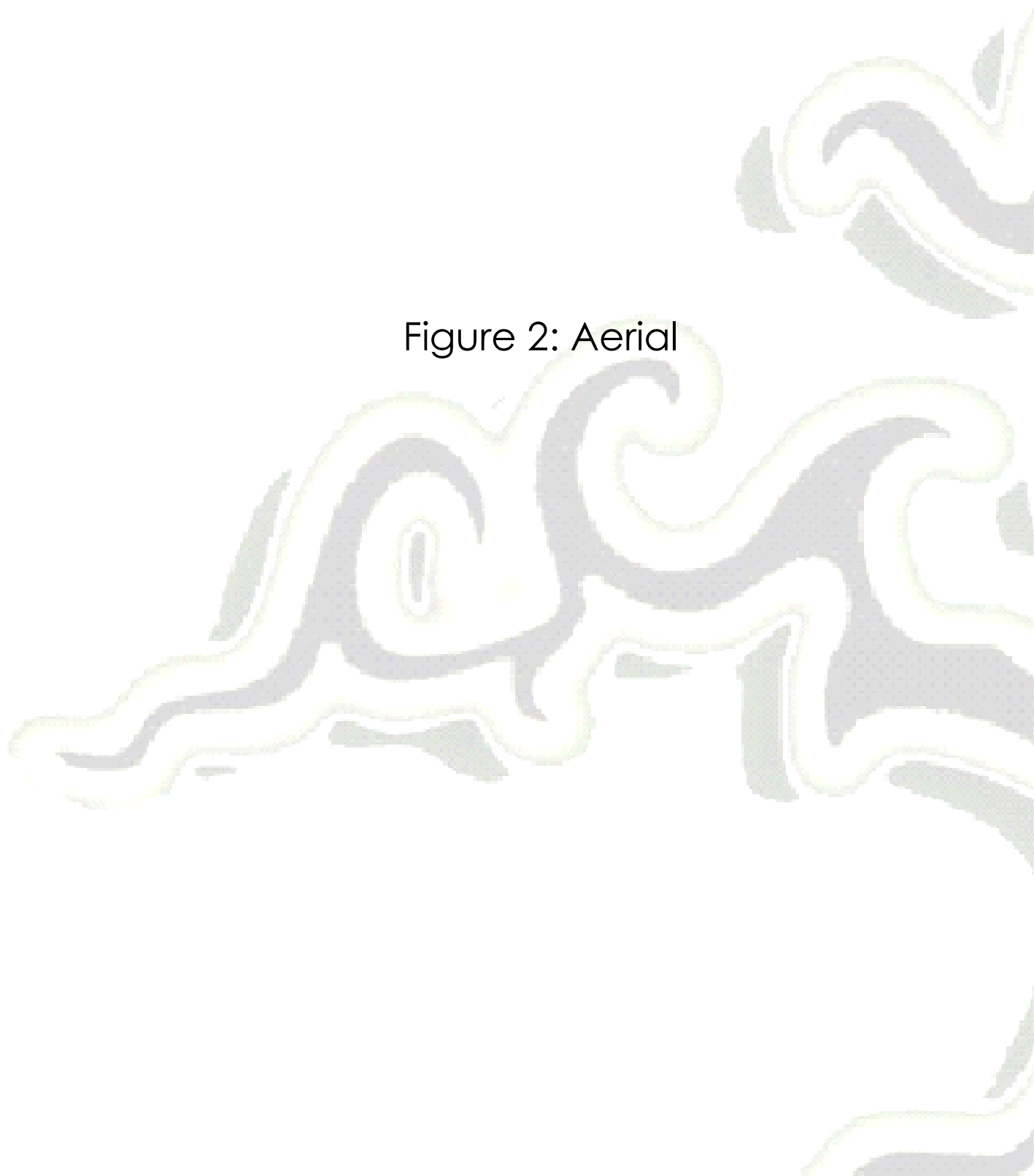


Figure 2: Aerial



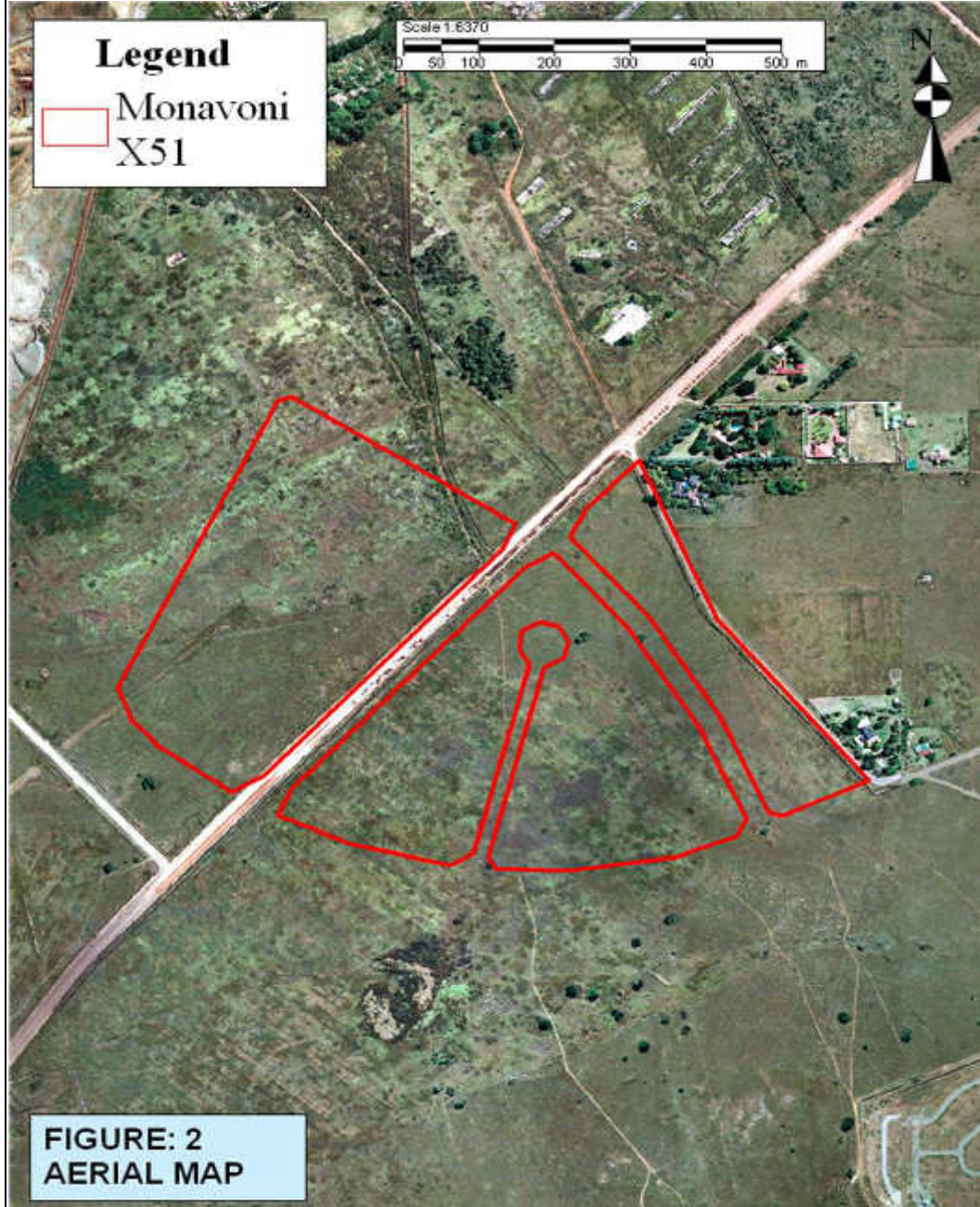


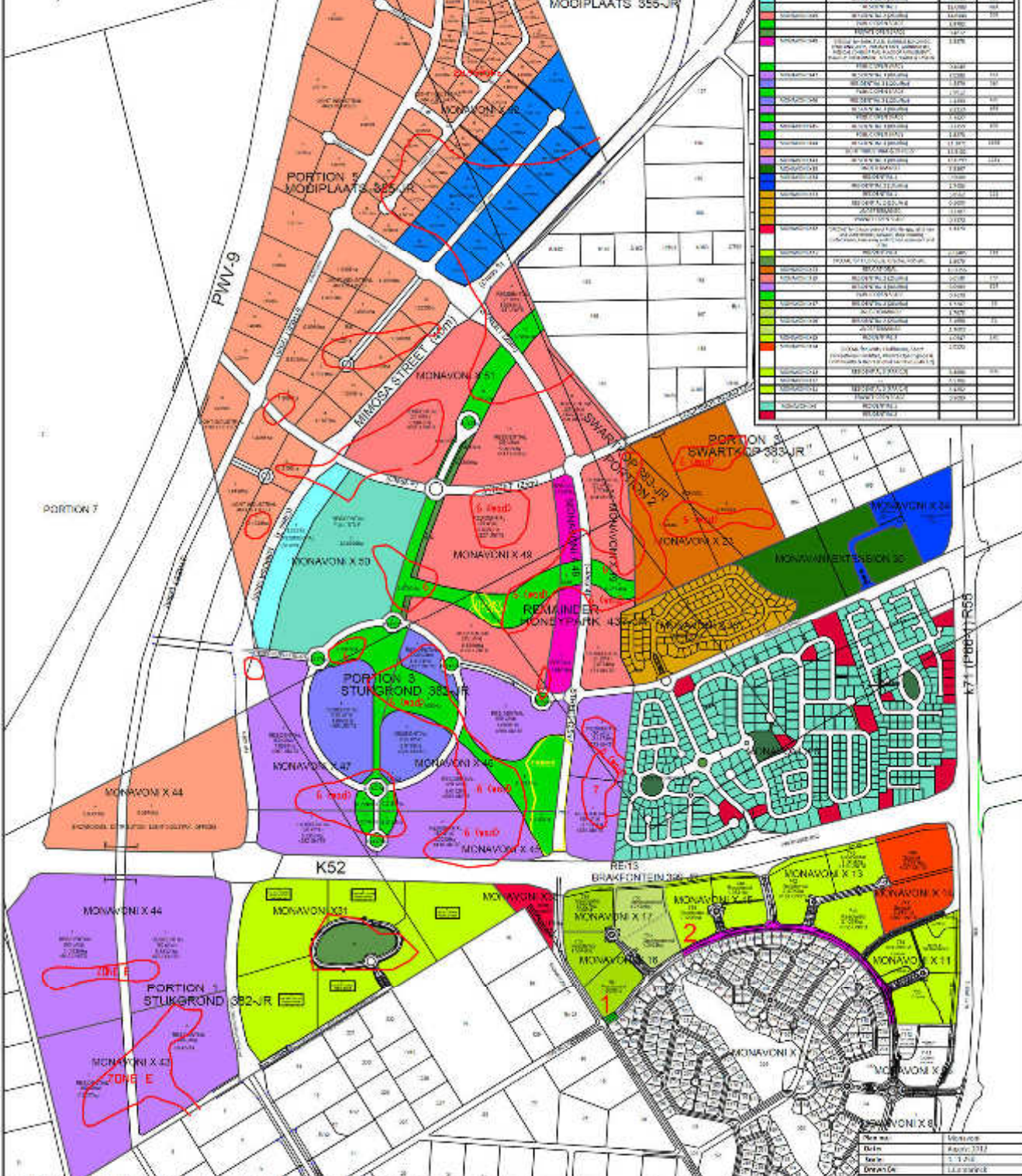
Fig 2: Aerial Map

Monavoni X 51



Figure 3: Monavoni
Development Framework





MONAVONI FRAMEWORK

- Building lines are in accordance with the approved Site Development Plan;
- All areas and dimensions are approximate and subject to final survey.

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 Eco-Park
 Highveld, 0159
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 Fax: (012) 676 8585
 Website: www.m-t.co.za

Figure 4: GDARD C-Plan Map



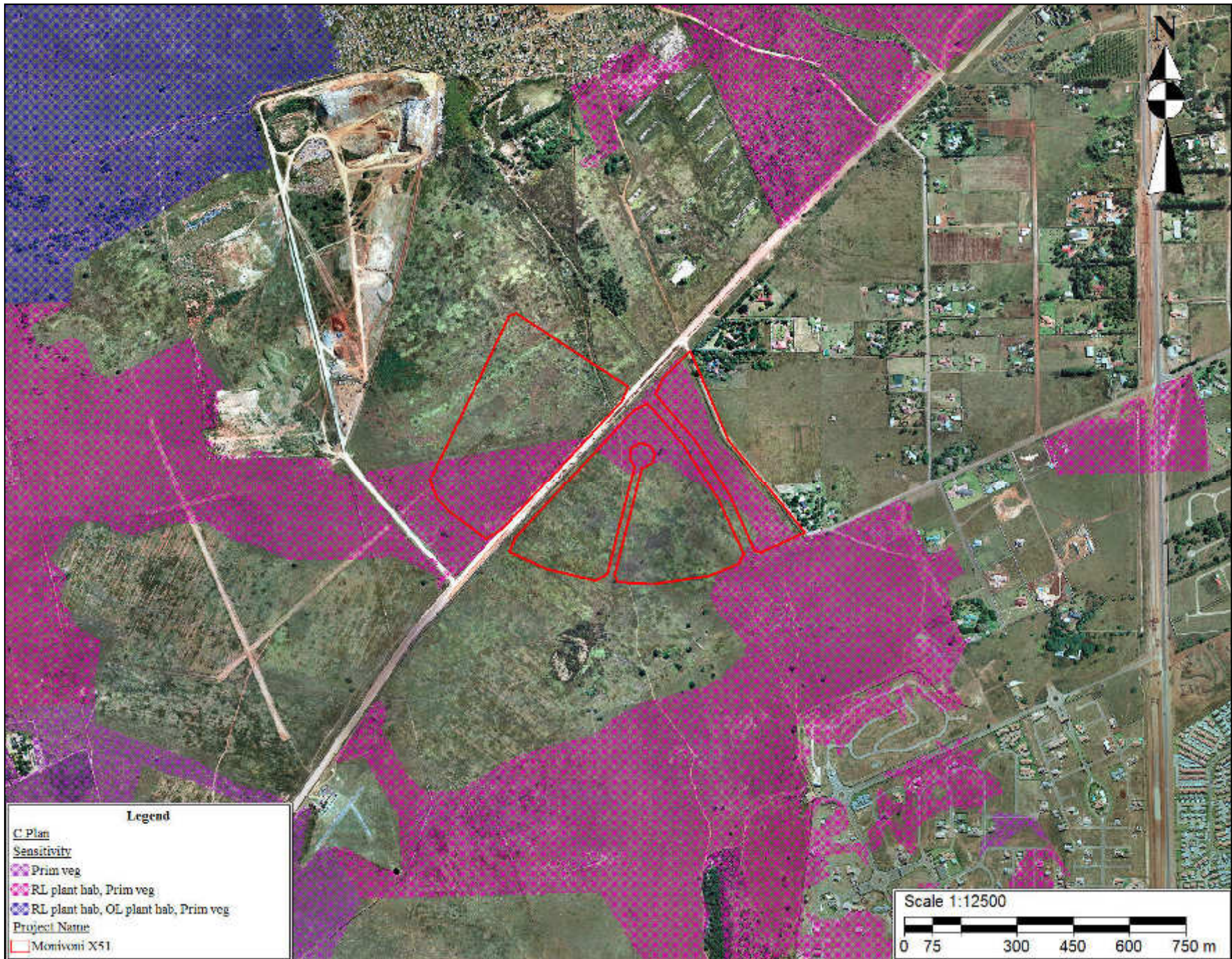


Figure 5: Agricultural Hub



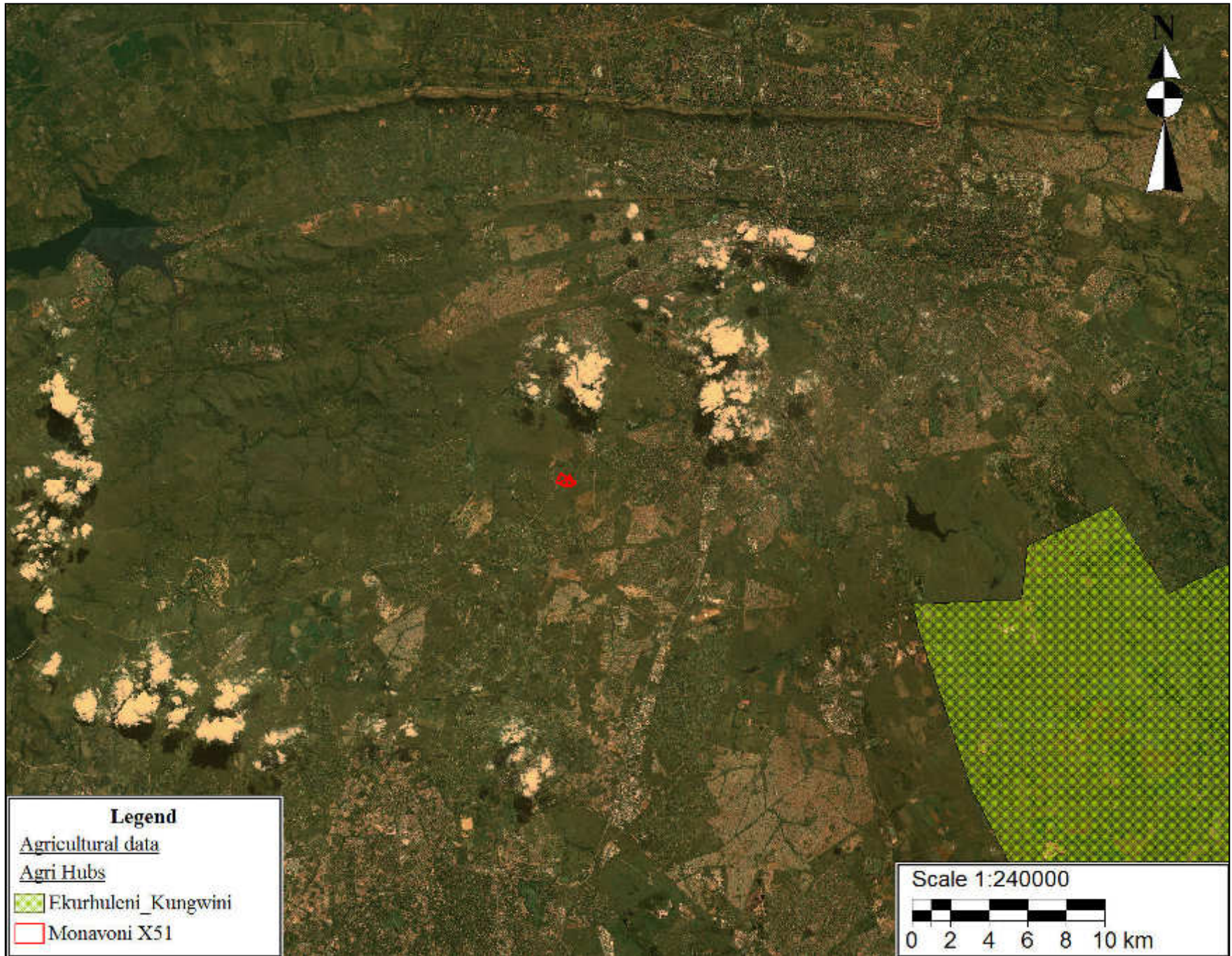


Figure 6: Gauteng Provincial
Urban Edge



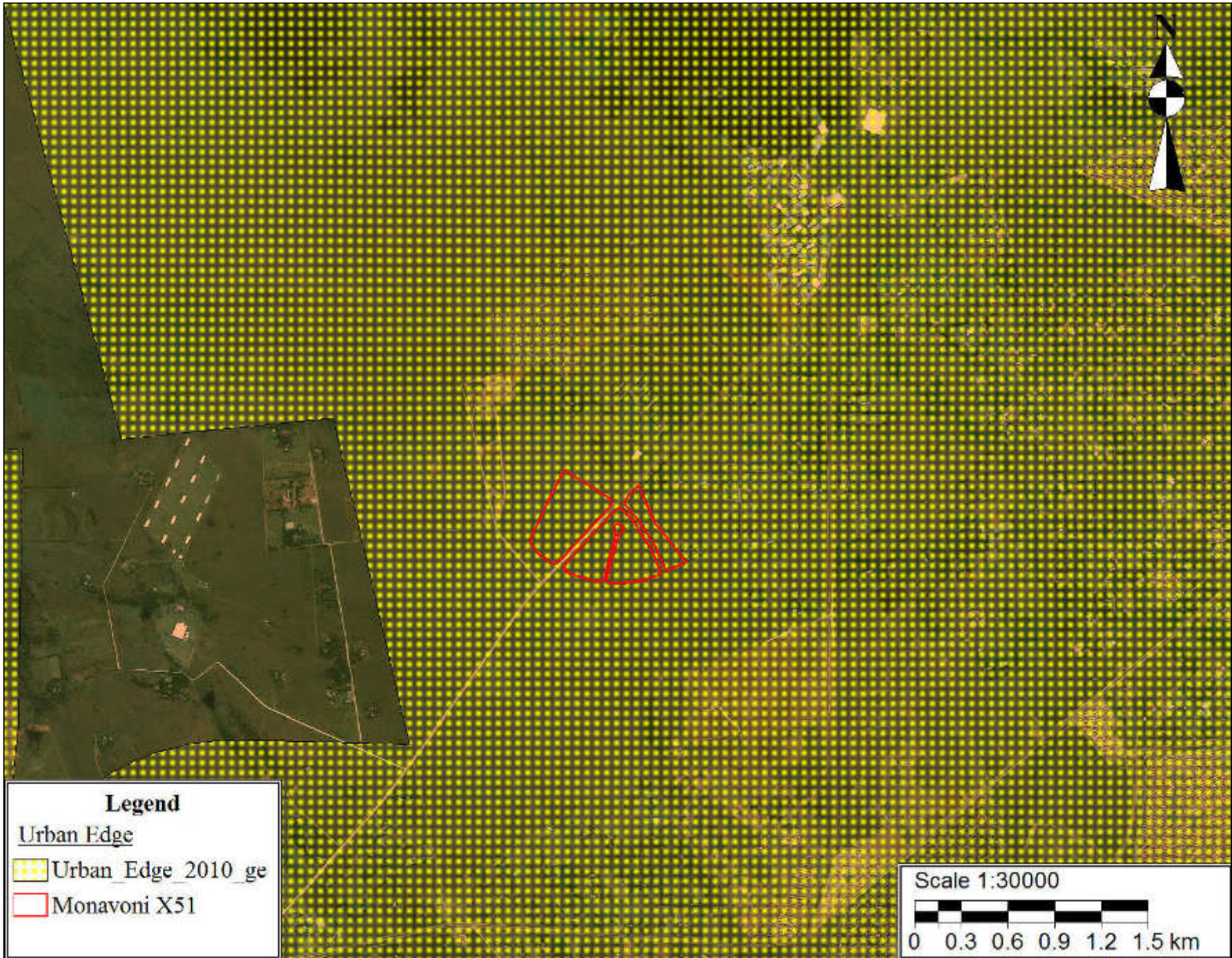


Figure 7: Agricultural Potential



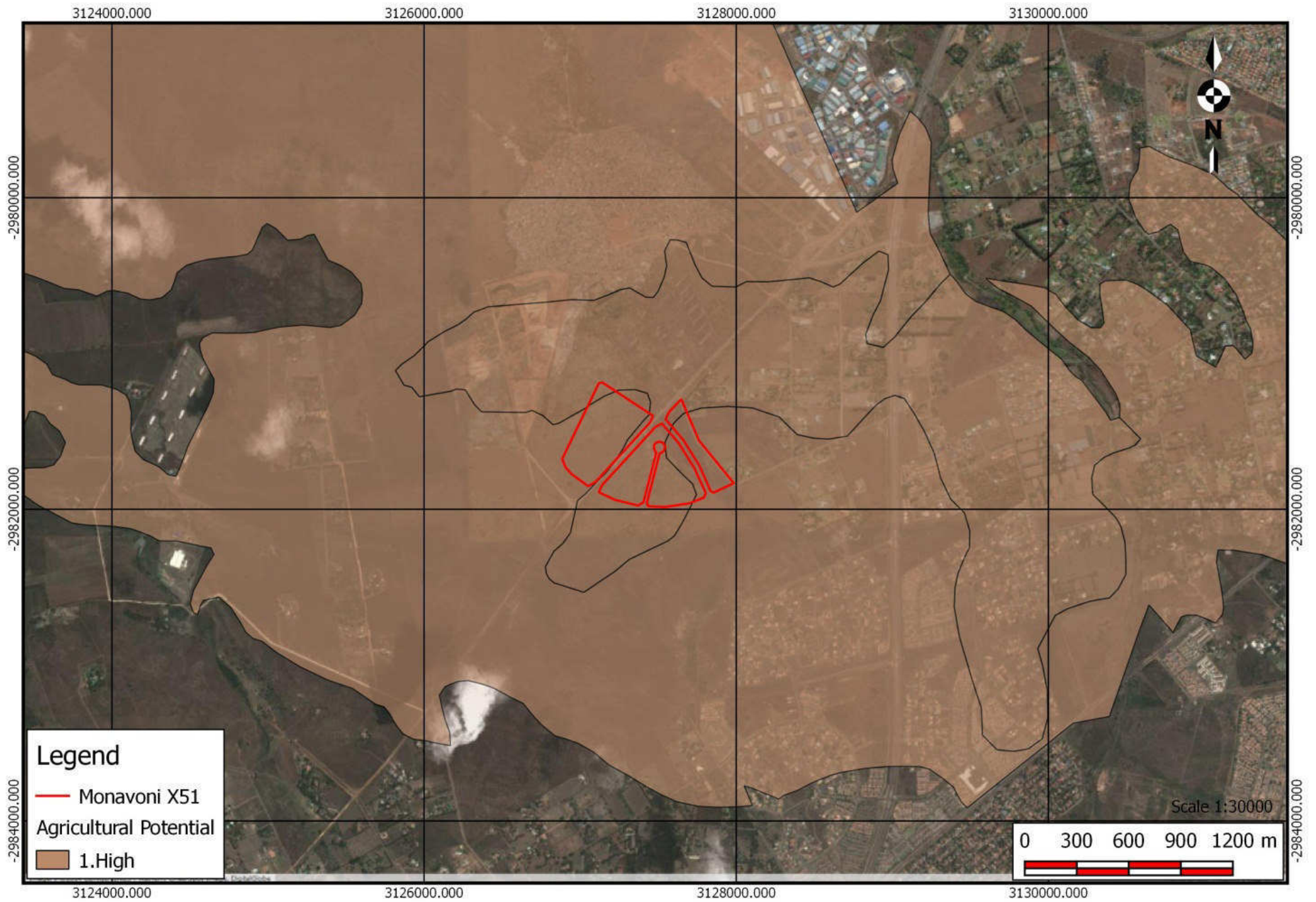


Figure 8: Conservancy Map



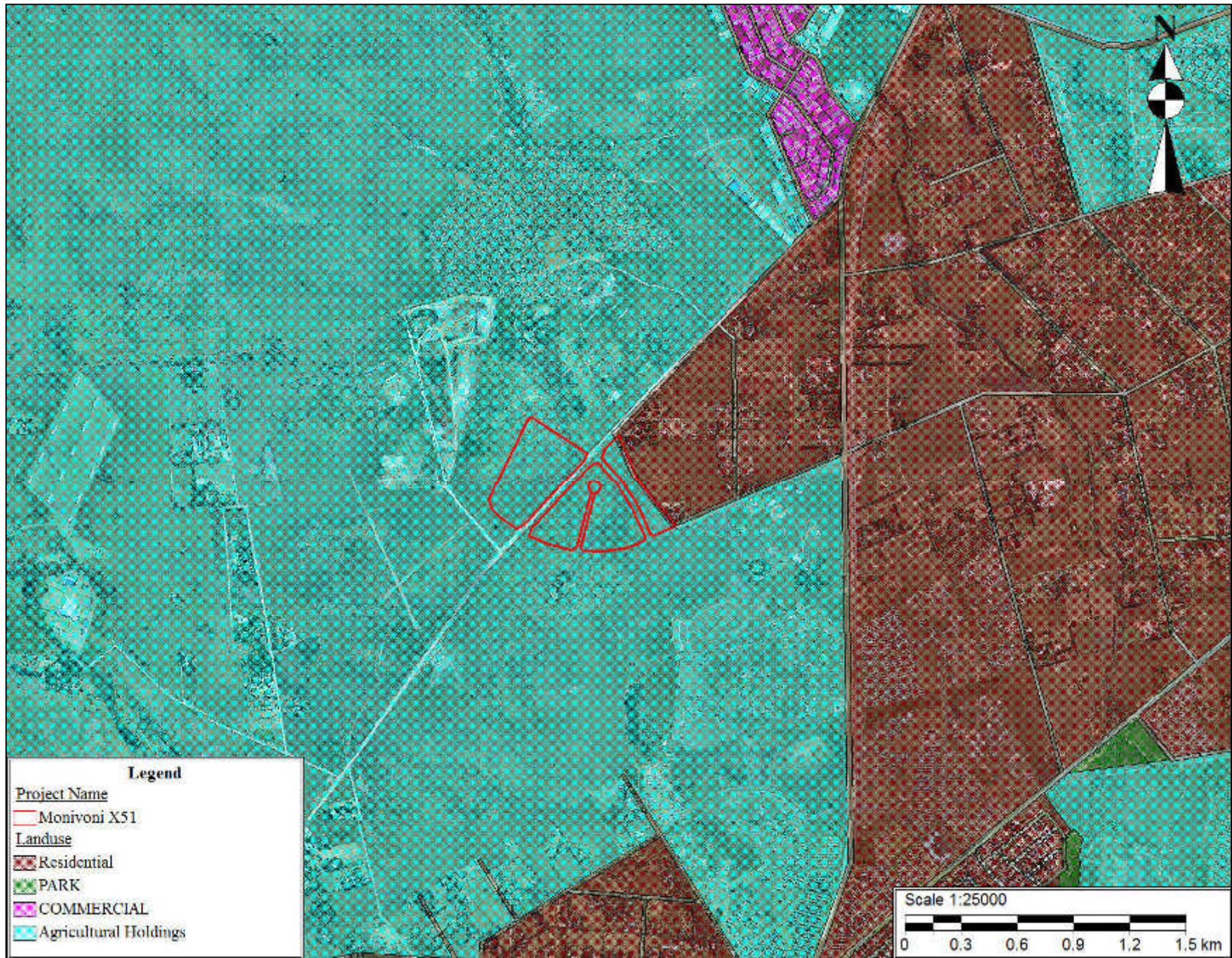
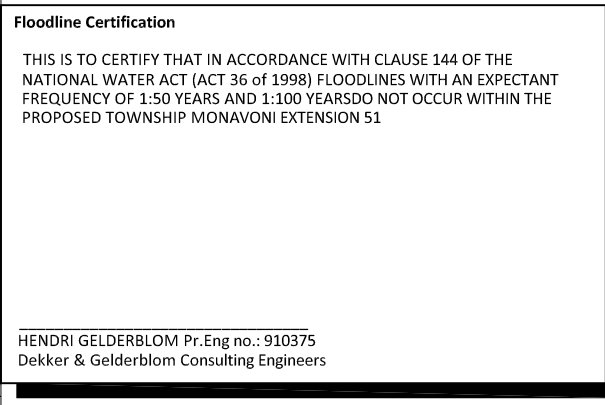
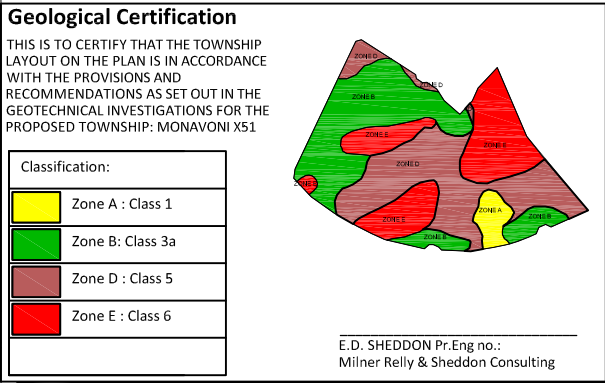
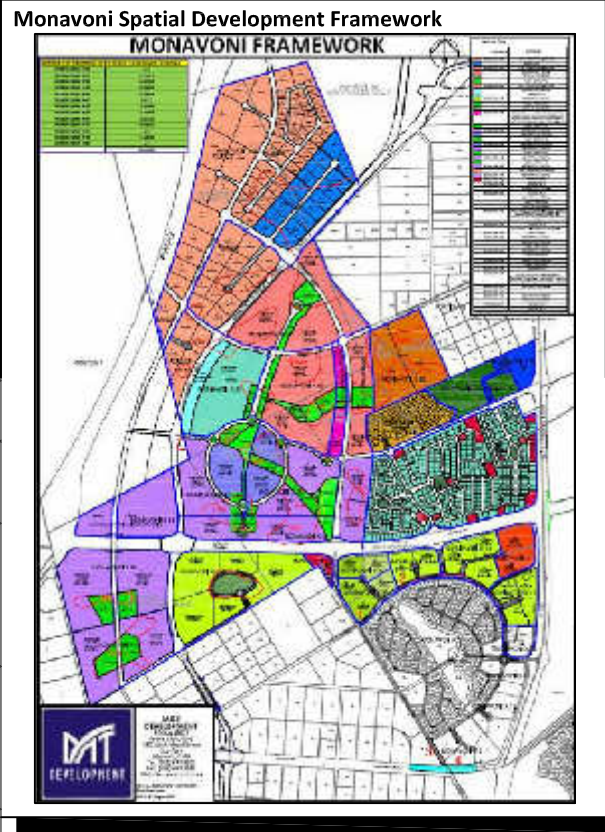
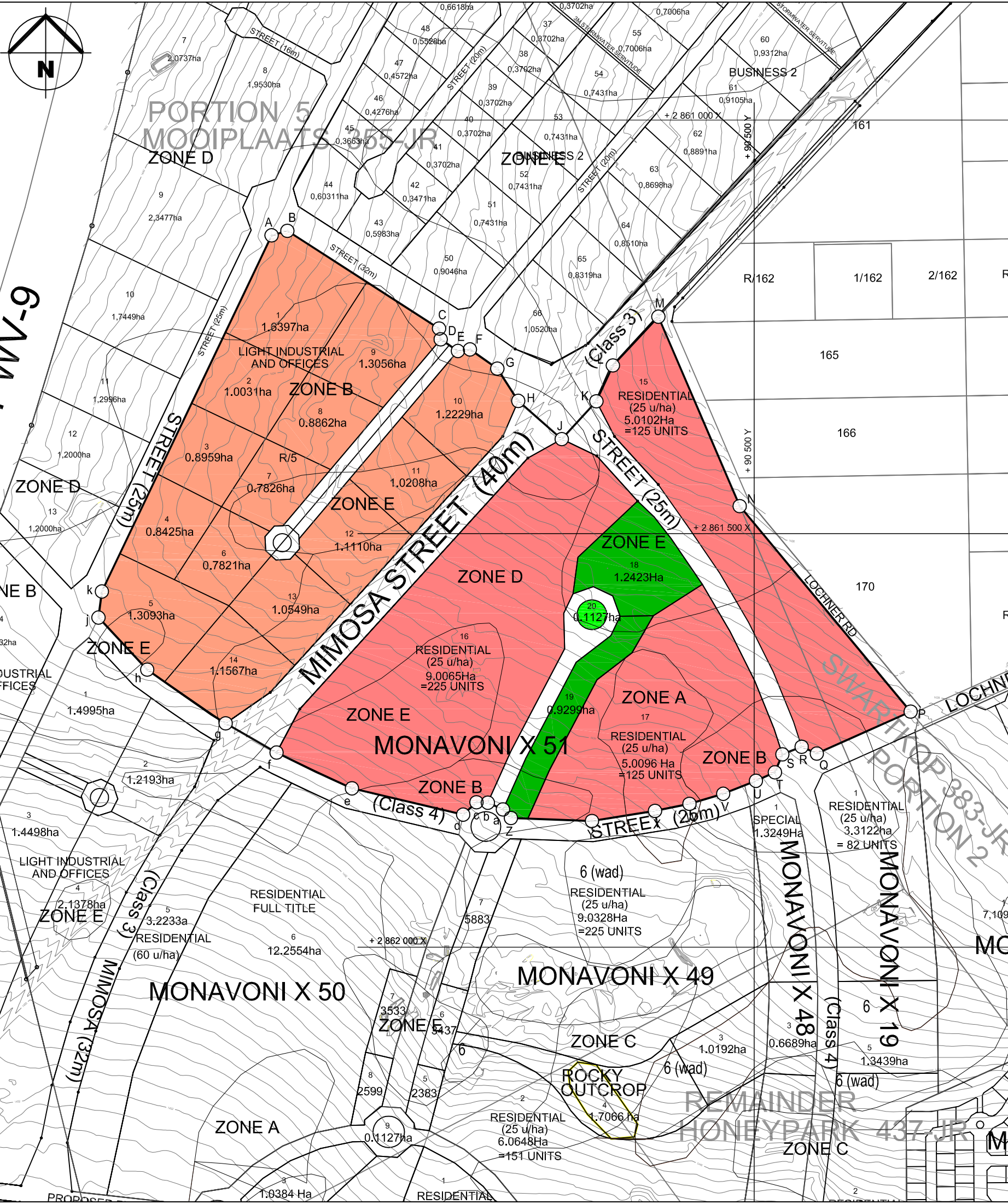
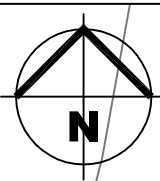


Figure 9: Layout Plan





USE ZONE	ERF NUMBERS	TOTAL ERVEN	TOTAL UNITS	AVERAGE ERF SIZE	TOTAL AREA	%
LIGHT INDUSTRIAL AND OFFICES	1 - 14	14	n/a	1.0724 Ha	15.0133 Ha	35.57
RESIDENTIAL (25u/ha)	15 - 17	3	475	6.5828 Ha	19.0263 Ha	46.79
PUBLIC OPEN SPACE	18, 19	2	n/a	0.0564 Ha	0.1127 Ha	0.27
PRIVATE OPEN SPACE	20	1	n/a	2.1722 Ha	2.1722 Ha	5.15
STREETS	N/A	N/A	N/A	N/A	5.1601 Ha	12.23
TOTAL:		20	494	N/A	41.4846	100

MONAVONI EXTENSION 51 SITE LAYOUT PLAN

SITUATED ON: A PART OF THE REMAINDER OF PORTION 5 OF THE FARM MOOIPLAATS 355-JR, AND A PART OF PORTION 2 OF THE FARM ZWARTKOP 383-JR.
LOCAL AUTHORITY: CITY OF TSHWANE METROPOLITAN MUNICIPALITY



- Notes**
- The figure ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghjka represents 42.2066 Ha of land being the proposed township boundary of Monavoni Extension 51;
 - All streets have a minimum gradient of 0.5% and a maximum gradient of 5%;
 - Contours are drawn in 0.5m intervals, and are in accordance with Regulation 18(1) of the Town-Planning and Townships Ordinance, 1986;
 - All dimensions and measurements are approximate and subject to final survey;

Servitude Notes

Plan no.:	MONx51-1
Scale:	1 : 5000 (A3)
Date:	October 2013
Drawn by:	L. Combrinck

Amendments:
Monx51-1 2013-10-16 Proposed Layout

linndi@mtdevelopment.co.za
t: 012 676 8500 | f: 012 676 8585

Figure 10: Soils Map



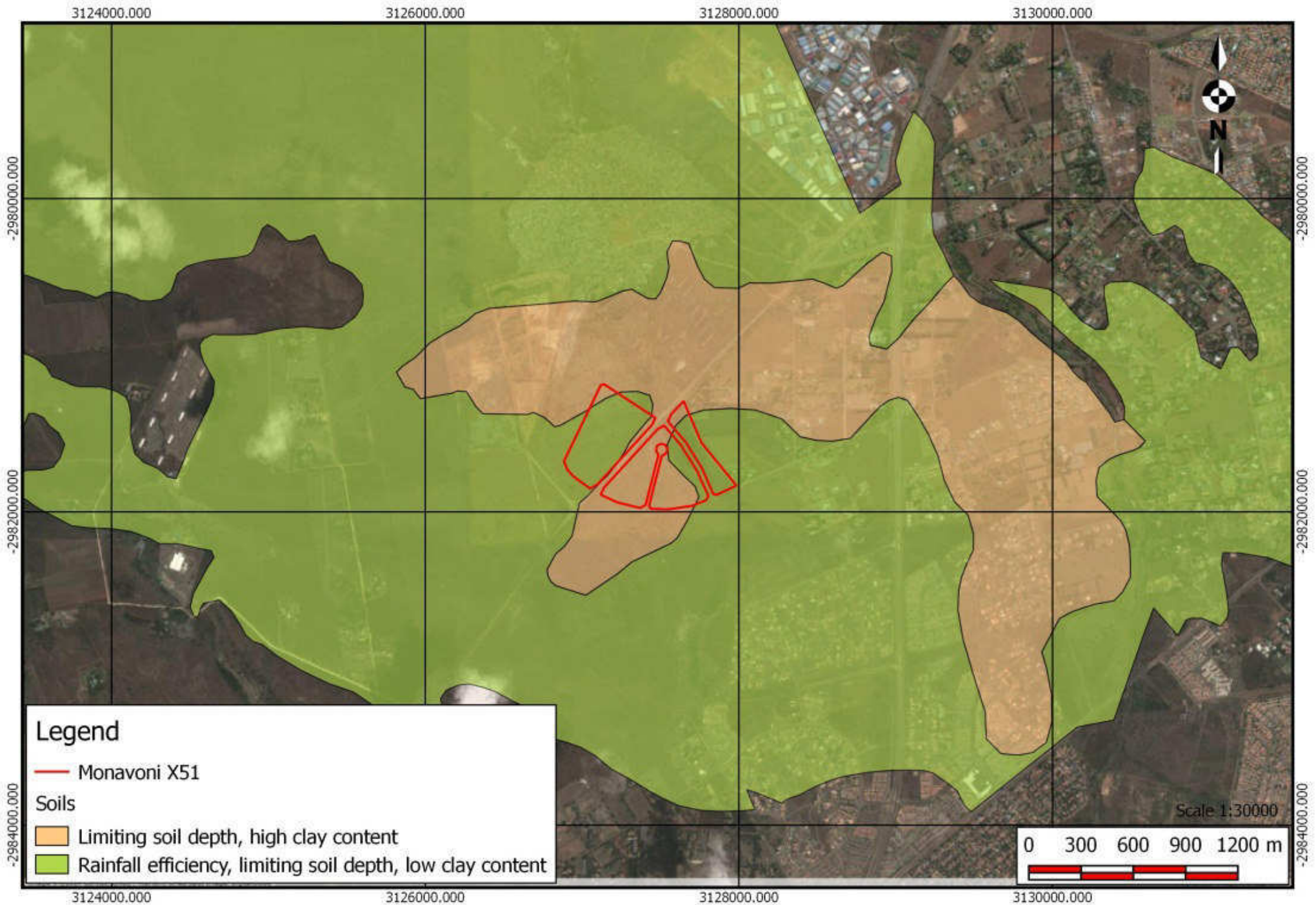
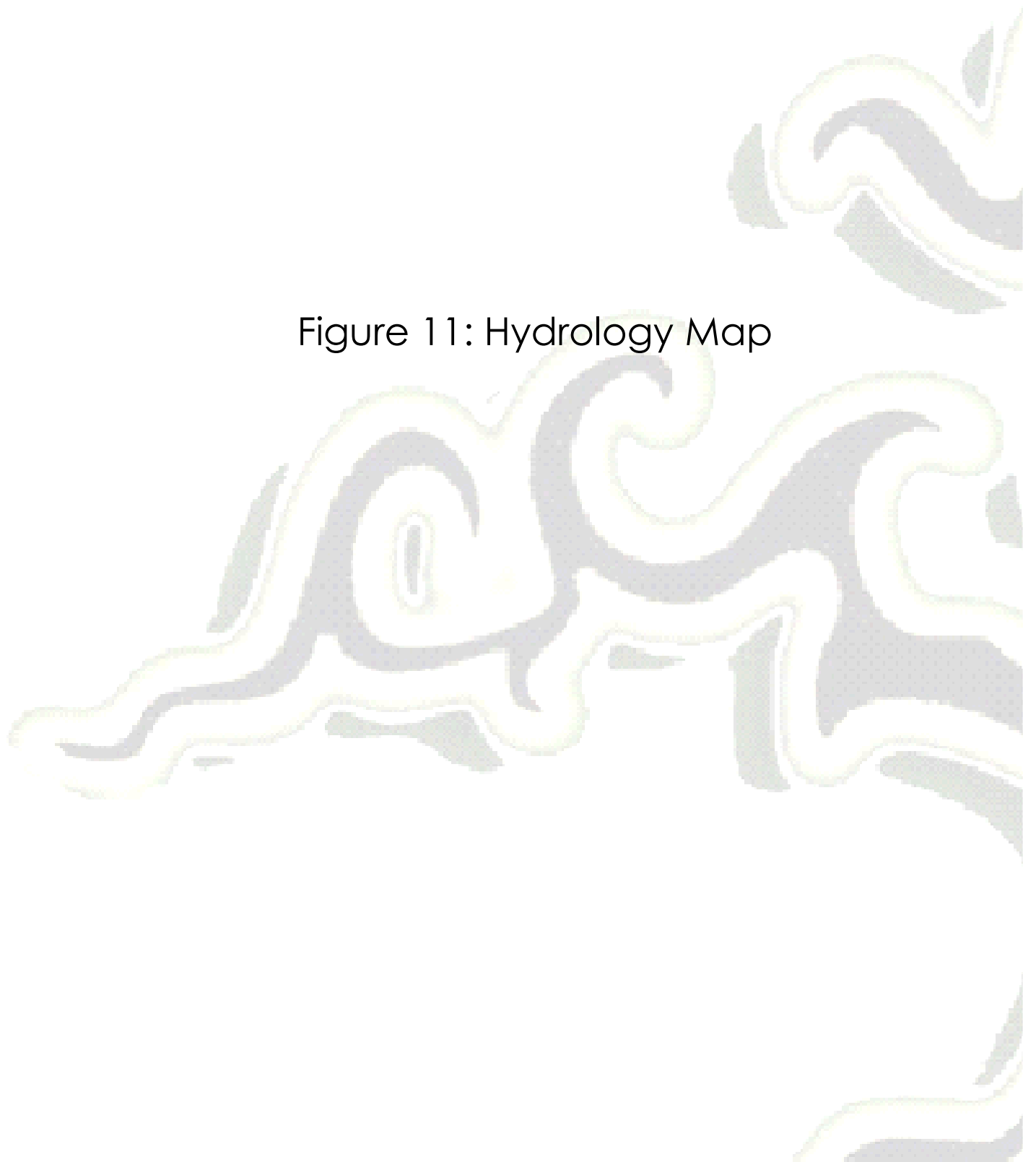


Figure 11: Hydrology Map



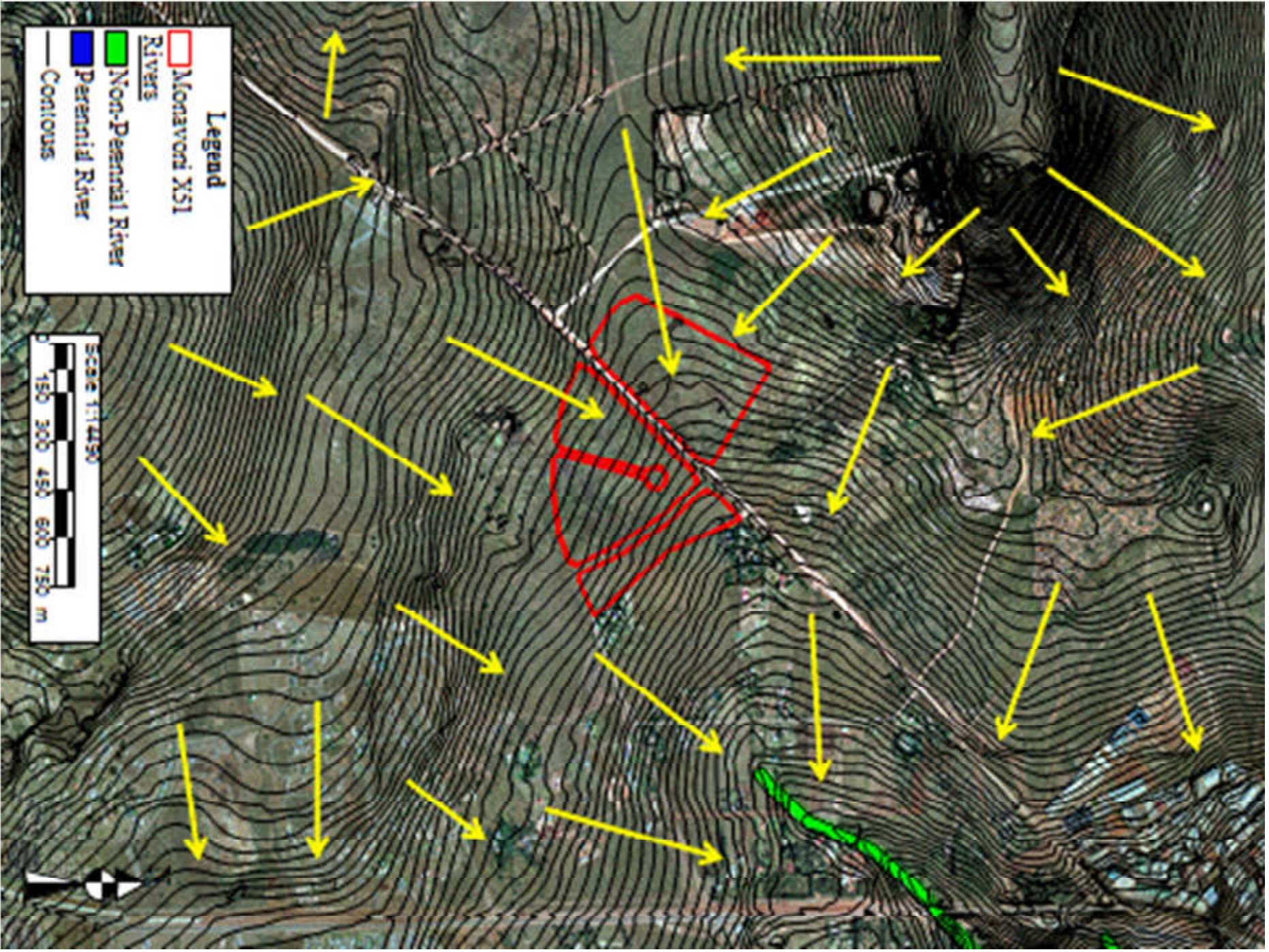
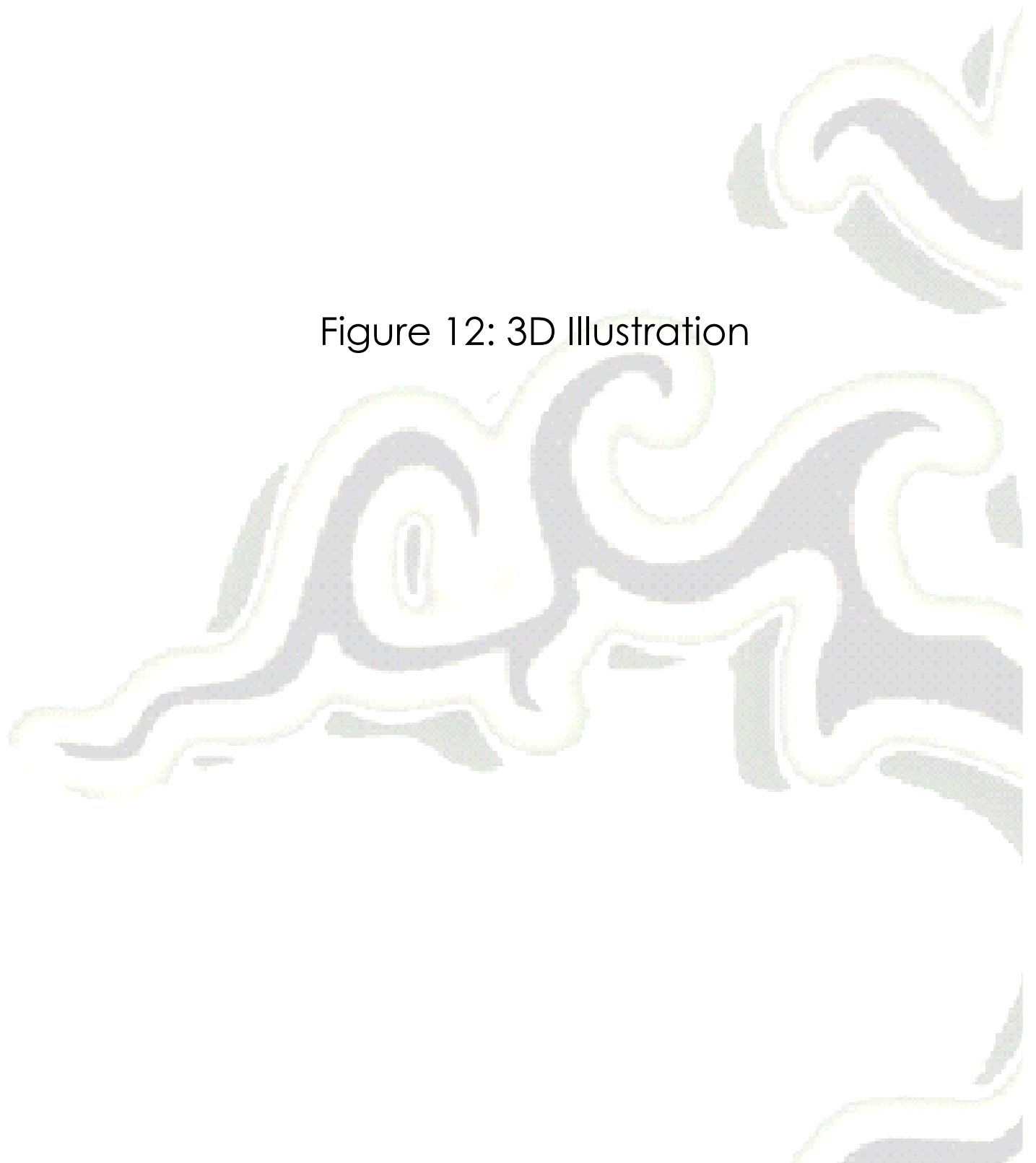
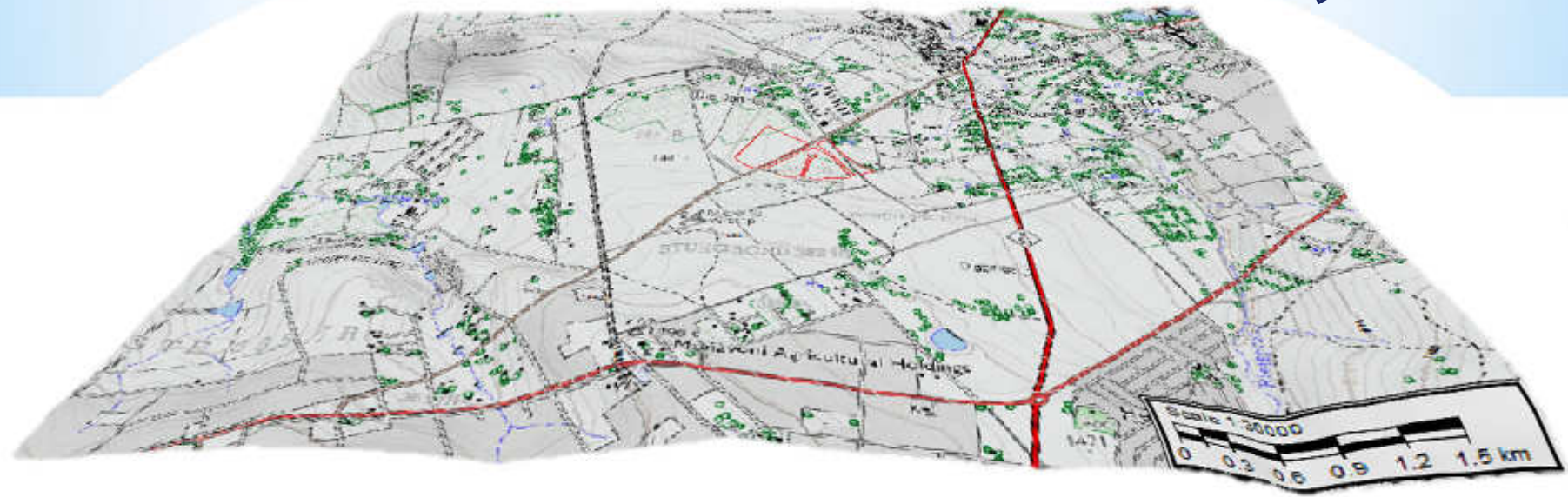


Figure 12: 3D Illustration



3D Visibility Map

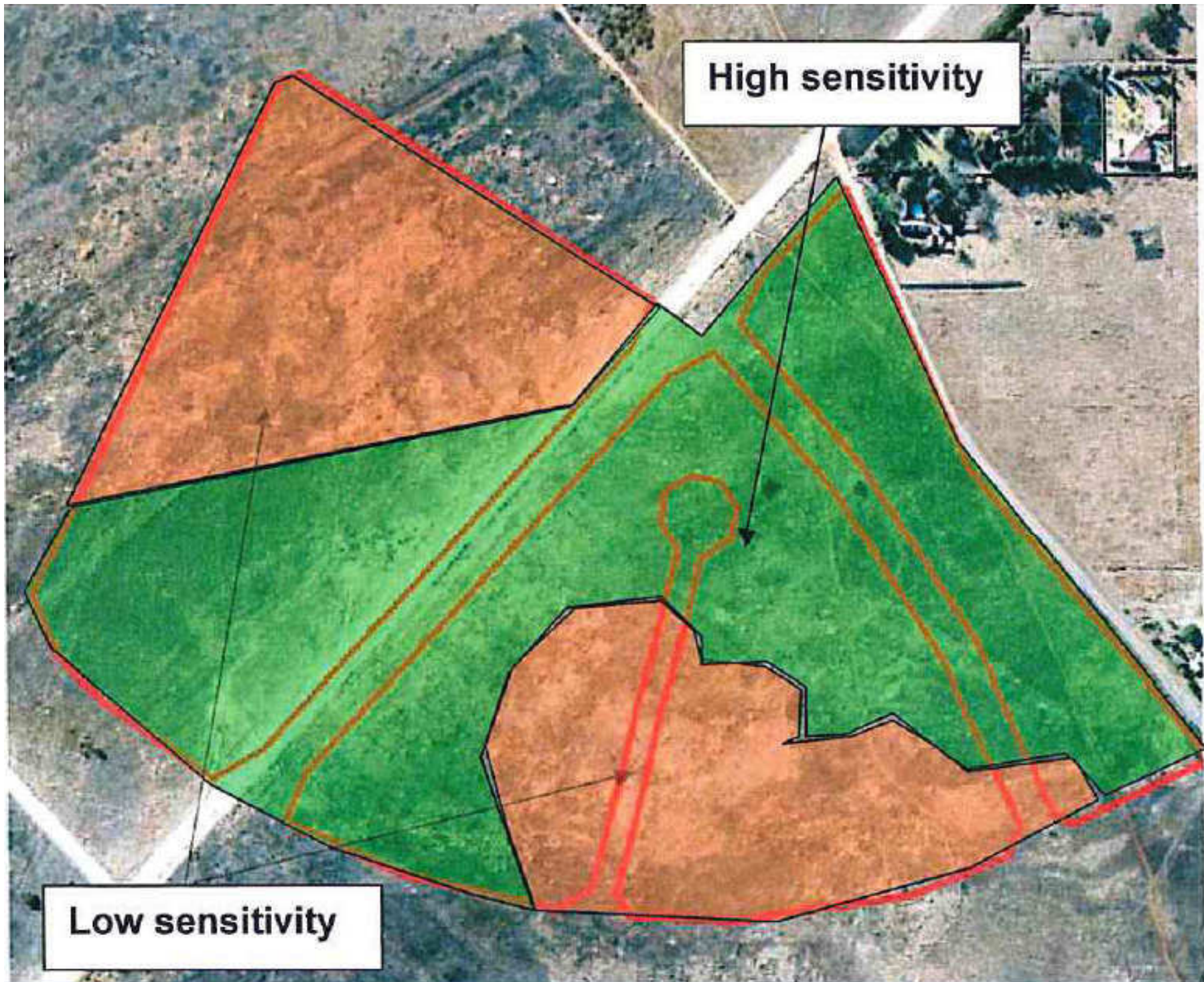


Legend

 Monavoni X51

Figure 13: Ecological
Sensitivity Map





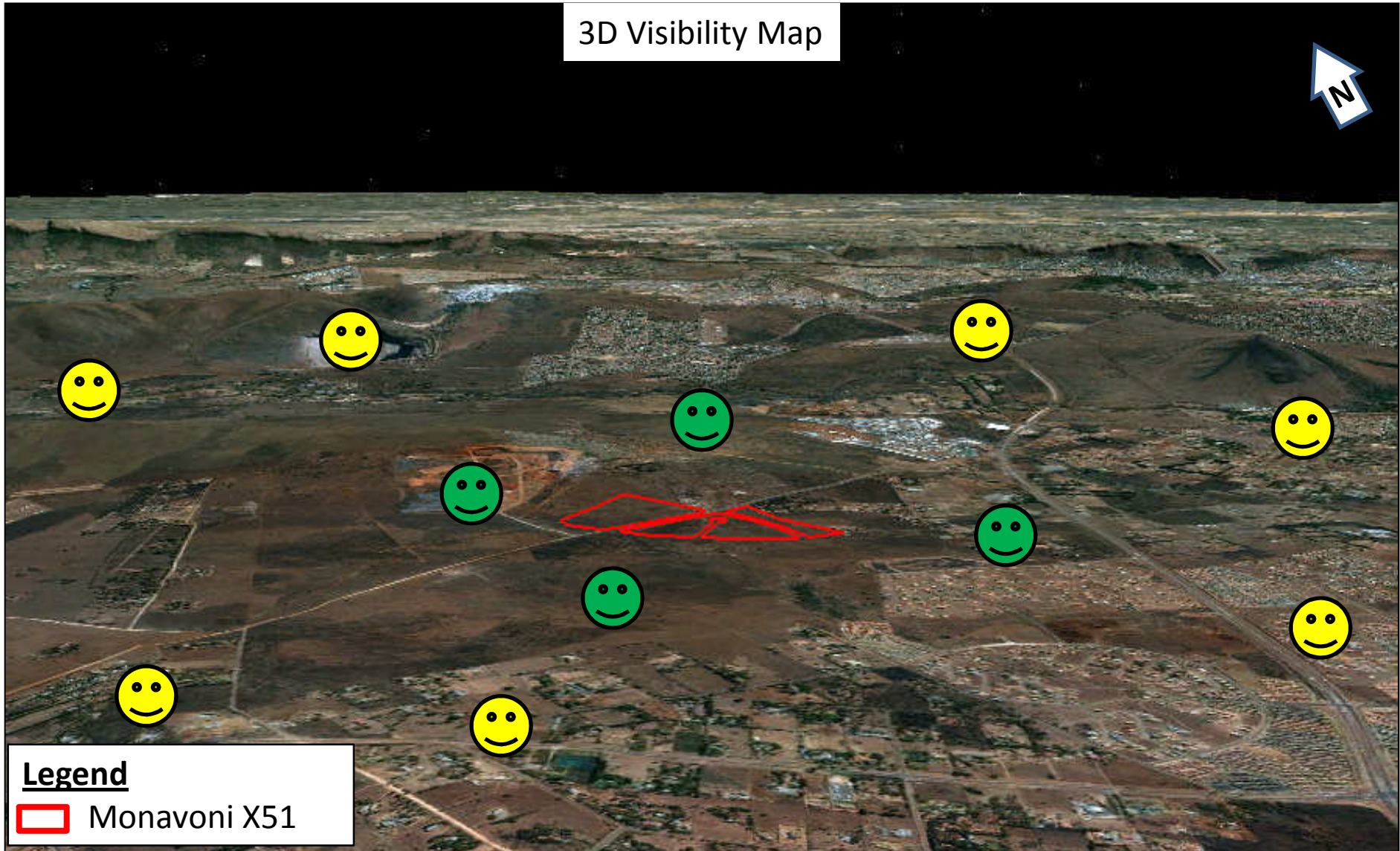
High sensitivity

Low sensitivity

Figure 14: Visual Impact Assessment



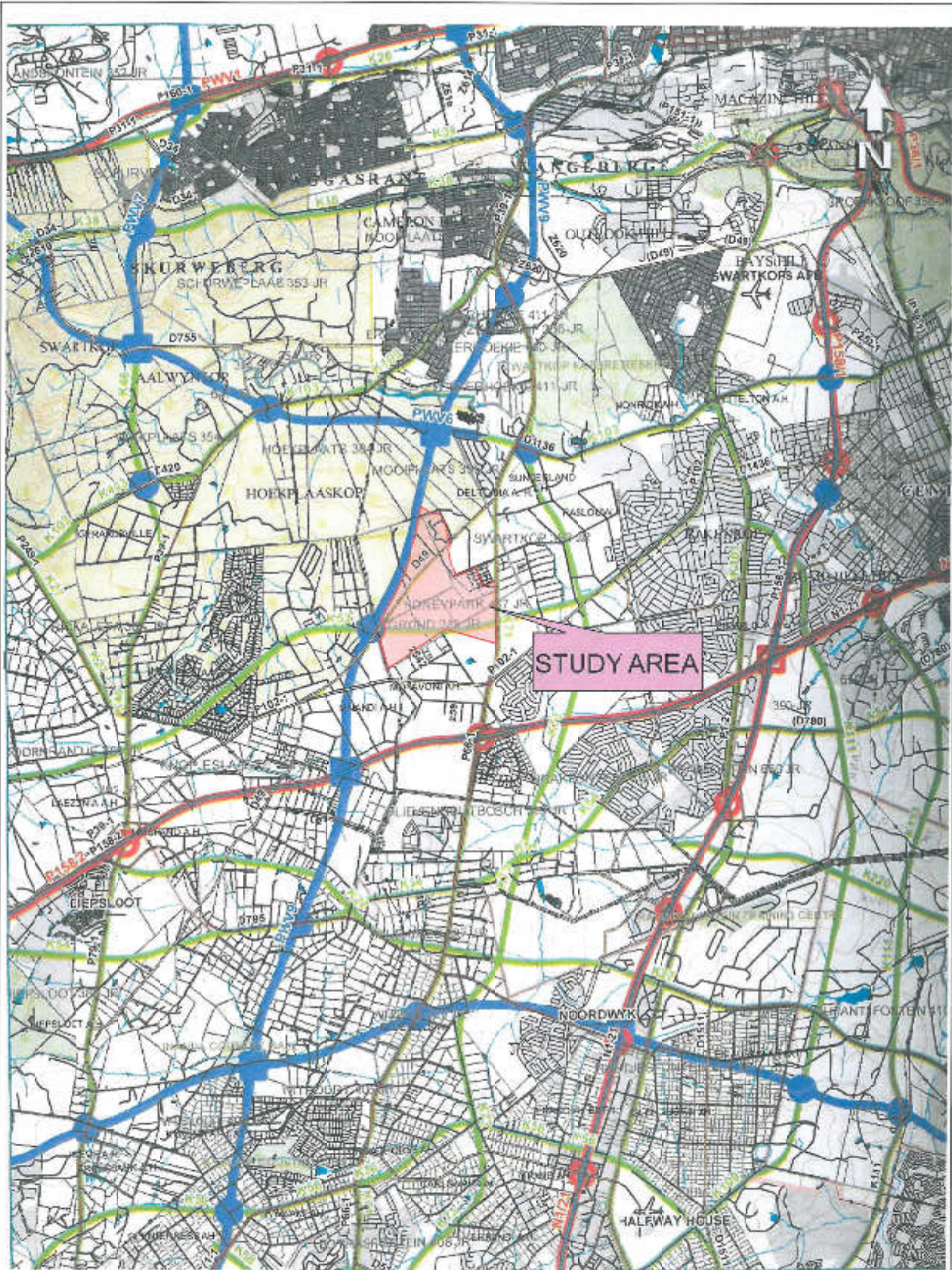
3D Visibility Map



Legend
[Red Outline] Monavoni X51

Figure 15: Monavoni Master Plan





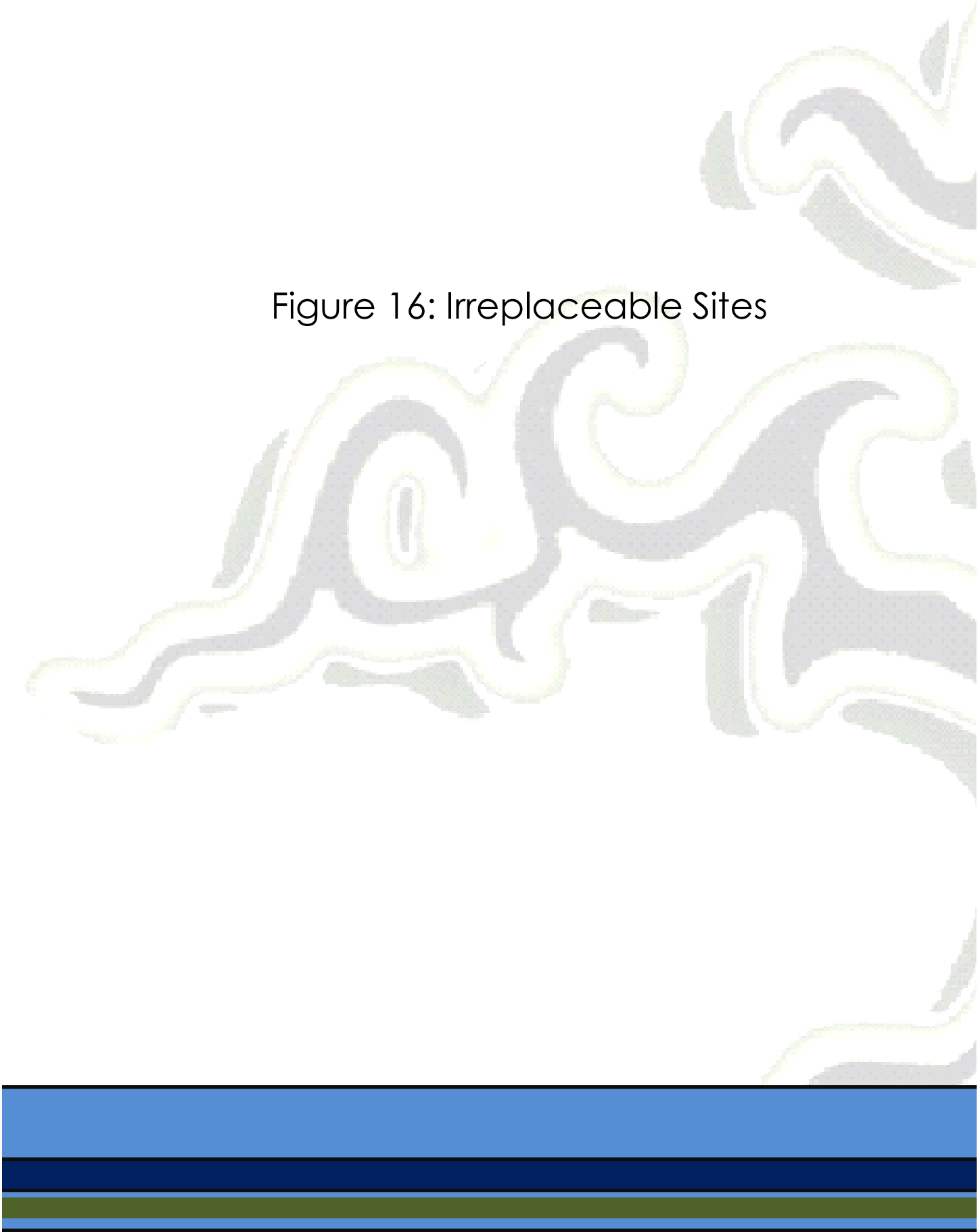
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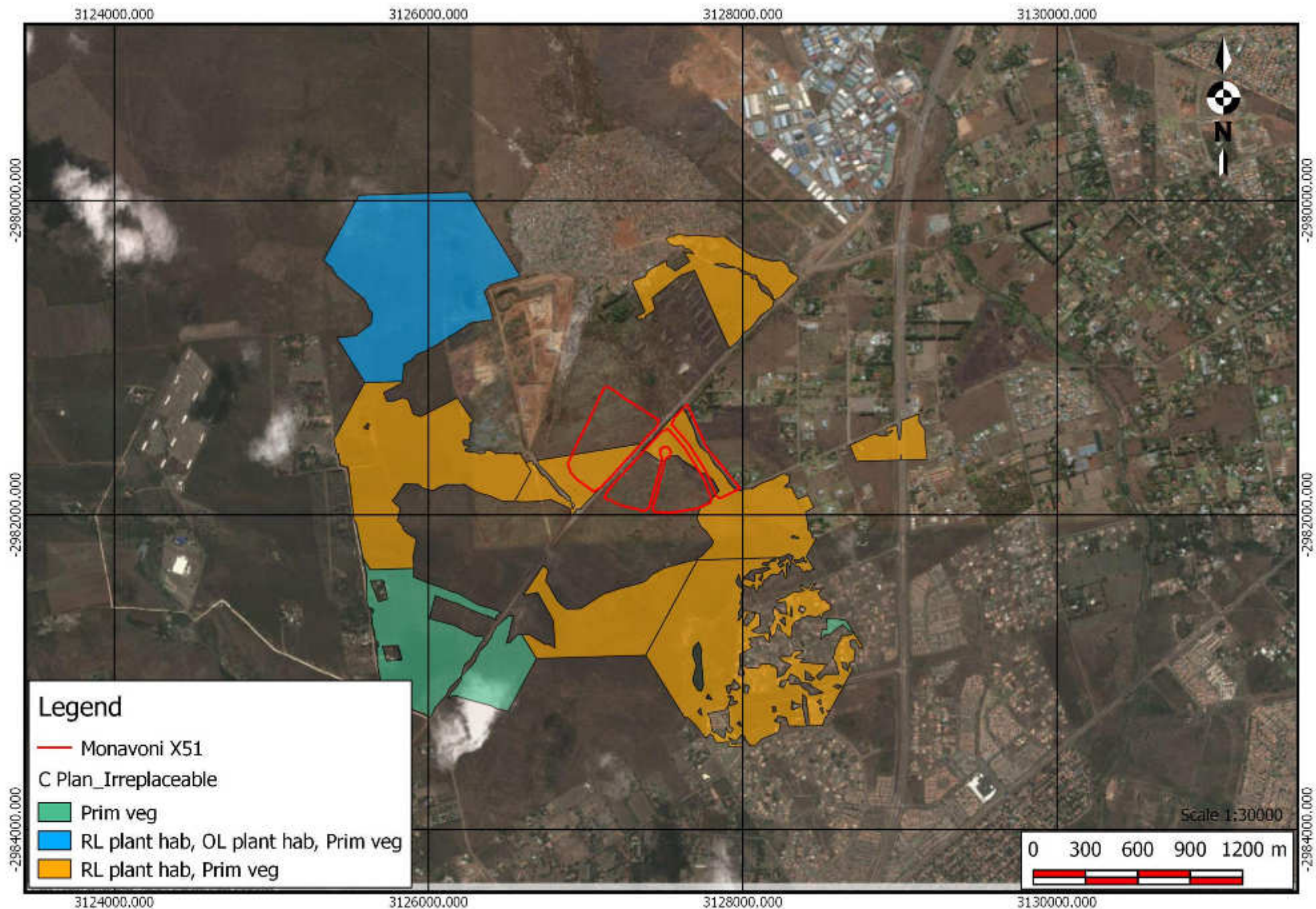
2675 /Road Network.cdr



Project:	Monavoni Master Planning	Figure:	Locality and Provincial Road Network
		Nc.	1

Figure 16: Irreplaceable Sites



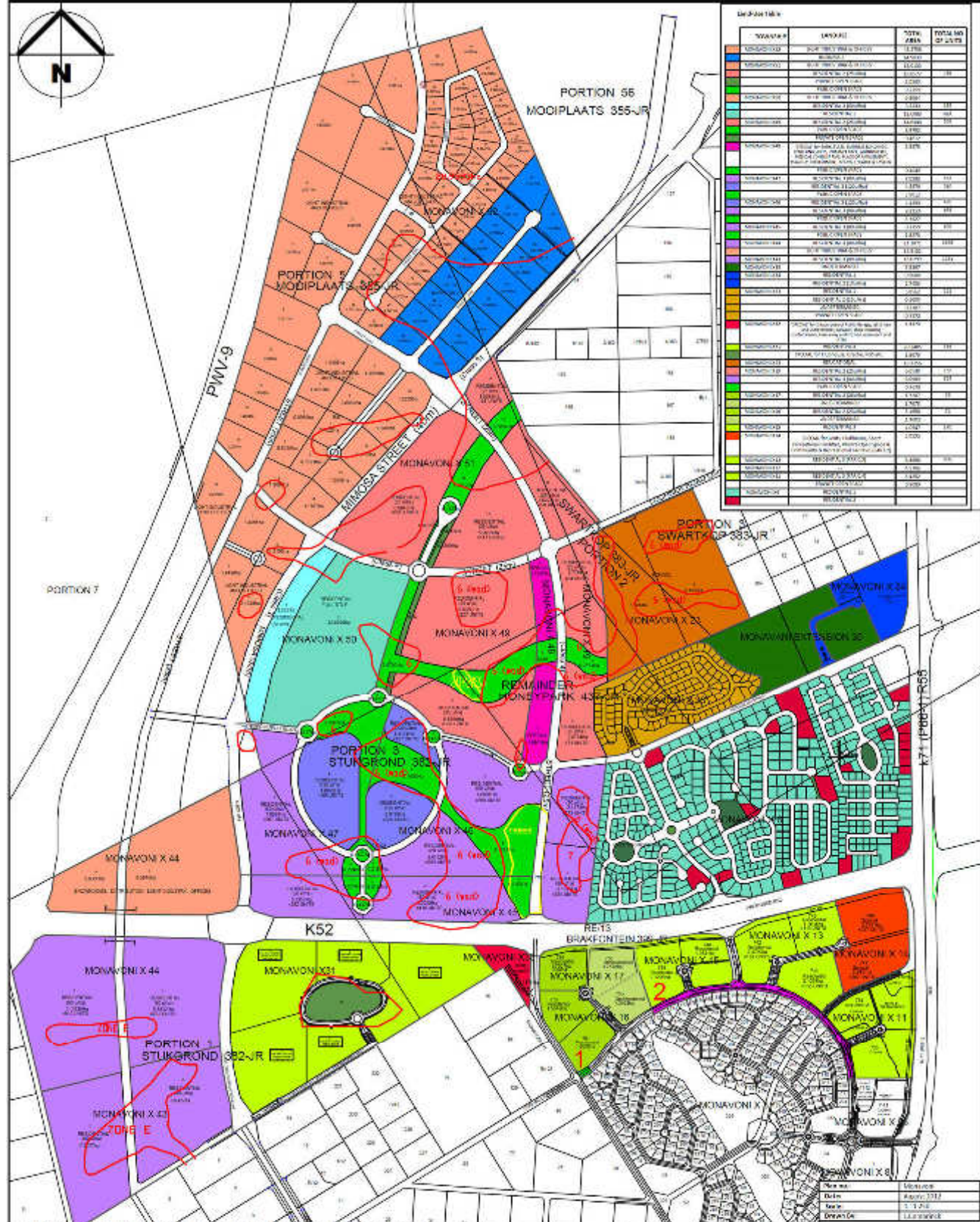




Annexure B

Monavoni Development
Framework





MONAVONI	LANDFOLK	TOTAL AREA	TOTAL NO OF UNITS
MONAVONI 1	RESIDENTIAL	12000	1200
MONAVONI 2	RESIDENTIAL	15000	1500
MONAVONI 3	RESIDENTIAL	18000	1800
MONAVONI 4	RESIDENTIAL	21000	2100
MONAVONI 5	RESIDENTIAL	24000	2400
MONAVONI 6	RESIDENTIAL	27000	2700
MONAVONI 7	RESIDENTIAL	30000	3000
MONAVONI 8	RESIDENTIAL	33000	3300
MONAVONI 9	RESIDENTIAL	36000	3600
MONAVONI 10	RESIDENTIAL	39000	3900
MONAVONI 11	RESIDENTIAL	42000	4200
MONAVONI 12	RESIDENTIAL	45000	4500
MONAVONI 13	RESIDENTIAL	48000	4800
MONAVONI 14	RESIDENTIAL	51000	5100
MONAVONI 15	RESIDENTIAL	54000	5400
MONAVONI 16	RESIDENTIAL	57000	5700
MONAVONI 17	RESIDENTIAL	60000	6000
MONAVONI 18	RESIDENTIAL	63000	6300
MONAVONI 19	RESIDENTIAL	66000	6600
MONAVONI 20	RESIDENTIAL	69000	6900
MONAVONI 21	RESIDENTIAL	72000	7200
MONAVONI 22	RESIDENTIAL	75000	7500
MONAVONI 23	RESIDENTIAL	78000	7800
MONAVONI 24	RESIDENTIAL	81000	8100
MONAVONI 25	RESIDENTIAL	84000	8400
MONAVONI 26	RESIDENTIAL	87000	8700
MONAVONI 27	RESIDENTIAL	90000	9000
MONAVONI 28	RESIDENTIAL	93000	9300
MONAVONI 29	RESIDENTIAL	96000	9600
MONAVONI 30	RESIDENTIAL	99000	9900
MONAVONI 31	RESIDENTIAL	102000	10200
MONAVONI 32	RESIDENTIAL	105000	10500
MONAVONI 33	RESIDENTIAL	108000	10800
MONAVONI 34	RESIDENTIAL	111000	11100
MONAVONI 35	RESIDENTIAL	114000	11400
MONAVONI 36	RESIDENTIAL	117000	11700
MONAVONI 37	RESIDENTIAL	120000	12000
MONAVONI 38	RESIDENTIAL	123000	12300
MONAVONI 39	RESIDENTIAL	126000	12600
MONAVONI 40	RESIDENTIAL	129000	12900
MONAVONI 41	RESIDENTIAL	132000	13200
MONAVONI 42	RESIDENTIAL	135000	13500
MONAVONI 43	RESIDENTIAL	138000	13800
MONAVONI 44	RESIDENTIAL	141000	14100
MONAVONI 45	RESIDENTIAL	144000	14400
MONAVONI 46	RESIDENTIAL	147000	14700
MONAVONI 47	RESIDENTIAL	150000	15000
MONAVONI 48	RESIDENTIAL	153000	15300
MONAVONI 49	RESIDENTIAL	156000	15600
MONAVONI 50	RESIDENTIAL	159000	15900
MONAVONI 51	RESIDENTIAL	162000	16200
MONAVONI 52	RESIDENTIAL	165000	16500
MONAVONI 53	RESIDENTIAL	168000	16800
MONAVONI 54	RESIDENTIAL	171000	17100
MONAVONI 55	RESIDENTIAL	174000	17400
MONAVONI 56	RESIDENTIAL	177000	17700
MONAVONI 57	RESIDENTIAL	180000	18000
MONAVONI 58	RESIDENTIAL	183000	18300
MONAVONI 59	RESIDENTIAL	186000	18600
MONAVONI 60	RESIDENTIAL	189000	18900
MONAVONI 61	RESIDENTIAL	192000	19200
MONAVONI 62	RESIDENTIAL	195000	19500
MONAVONI 63	RESIDENTIAL	198000	19800
MONAVONI 64	RESIDENTIAL	201000	20100
MONAVONI 65	RESIDENTIAL	204000	20400
MONAVONI 66	RESIDENTIAL	207000	20700
MONAVONI 67	RESIDENTIAL	210000	21000
MONAVONI 68	RESIDENTIAL	213000	21300
MONAVONI 69	RESIDENTIAL	216000	21600
MONAVONI 70	RESIDENTIAL	219000	21900
MONAVONI 71	RESIDENTIAL	222000	22200
MONAVONI 72	RESIDENTIAL	225000	22500
MONAVONI 73	RESIDENTIAL	228000	22800
MONAVONI 74	RESIDENTIAL	231000	23100
MONAVONI 75	RESIDENTIAL	234000	23400
MONAVONI 76	RESIDENTIAL	237000	23700
MONAVONI 77	RESIDENTIAL	240000	24000
MONAVONI 78	RESIDENTIAL	243000	24300
MONAVONI 79	RESIDENTIAL	246000	24600
MONAVONI 80	RESIDENTIAL	249000	24900
MONAVONI 81	RESIDENTIAL	252000	25200
MONAVONI 82	RESIDENTIAL	255000	25500
MONAVONI 83	RESIDENTIAL	258000	25800
MONAVONI 84	RESIDENTIAL	261000	26100
MONAVONI 85	RESIDENTIAL	264000	26400
MONAVONI 86	RESIDENTIAL	267000	26700
MONAVONI 87	RESIDENTIAL	270000	27000
MONAVONI 88	RESIDENTIAL	273000	27300
MONAVONI 89	RESIDENTIAL	276000	27600
MONAVONI 90	RESIDENTIAL	279000	27900
MONAVONI 91	RESIDENTIAL	282000	28200
MONAVONI 92	RESIDENTIAL	285000	28500
MONAVONI 93	RESIDENTIAL	288000	28800
MONAVONI 94	RESIDENTIAL	291000	29100
MONAVONI 95	RESIDENTIAL	294000	29400
MONAVONI 96	RESIDENTIAL	297000	29700
MONAVONI 97	RESIDENTIAL	300000	30000
MONAVONI 98	RESIDENTIAL	303000	30300
MONAVONI 99	RESIDENTIAL	306000	30600
MONAVONI 100	RESIDENTIAL	309000	30900

MONAVONI FRAMEWORK

1. Building lines are in accordance with the approved Site Development Plan;
2. All areas and dimensions are approximate and subject to final survey.

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 Highveld, 0159
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 Fax: (012) 676 8585
 Website: www.m-t.co.za



Annexure C

City of Tshwane Correspondence





CITY OF
TSHWANE
IGNITING EXCELLENCE

Environmental Management Services Department

4th Floor | 11 Francis Baard Street | Pretoria | 0002
PO Box 1454 | Pretoria | 0001
Tel: 012 358 8871 | Fax: 012 358 8934
Email: livhuwanis@tshwane.gov.za | www.tshwane.gov.za

My ref:	8/3/1/1	Tel:	012 358 8920
Your ref:	MVO Framework	Fax:	012 358 8934
Contact person:	B. H. Masinyana	Email:	boniswam@tshwane.gov.za
Section:	EP & OSM	Date:	08 October 2013

STRATEGIC EXECUTIVE DIRECTOR: CITY PLANNING and DEVELOPMENT DEPARTMENT
(Attention: L. Zeelie)

Dear Sir/Madam

MONAVONI OPEN SPACE FRAMEWORK:


Our previous discussions and the meeting which took place on the 13 August 2013 has reference.

CONCLUSION AND CONDITIONS

The Department in principle support the Monavoni Open Space Framework dated 23 August 2013 as submitted subject to the following conditions:

- No further changes can be made to the Open Spaces as discussed and supported.
- A "green servitude" in favor of the Council (not the general public) for purposes of protecting it for open spaces. The change of zoning of these properties will not be supported by this Department.
- A Site and Landscape Development Plan for each township drafted by a qualified Landscape Architect must be submitted to the Department for approval. Such Plan must include the following information:
 - At least 4m² per dwelling unit with a minimum of 50m² on a property which shall be developed and maintained as a children's playground.

Yours faithfully


.....
Mr. Livhuwani Siphuma
EXECUTIVE DIRECTOR: ENVIRONMENTAL MANAGEMENT & PARKS
Letter signed by: Leloko Puling
Designation: Director: Environmental Planning & Open Space Management Section


.....
Date

On request, this document can be provided in another official language

Kgoro ya Taolo ya Tikologo • Departement Omgewingsbestuur • Lefapha la Tsamaiso ya Tikologo

Indawo ye Madambhalo ya naha Mlangeni • UMnyango Wezokuphathwa Kwenvelo
Environmental Management Department





Annexure D

COPY OF CV OF LIZELLE
GREGORY FROM BOKAMOSO
LANDSCAPE ARCHITECTS AND
ENVIRONMENTAL
CONSULTANTS



Qualifications And Experience In The Field Of Environmental Planning And Management (Lizelle Gregory (Member Bokamoso)):

Qualifications:

- Qualified as **Landscape Architect** at UP 1991;
- Qualified as **Professional Landscape Architect in 1997**;
- A Registered Member at The **South African Council for the Landscape Architect Profession (SACLAP)** with Practise Number: **PrLArch97078**;
- A Registered Member at the **International Association for Impact Assessment Practitioners (IAIA)**;
- Qualified as an **Environmental Auditor in July 2008** and also became a Member of the International Environmental Management Association (IEMAS) in 2008.

Working Experience:

- Worked part time at Eco-Consult – 1988-1990;
- Worked part time at **Plan Associates as Landscape Architect in training** – 1990-1991;
- Worked as Landscape Architect at **Environmental Design Partnership (EDP)** from 1992 - 1994
- Practised under **Lizelle Gregory Landscape Architects** from 1994 until 1999;
- Lectured** at Part-Time at **UP** (1999) – Landscape Architecture and **TUT** (1998- 1999)- Environmental Planning and Plant Material Studies;
- Worked as **part time Landscape Architect and Environmental Consultant at Plan Associates** and **managed their environmental division for more than 10 years** – 1993 – 2008 (assisted the **PWV Consortium** with various road planning matters which amongst others included environmental Scans, EIA's, Scoping reports etc.)
- Renamed business as **Bokamoso in 2000** and is the only member of Bokamoso Landscape Architects and Environmental Consultants CC;
- More than 20 years experience in the compilation of Environmental Reports**, which amongst others included the compilation of various **DFA Regulation 31 Scoping Reports**, EIA's for EIA applications in terms of the applicable environmental legislation, Environmental Management Plans, Inputs for Spatial Development Frameworks, DP's, EMF's etc. Also included EIA Application on and adjacent to mining land and slimes dams (i.e. Brahm Fisherville, Doornkop)

Qualifications And Experience In The Field Of Landscape Architecture (Lizelle Gregory (Member Bokamoso)):

Landscape Architecture:

-Compiled landscape and rehabilitation plans for more than 22 years.

The most significant landscaping projects are as follows:

-Designed the Gardens of the Witbank Technicon (a branch of TUT). Also supervised the implementation of the campus gardens (2004);

-Lizelle Gregory was the Landscape Architect responsible for the paving and landscape design at the UNISA Sunnyside Campus and received a Corobrick Golden Award for the paving design at the campus (1998-2004);

-Bokamoso assisted with the design and implementation of a park for the City of Johannesburg in Tembisa (2010);

-The design and implementation of the landscape gardens (indigenous garden) at the new Coca-Cola Valpre Plant (2012-2013);

-Responsible for the rehabilitation and landscaping of Juksei River area at the Norwood Shopping Mall (Johannesburg) (2012-2013);

-Designed and implemented a garden of more than 3,5ha in Randburg (Mc Arthurpark). Bokamoso also seeded the lawn for the project (more than 2,5 ha of lawn successfully seeded) (1999);

-Bokamoso designed and implemented more than 800 townhouse complex gardens and submitted more than 500 Landscape Development Plans to CTMM for approval (1995 – 2013);

-Assisted with Landscape Designs and the Masterplan at Eco-Park (M&T Developments) (2005-2011);

-Bokamoso designed and implemented an indigenous garden at an office park adjacent to the Bronberg. In this garden it was also necessary to establish a special garden for the Juliana Golden Mole. During a recent site visit it was established that the moles are thriving in this garden. Special sandy soils had to be imported and special indigenous plants had to be established in the natural section of the garden.

-Lizelle Gregory also owns her own landscape contracting business. **For the past 20 years she trained more than 40 PDI jobless people (sourced from a church in Mamelodi)** to become landscape contracting workers. All the workers are (on a continuous basis) placed out to work at nurseries and other associated industries;

-Over the past 20 years the Bokamoso team compiled more than 800 landscape development plans and also implemented most of the gardens. Bokamoso also designed and implemented the irrigation for the gardens (in cases where irrigation was required). Lizelle regarded it as important to also obtain practical experience in the field of landscape implementation.



Bokamoso

**Landscape Architects &
Environmental consultants**

**P.O.BOX 11375
Maroelana
0161**

**Tel: (012) 346 3810
Fax: (086) 570 5559**

**E-mail: lizelle@mweb.co.za
Website: www.bokamoso.net**

- 01** Executive Summary
- 02** Vision, Mission & Values
- 03** Human Resources
- 04** Services
- 05** Landscape Projects
- 06** Corporate Highlights
- 07** Environmental Projects
- 08** Indicative Clients
- 09** Tools

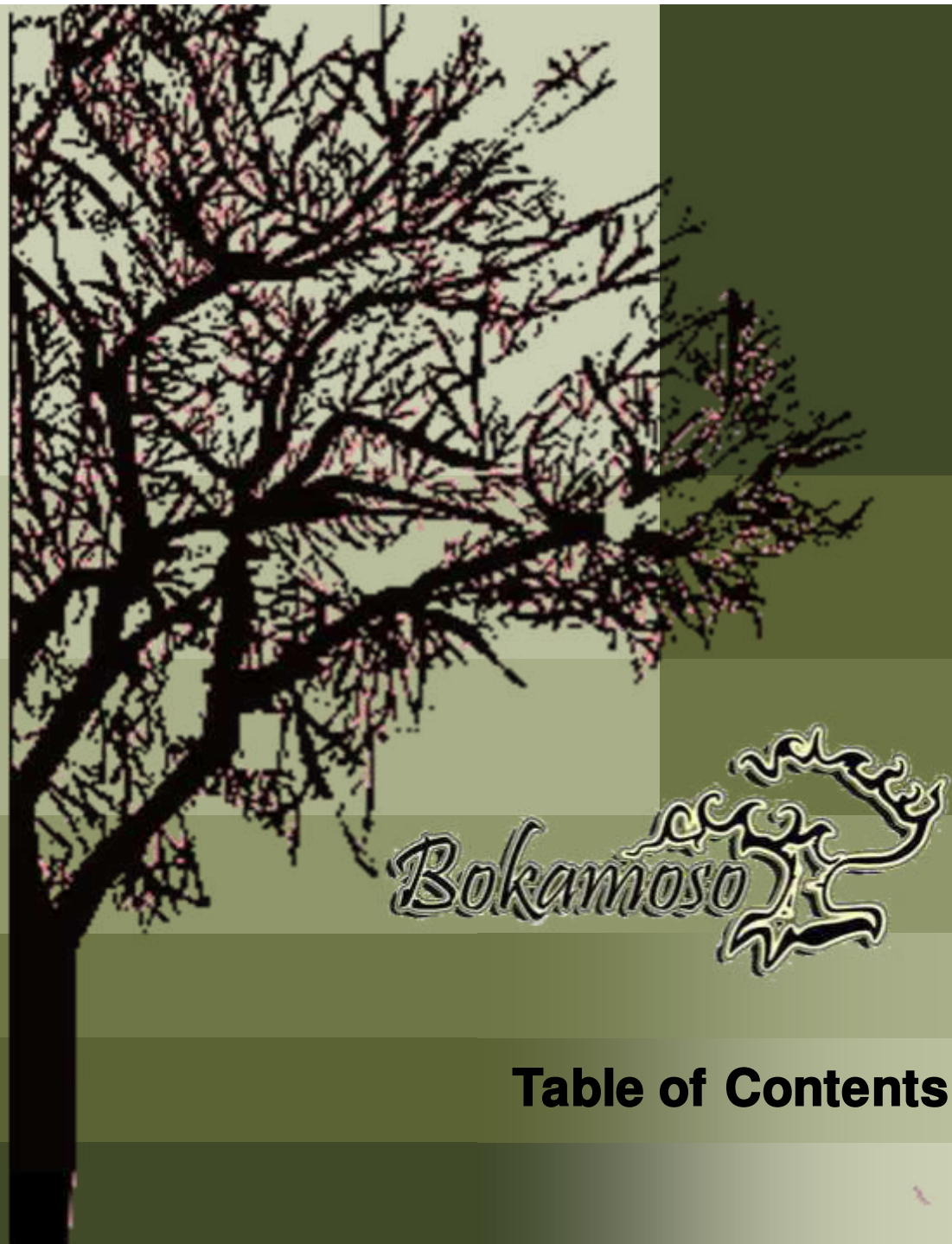


Table of Contents

Bokamoso specialises in the fields of Landscape Architecture and all aspects of Environmental Management and Planning. Bokamoso was founded in 1992 and has shown growth by continually meeting the needs of our clients. Our area of expertise stretches throughout the whole of South Africa. Our projects reflect the competence of our well compiled team. The diversity of our members enables us to tend to a variety of needs. Our integrated approach establishes a basis for outstanding quality. We are well known to clients in the private, commercial as well as governmental sector.

At Bokamoso we stand on a firm basis of environmental investigation in order to find unique solutions to the requirements of our clients and add value to their operations.



01 Executive Summary

011 Company Overview



Vision:

At Bokamoso we strive to find the best planning solutions by taking into account the functions of a healthy ecosystem. Man and nature should be in balance with each other.

Mission:

We design according to our ethical responsibility, take responsibility for successful completion of projects and constitute a landscape that contributes to a sustainable environment. We add value to the operations of our clients and build long term relationships that are mutually beneficial.

Values:

Integrity

Respect



Bokamoso stands on the basis of fairness. This include respect within our multicultural team and equal opportunities in terms of gender, nationality and race.

We have a wide variety of projects to tend to, from complicated reports to landscape installation. This wide range of projects enables us to combine a variety of professionals and skilled employees in our team.

Bokamoso further aids in the development of proficiency within the working environment. Each project, whether in need of skilled or unskilled tasks has its own variety of facets to bring to the table.

We are currently in the process of receiving our BEE scorecard. We support transformation in all areas of our company dynamics.



03 Human Resources

031 Employment Equity

Lizelle Gregory (100% interest)

Lizelle Gregory obtained a degree in Landscape Architecture from the University of Pretoria in 1992 and passed her board exam in 1995.

Her professional practice number is PrLArch 97078.

Ms. Gregory has been a member of both the Institute for Landscape Architecture in South Africa (ILASA) and South African Council for the Landscape Architecture Profession (SACLAP), since 1995.

Although the existing Environmental Legislation doesn't yet stipulate the academic requirements of an Environmental Assessment Practitioner (EAP), it is recommended that the Environmental Consultant be registered at the International Association of Impact Assessments (IAIA). Ms. Gregory has been registered as a member of IAIA in 2007.

Ms. Gregory attended and passed an International Environmental Auditing course in 2008. She is a registered member of the International Environmental Management and Assessment Council (IEMA).

She has lectured at the Tshwane University of Technology (TUT) and the University of Pretoria (UP). The lecturing included fields of Landscape Architecture and Environmental Management.

Ms. Gregory has more than 20 years experience in the compilation of Environmental Evaluation Reports:

Environmental Management Plans (EMP);

Strategic Environmental Assessments;

All stages of Environmental input ;

EIA under ECA and the new and amended NEMA regulations and various other Environmental reports and documents.

Ms. Gregory has compiled and submitted more than 600 Impact Assessments within the last 5-6 years. Furthermore, Ms. L. Gregory is also familiar with all the GDARD/Provincial Environmental policies and guidelines. She assisted and supplied GAUTRANS/former PWV Consortium with Environmental input and reports regarding road network plans, road determinations, preliminary and detailed designs for the past 12 years.



03 Human Resources

032 Members

Consulting

Anè Agenbacht

Introduction to Sustainable Environmental Management—An overview of Principles, Tools, & Issues (Potch 2006)
Leadership Training School (Lewende Woord 2010)
BA Environmental Management (UNISA 2011)
PGCE Education (Unisa 2013) - CUM LAUDE
Project Manager
More than 10 years experience in the compilation of various environmental reports

Mary-Lee Van Zyl

Msc. Plant Science (UP)
BSc (Hons) Plant Science (UP)
BSc Ecology (UP)
2years 7months working experience in the Environmental field
Specialises in ECO works, Basic Assessments, EIA's, and Flora Reports
Compilation of various Environmental Reports

Dashentha Naidoo

BA Honours Degree in Environmental Management (UNISA) - CUM LAUDE
Bachelor Social Science in Geography & Environmental Management (UKZN)
More than 4 years experience in WUL Application & Integrated Environmental Management within water resource management.
Senior Environmental Practitioner & Water Use Licences Consultant
Specialises in Water Use License & Compilation of various Env. Reports

Ben Bhukwana

BSc Landscape Architecture (UP)
More than 5 years experience in the field of Landscape Architecture (Design, Construction, and Implementation).
Specialises in Landscape Design, ECO, Rehabilitation Plans and Compilation Basic Assessment Reports
Compilation of Tender documents



03 Human Resources

033 Personnel

Anton Nel

B-Tech Landscape Technology (TUT)
N Dip Landscape Technology (TUT)
Hazardous Waste Management Short Course
2 years experience in ECO.
Specialises in Basic Assessment Reports.

Juanita de Beer

Diploma Events Management and Marketing (Damelin)
Specializes in Public relations and Public Participation Processes (3 years experience)

Alfred Thomas

CIW Foundation & Internet Marketing (IT Academy)
12 years experience in GIS and IT in general.
GIS Operator and Multimedia Specialist.

Bianca Reyneke

Applying SHE Principles and Procedures (NOSA)
Intro to SAMTRAC Course (NOSA)
SHEQ Coordinator and compilation of environmental reports
Specialises in compiling various environmental reports



03 Human Resources

034 Personnel

Elsa Viviers

Interior Decorating (Centurion College)
(Accounting/ Receptionist) and Secretary to Lizelle Gregory

Loura du Toit

N. Dip. Professional Teacher (Heidelberg Teachers Training College)
Librarian and PA to Project Manager

Merriam Mogalaki

Administration Assistant with in-house training in bookkeeping

Landscape Contracting

Elias Maloka

Site manager overseeing landscape installations.
Irrigation design and implementation.
Landscape maintenance
18 years experience in landscape contracting works.

The contracting section comprises of six permanently employed black male workers. In many cases the team consists of up to 12 workers, depending on the quantity of work.



03 Human Resources

035 Personnel



01 Environmental Management Services

- Basic Assessment Reports
- EIA & Scoping Reports
- Environmental Management Plans
- Environmental Scans
- Strategic Environmental Assessments
- EMP for Mines
- Environmental Input and Evaluation of Spatial Development Frameworks
- State of Environmental Reports
- Compilation of Environmental Legislation and Policy Documents
- Environmental Auditing and Monitoring
- Environmental Control Officer (ECO)
- Visual Impact assessments
- Specialist Assistance with Environmental Legislation Issues and Appeals
- Development Process Management
- Water Use License applications to DWA
- Waste License Application



04 Services

041 Consulting Services

02 Landscape Architecture

- Master Planning
- Sketch Plans
- Planting Plans
- Working Drawings
- Furniture Design
- Detail Design
- Landscape Development Frameworks
- Landscape Development Plans (LDP)
- Contract and Tender Documentation
- Landscape Rehabilitation Works

03 Landscape Contracting

Implementation of Plans for:

- Office Parks
- Commercial/ Retail / Recreational Development
- Residential Complexes
- Private Residential Gardens
- Implementation of irrigation systems



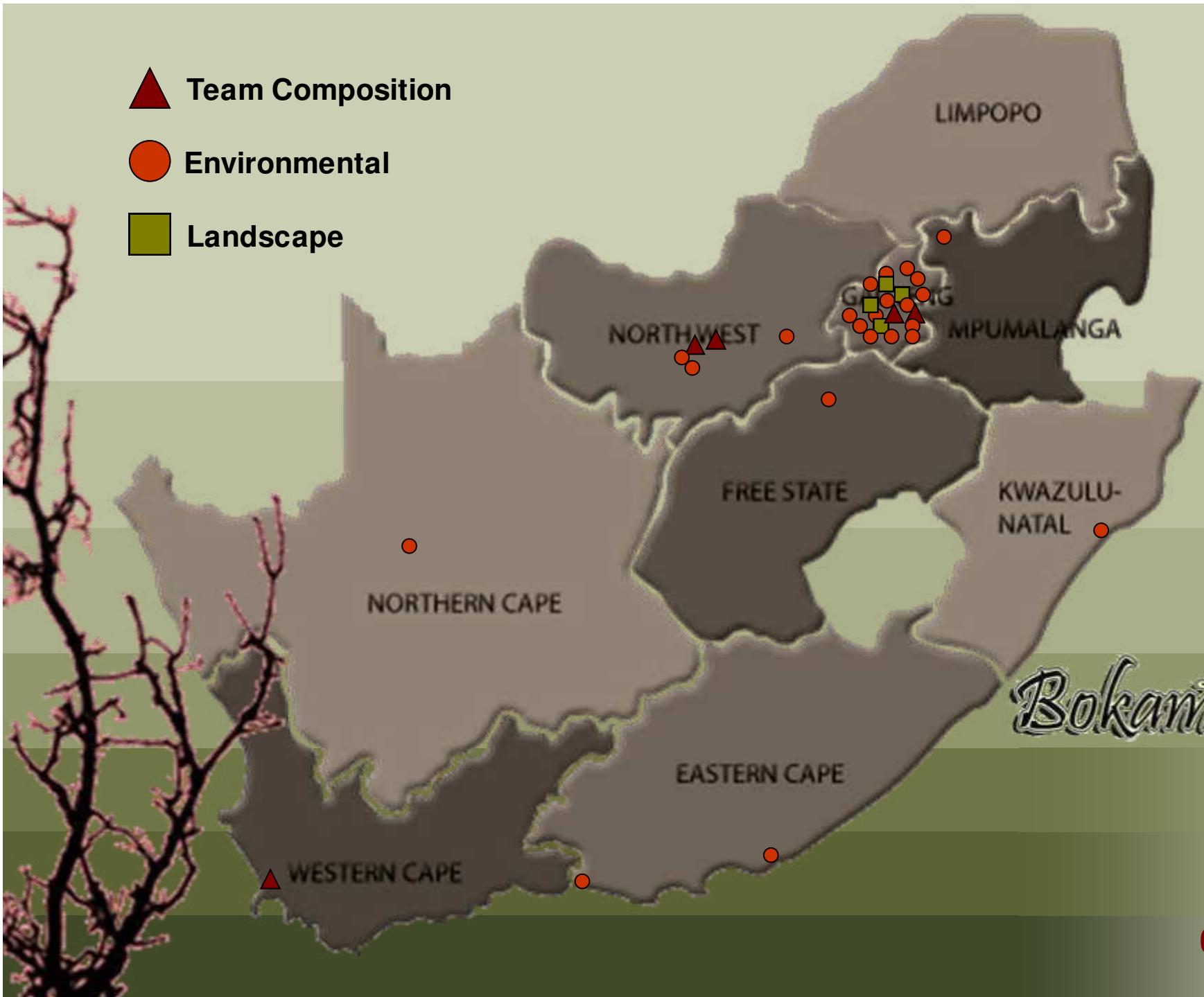
04 Services

042 Contracting Services

▲ Team Composition

● Environmental

■ Landscape



04 Services

043 Orientation

01 Valpre Bottling Plant, Heidelberg



project
shelter-site plan

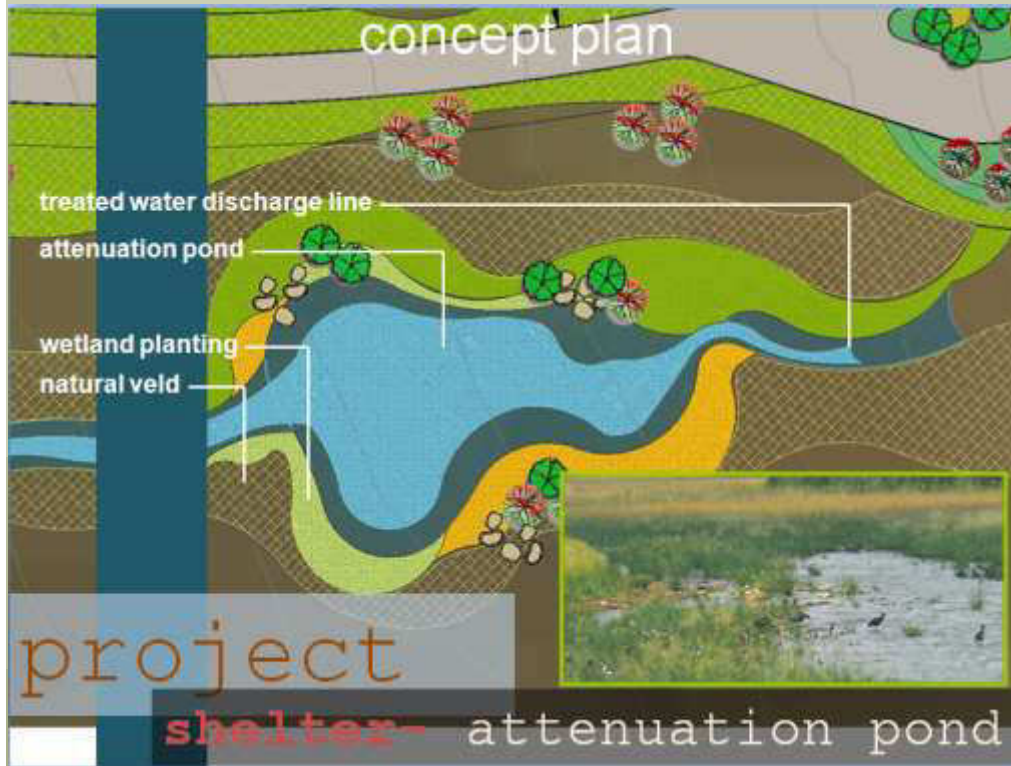


05 Landscape Projects- Current

051 Commercial



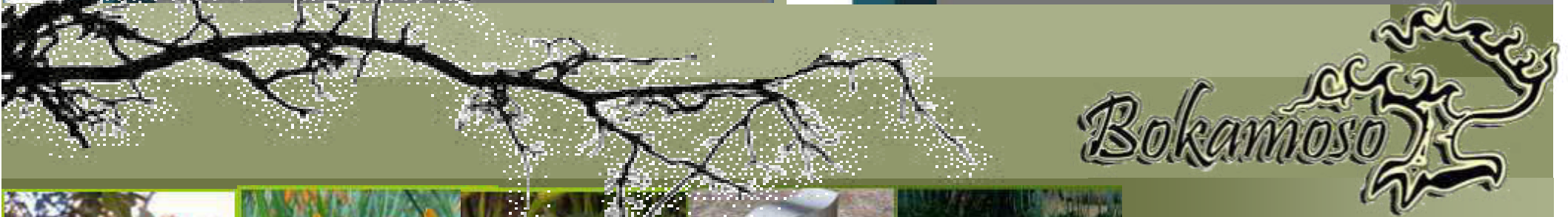
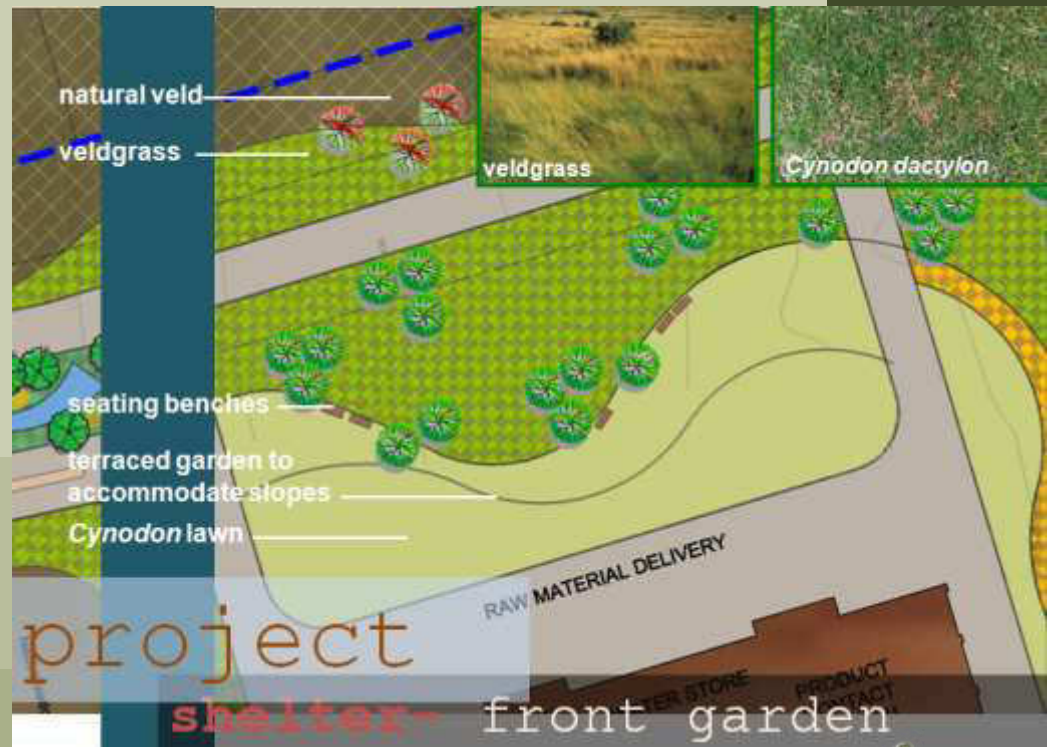
01 Valpre Bottling Plant, Heidelberg



05 Landscape Projects- Current

051 Commercial

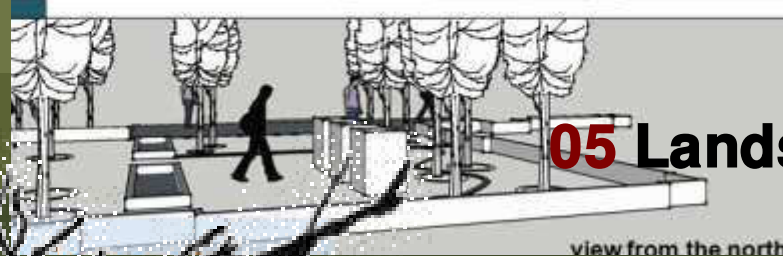
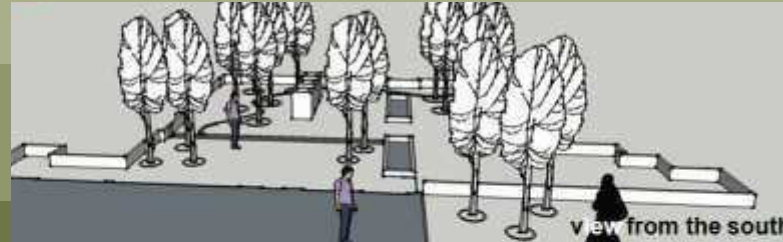
01 Valpre Bottling Plant, Heidelberg



05 Landscape Projects– Current

051 Commercial

01 Valpre Bottling Plant, Heidelberg



05 Landscape Projects– Current

051 Commercial

02 Melodie Waters, Hartebeespoortedam



Streetscape

Indigenous Planting



05 Landscape Projects – Current

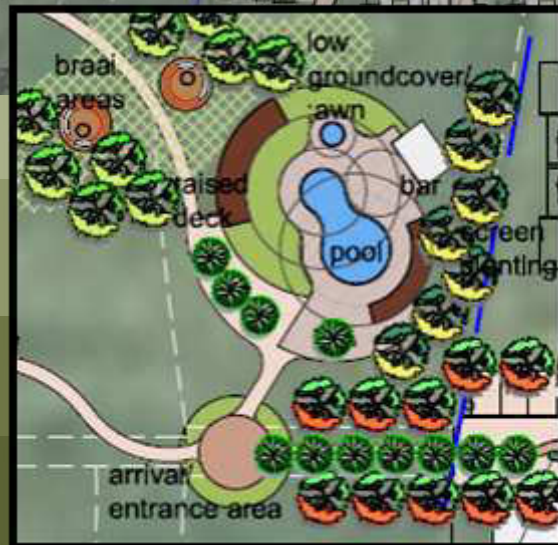
052 Commercial/Recreational



02 Melodie waters, Hartebeestpoortdam



Rehabilitation



Area Layout



05 Landscape Projects– Current

052 Commercial/Recreational

03 Grain Building, Pretoria



Bokamoso

05 Landscape Projects– Completed

053 Offices

04 Ismail Dawson offices, Pretoria



Bokamoso

05 Landscape Projects – Conceptual

053 Offices

05 Celtic Manor, Pretoria

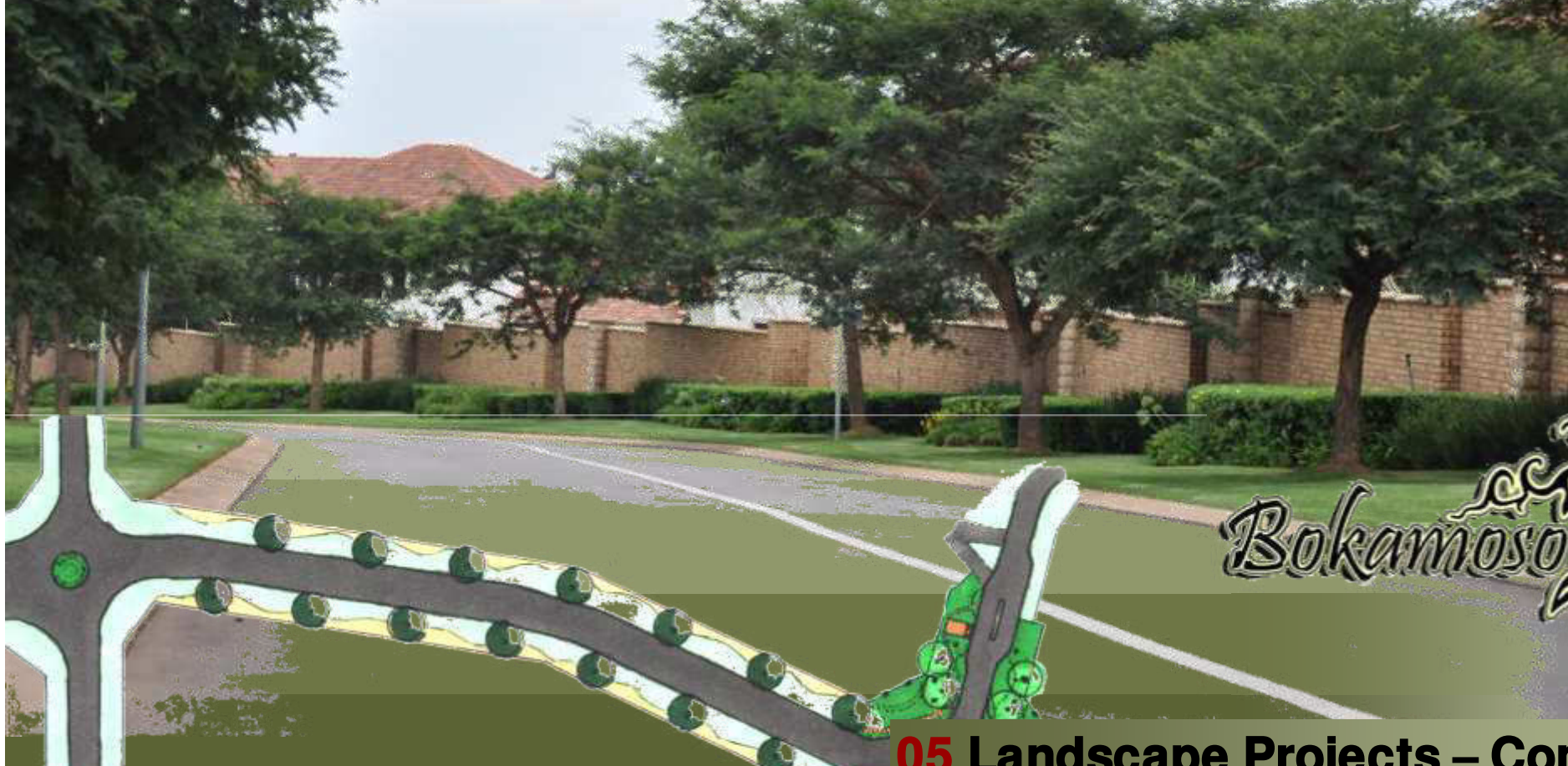


Bokamoso

05 Landscape Projects - Completed

054 Complex Development

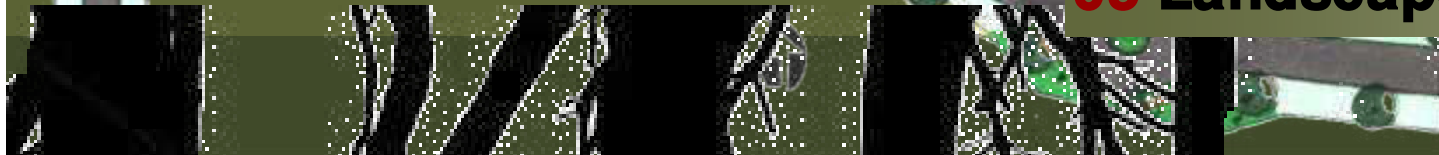
06 The Wilds, Pretoria



Bokamoso

05 Landscape Projects – Completed

054 Complex Development



07 The Wilds, Pretoria

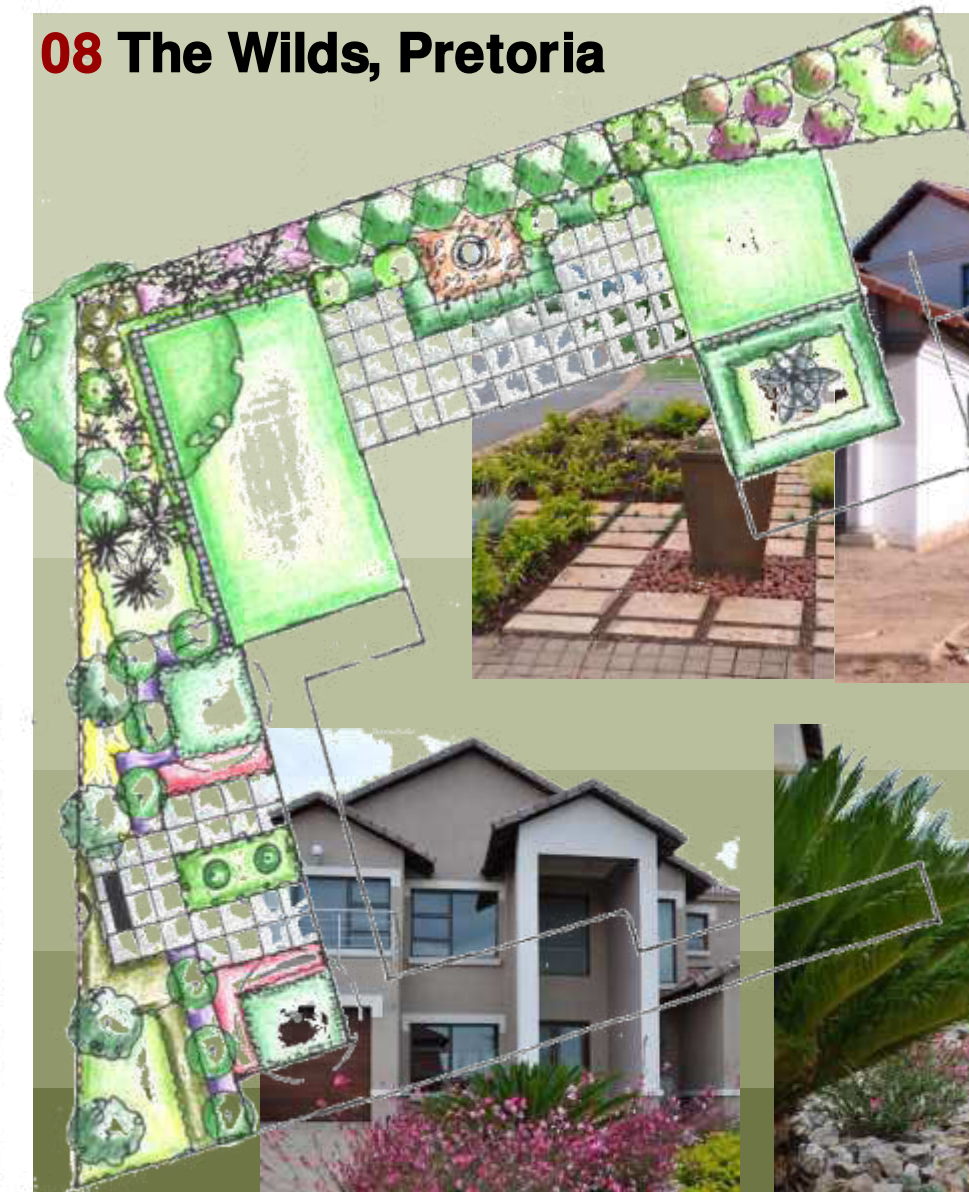


بوكاموسو
Bokamoso

05 Landscape Projects – Completed

055 Residential

08 The Wilds, Pretoria



Bokamoso

05 Landscape Projects – Completed

055 Residential

09 The Wilds, Pretoria



05 Landscape Projects – Completed

055 Residential

010 The Wilds, Pretoria



05 Landscape Projects – Completed

055 Residential



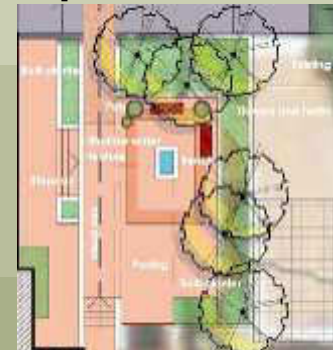
011 Governor of Reserve Bank's Residence, Pretoria



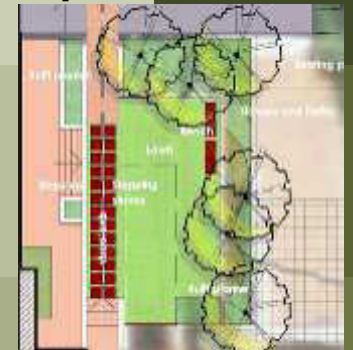
Plant Palette



Option 1



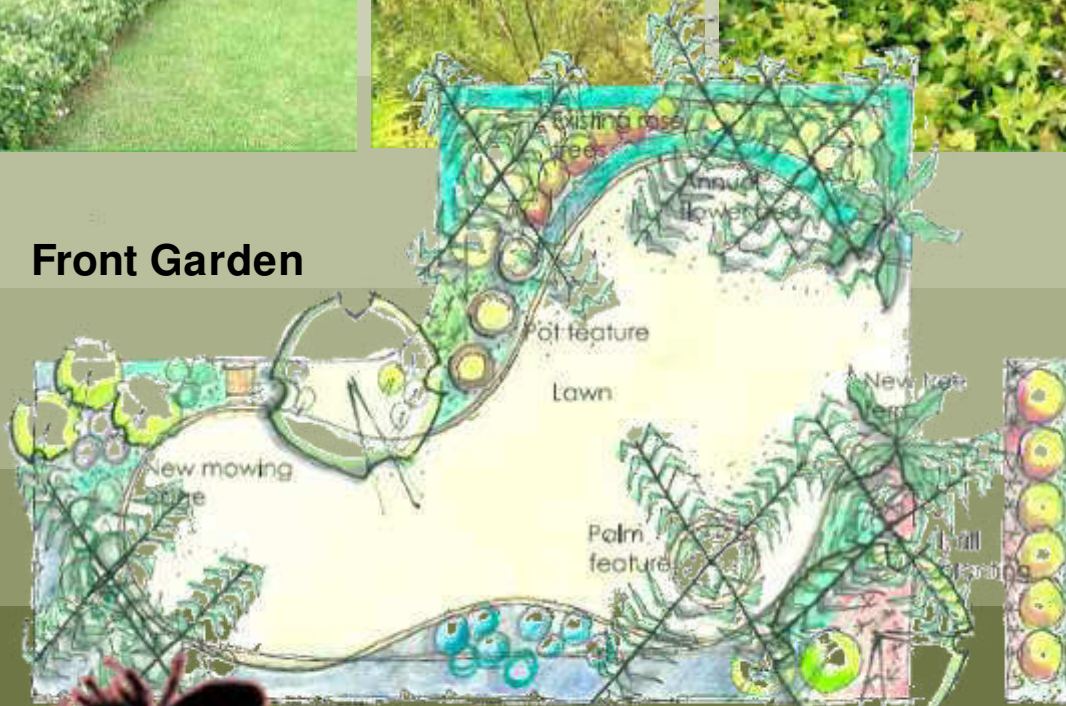
Option 2



012 House Ismail, Pretoria



Front Garden

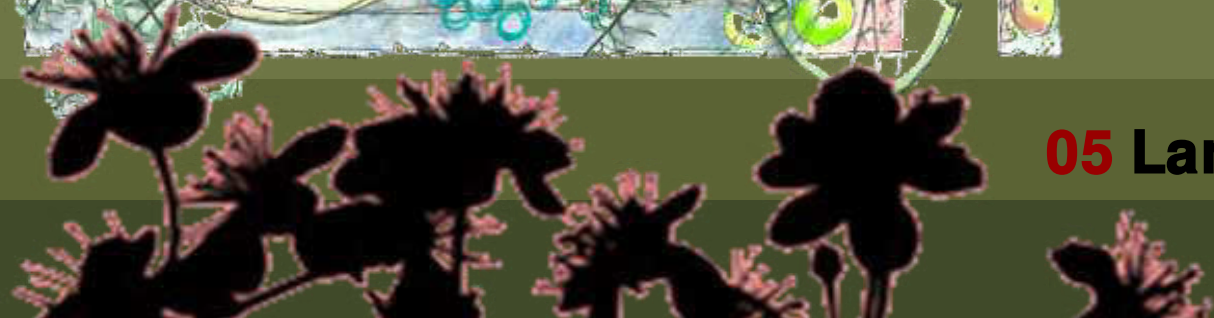


Back Garden



05 Landscape Projects - Conceptual

055 Residential



013 Forest Garden, Pretoria



Bokamoso

05 Landscape Projects – Completed

055 Residential

015 Forest Garden, Pretoria



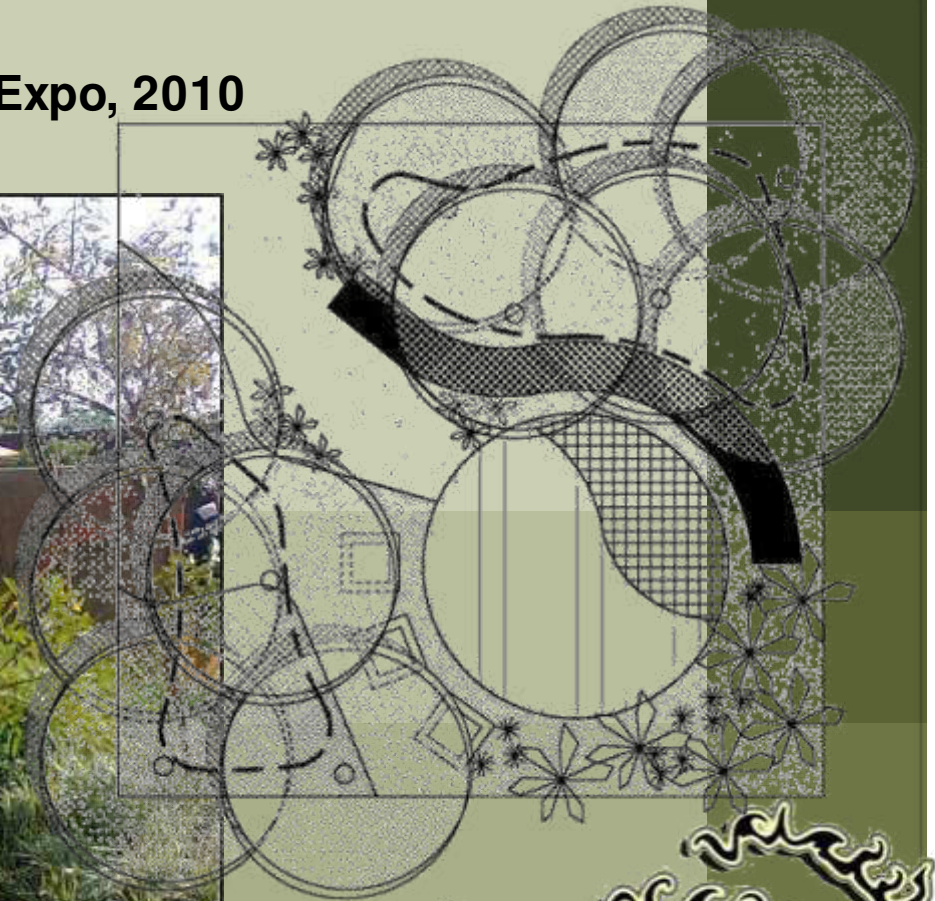
Bokamoso 

05 Landscape Projects - Completed

055 Residential

01 Safari Garden Expo

Received a Silver Certificate at the Safari Garden Expo, 2010



Bokamoso 

06 Corporate Highlights

061 Awards

02 UNISA Sunnyside Campus, Pretoria

Best Commercial Paving Plan in Gauteng, 1997



06 Corporate Highlights

061 Awards

Project Name	Status	Project
Environmental Impact Assessment(EIA) and Scoping Report		
Junction 21	ROD	EIA
5 O'clock site access	In Progress	EIA
Bokamoso X 1	In Progress	Scoping & EIA
Doornvallei Phase 6 & 7	In Progress	EIA
Engen Interchange	In Progress	Scoping & EIA
Erasmia X15	In Progress	EIA
Franschkloof	In Progress	EIA
K113	Amendment of ROD	EIA
K220 East	ROD	EIA
K220 West	ROD	EIA
K54 ROD conditions	In Progress	EIA
Knopjeslaagte 95/Peachtree	ROD	EIA
Knopjeslaagte portion 20 & 21	ROD	EIA
Lillieslief/Nooitgedacht	In Progress	EIA
Mooiplaats 70 (Sutherland)	In Progress	EIA
Naauwpoort 1 - 12/Valley View	In Progress	EIA
PeachTree X5	In Progress	EIA
Strydfontein 60	In Progress	EIA
Thabe Motswere	In Progress	Scoping & EIA
Vlakplaats	In Progress	EIA
Waterval Valley	In Progress	EIA
Environmental Opinion		
Doornkloof 68 (Ross)	In Progress	Opinion
Monavoni X 53	In Progress	BA & Opinion
Mooikloof (USN)	In Progress	Opinion
Norwood Mall/Sandspruit	In Progress	Opinion
Riversong X 9	In Progress	Opinion
Sud Chemie	In Progress	Opinion
USN Benjoh Fishing Resort	In Progress	Opinion



The adjacent list host the status of our current projects. Only a selected amount of projects are displayed.



07 Current Environmental Projects

071 EIA, Scoping & Opinion

Project Name	Status	Project
Basic Assessment(BA)		
Annlin X 138	In Progress	BA
Clubview X 29	ROD	BA
Darrenwood Dam	In Progress	BA
Durley Holding 90 & 91	In Progress	BA
Elim	In Progress	BA
Fochville X 3	In Progress	BA
Hartebeeshoek 251	In Progress	BA
Klerksdorp (Matlosana Mall)	In Progress	BA
Monavoni External Services	ROD	BA
Monavoni X 45	Amendment of ROD	BA
Montana X 146	In Progress	BA
Rooihuiskraal X29	In Progress	BA
Thorntree Mall	In Progress	BA

Environmental control officer (ECO)		
Grace Point Church	In Progress	ECO
R 81	In Progress	ECO
Highveld X 61	In Progress	ECO
Mall of the North	In Progress	ECO
Olievenhoutbosch Road	In Progress	ECO
Orchards 39	In Progress	ECO
Pierre van Ryneveld Reservoir	In Progress	ECO
Project Shelter	In Progress	ECO

S24 G		
Wonderboom	In Progress	S24 G
Mogwasi Guest houses	Completed	S24 G



07 Current Environmental Projects

072 BA, ECO & S24 G

Project Name	Status	Project
Objection		
Colesberg WWTW	In Progress	Objection
Nigel Steelmill	Completed	Objection
Chantilly Waters	Completed	Objection

Development facilitation Act- Input (DFA)		
Burgersfort	In Progress	DFA & BA
Doornpoort Filling Station	In Progress	DFA & EIA & Scoping
Eastwood Junction	In Progress	DFA
Ingersol Road (Erf 78, 81 - 83)	In Progress	DFA
Roos Senekal	In Progress	DFA & EIA & Scoping
Thaba Meetse 1	In Progress	DFA & EIA & Scoping

Water Use License Act (WULA)		
Britstown Bulk Water Supply	In Progress	WULA
Celery Road / Green Channel	In Progress	WULA
Clayville X 46	In Progress	WULA
Dindingwe Lodge	In Progress	WULA
Doornpoort Filling Station	In Progress	WULA+DFA+EIA+SC
Eco Park Dam	In Progress	WULA
Groote Drift Potch	In Progress	WULA
Jozini Shopping Centre	In Progress	WULA+BA
K60	Completed	WULA
Maloto Roads	In Progress	WULA
Kwazele Sewage Works	In Progress	WULA
Monavoni External Services	In Progress	WULA+BA
Nyathi Eco Estate	In Progress	WULA
Prairie Giants X 3	In Progress	WULA
Waveside Water Bottling Plant	Completed	WULA



07 Current Environmental Projects

073 Objection, DFA & WULA

Project Name	Status	Project
Environmental Management Plan(EMP)		
Heidelberg X 12	ROD	EMP
Monavoni Shopping Centre	Completed	EMP
Forest Hill Development	Completed	EMP
Weltevreden Farm 105KQ	Completed	EMP+EIA
Raslouw Holding 93	Completed	EMP+BA
Durley Development	Completed	EMP+BA
Rooihuiskraal North X 28	Completed	EMP

Rehabilitation Plan		
Norwood Mall/Sandspruit	In Progress	Rehabilitation
Project Shelter Heidelberg	In Progress	Rehabilitation
Sagewood Attenuation Pond	ROD	Rehabilitation
Velmore Hotel	Completed	Rehabilitation
Grace Point Church	Completed	Rehabilitation
Mmamelodi Pipeline	Completed	Rehabilitation

Visual Impact Assessment		
Swatzkop Industrial Developme	Completed	Assessment +DFA
Erasmia	Completed	Assessment

Signage Application		
Menlyn Advertising	Completed	Signage
The Villa Mall	Completed	Signage+EMP+BA



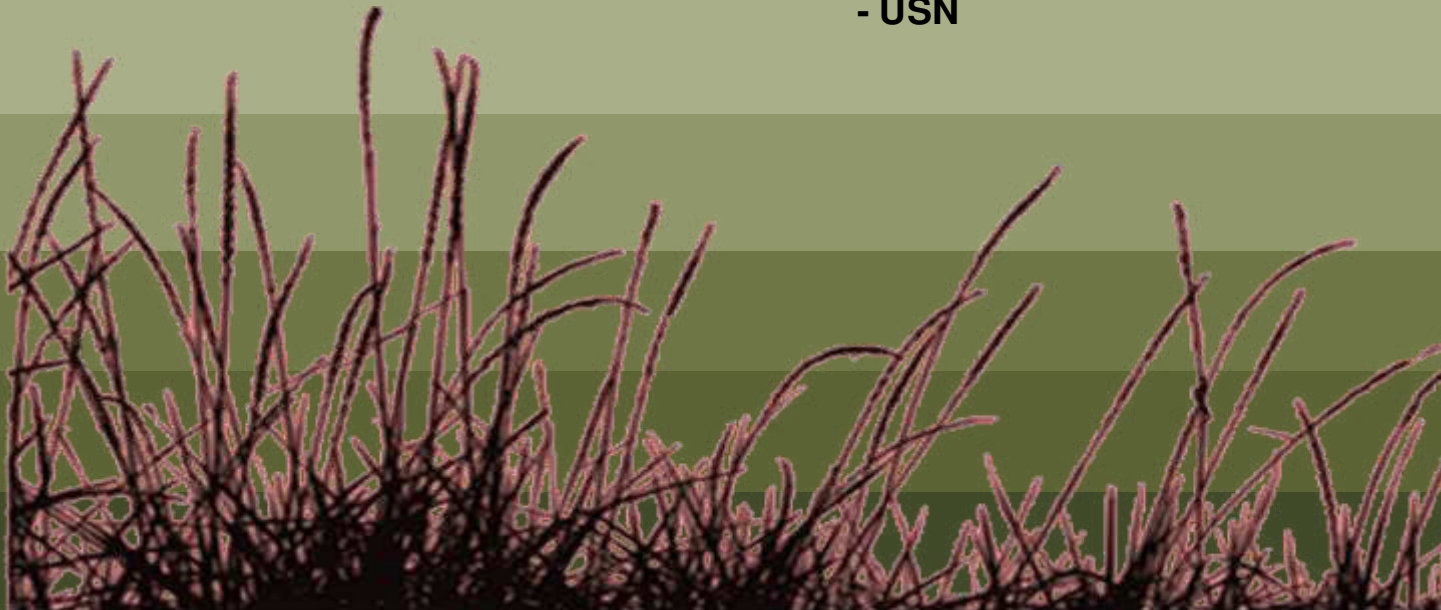
07 Current Environmental Projects

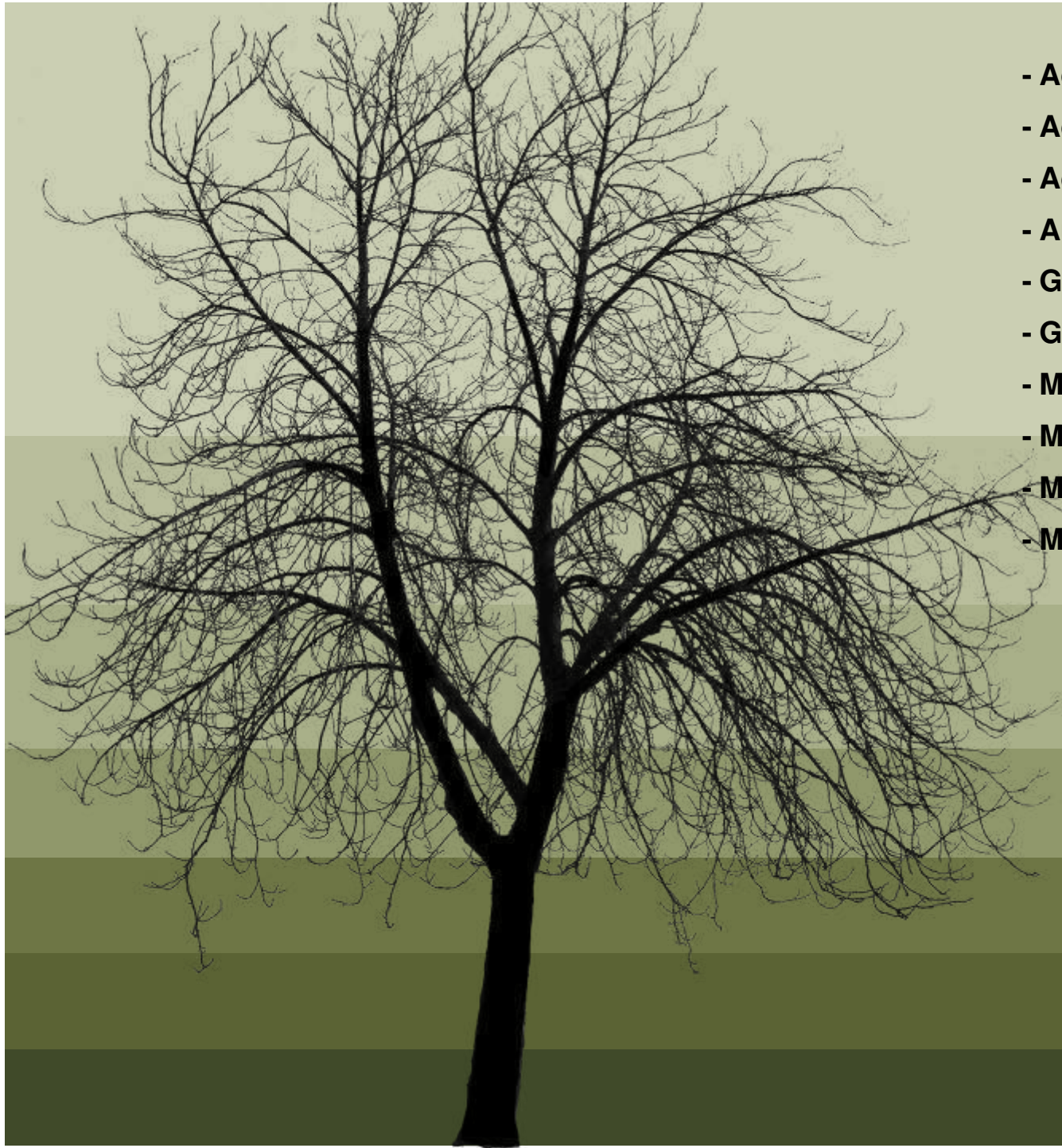
074 EMP, Rehabilitation , Waste Management & Signage Application

- Billion Property Group
- Cavaleros Developments
- Centro Developers
- Chaimberlains
- Chieftain
- Century Property Group
- Coca Cola
- Elmado Property Development
- Flanagan & Gerard
- Gautrans
- Hartland Property Group
- Moolman Group
- MTN
- M&T Development
- Old Mutual
- Property Investment Company
- Petroland Developments
- RSD Construction
- SAND
- Stephan Parsons
- Twin City Developments
- Urban Construction
- USN



08 Indicative Clients





- Adobe Illustrator CS3
- Adobe Photoshop CS3
- Adobe InDesign CS3
- AutoCAD
- Google SketchUP
- GIS
- Microsoft Office Word
- Microsoft Office Excel
- Microsoft Office Publisher
- Microsoft Office Power Point

Bokamoso 



Annexure E

Correspondence from
GDARD





agriculture and rural development

Department: Agriculture and Rural Development
GAUTENG PROVINCE

Diamond Building, 11 Diagonal Street, Johannesburg
P O Box 8769, Johannesburg, 2000

Telephone: (011) 240 2500

Fax: (011) 240 2700

Website: <http://www.gdard.gpg.gov.za>

Reference:	Gaut: 002/13-14/E0032
Enquiries:	Justine Chan
Telephone:	(011) 240 3048
Email:	Justine.Chan@gauteng.gov.za

Bokamoso Landscape Architects and Environmental Consultants

Email/Fax: lizelleg@mweb.co.za

Dear Sir / Madam

Draft Environmental Impact Assessment Report: Monavoni extension 51

The Department acknowledges having received the Draft Environmental Impact Assessment Report for environmental authorisation of the above-mentioned project on 05/02/2015.

You are required to submit five (5) copies (3 full colour hard copies and 2 CDs-PDF) of the Final Environmental Impact Assessment Report.

Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully

UBWA

Boniswa Belot

Deputy Director: Strategic Administration Support

Date: 05/03/2015

CC: JR 209 Investments (Pty) Ltd

Att:

Mr B Hertzog

Email/Fax:

barry@mtdevelopment.co.za



agriculture and rural development

Department: Agriculture and Rural Development
GAUTENG PROVINCE

Diamond Corner Building, 68 Eloff & Market Street, Johannesburg
P O Box 8769, Johannesburg, 2000

Telephone: (011) 355-1900

Fax: (011) 355-1000

Website: <http://www.gdard.gpg.gov.za>

Reference:	Gaut: 002/13-14/E0032
Enquiries:	Justine Chan
Telephone:	(011) 355-1256
Email:	Justine.Chan@gauteng.gov.za

Bokamoso Landscape Architects and Environmental Consultants

Email/Fax: lizelleg@mweb.co.za

Dear Sir/ Madam

Final Scoping Report: / Monavoni extension 51

The Department acknowledges having received the report for environmental authorisation of the abovementioned project on 16/10/2013.

Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully

Boniswa Belot

Deputy Director: Strategic Administration Support

Date: 29/10/2013

CC: JR 209 Investments (Pty) Ltd

Att:

Mr B Hertzog

Email/Fax:

barry@mtdevelopment.co.za



agriculture and rural development

Department: Agriculture and Rural Development
GAUTENG PROVINCE

Diamond Corner Building, 68 Eloff & Market Street, Johannesburg
P O Box 8769, Johannesburg, 2000

Telephone: (011) 355-1900

Fax: (011) 355-1000

Website: <http://www.gdard.gpg.gov.za>

Reference:	Gaut: 002/13-14/E0032
Enquiries:	Falth Mlambo
Telephone:	(011) 355-1974
Email:	Falth.mlambo@gauteng.gov.za

Bokamoso Landscape CC

Email/Fax. lizelleg@mweb.co.za

Dear Sir / Madam

Draft Scoping Report : Monavoni Extension 51

The Department acknowledges having received of the Draft Scoping Report/ for environmental authorisation of the above-mentioned project on 16/07/2013.

You are required to submit five (5) copies (3 full colour hard copies and 2 CDs-PDF) of the Final Scoping Report.

Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully

UBew

Boniswa Belot

Deputy Director: Strategic Administration Support

Date: 02/08/2013

CC: JR 209 Investments (Pty) Ltd

Att:

Mr B Hertzog

Email/Fax:

barry@mtdevelopment.co.za



agriculture and rural development

Department: Agriculture and Rural Development
GAUTENG PROVINCE

11 Diagonal Street, Diamond Building, Newtown, Johannesburg
P O Box 8769, Johannesburg, 2000

Telephone: (011) 240-2500

Fax: (011) 240-2700

Website: <http://www.gdard.gpg.gov.za>

Reference:	Gaut: 002/13-14/E0032
Enquiries:	Faith Mlambo
Telephone:	011 240-3053
Email:	faith.mlambo@gauteng.gov.za

Bokamoso Landscape CC

Email/Fax: lizelleg@mweb.co.za

Dear Sir/ Madam

Request for extension of time to submit Draft Environmental Impact Report: Monavoni Extension 51

The Department acknowledges having received your request for extension of time to submit Draft EIR for the abovementioned project on 26/05/2014.

Your request for extension of time to submit Draft EIR has been granted. Thus, you have until 05/02/2015 to submit the Draft EIR.

Please draw the applicant's attention to the fact that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully

Boniswa Belot

Deputy Director: Strategic Administration Support

Date: 06/08/2014

CC: TR 209 Investments (Pty) Ltd

Att: Mr B Hertzog
Email/Fax: barry@mtdevelopment.co.za



AGRICULTURE, CONSERVATION, AND ENVIRONMENT

Diamond Corner Building, 68 Eloff & Market Street, Johannesburg
P O Box 8769, Johannesburg, 2000

Telephone: (011) 355-1900
Fax: (011) 337-2292

Reference:	Gaut 002/08-09/N0590
Enquiries:	Faith Mlambo
Telephone:	(011) 355-1974
Email:	faith.mlambo@gauteng.gov.za

Bokamoso Environmental Consultants

Fax no: 012 460 7079

Dear Sir/Madam

Application for environmental authorization / Monavoni Extension 51

The Department confirms having received the application form for environmental authorisation of the above mentioned project on 02/09/2008. You may proceed with the scoping process required in terms of the Environmental Impact Assessment Regulations, 2006. You are entitled to submit five (5) Scoping reports; three of them must be in full color.

The application has been assigned the reference number Gaut 002/08-09/N0590. Kindly quote this reference number in any future correspondence in respect of the application.

In order to determine whether a biodiversity assessment is required and, if so, which specialist studies are required, please send a shapefile (WGS84 datum; geographic co-ordinate system) of the application site to our biodiversity information service (GDACE_BiodiversityInfo@gauteng.gov.za), the e-mail clearly indicating the project reference number. Where biodiversity assessment is required, please ensure that it is conducted consistent with the *GDACE Requirements for Biodiversity Assessments*. A copy of this document can be obtained by e-mailing GDACE_BiodiversityInfo@gauteng.gov.za or can be downloaded from www.gdacc.gov.za.

Kindly note that the activity may not commence prior to an environmental authorisation being granted by the Department.

Yours faithfully


Mr. Nhlaphila Makhathini

Assistant Director: Document Management (Admin Unit)

Date: 08/09/2008

CC: JR 209 Investments (Pty) Ltd

Attn: Mr. Barry Hertzog
Tel: 012 991 9700
Fax: n/a



GAUTENG PROVINCE

AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

Reference: Gaut 002/13-14/E0032
Enquiries: Khaka khaka
Telephone: 011 355 1704
Email: Khaka.Khaka@gauteng.gov.za

Bakamoso Landscape CC
P. O. Box 11375
Maroelana
0161

Attn: Mrs. Lizelle Gregory
Fax No: 086 570 5659

PER FACSIMILE / REGISTERED MAIL

Dear Madam

ACCEPTANCE OF SCOPING REPORT: PROPOSED MONAVONI X51 ON PART OF THE REMAINDER OF PORTION 5 OF THE FARM MOOPLAATS 355 JR AND PART OF PORTION 2 OF THE FARM ZWARTKOP 383 JR

The scoping report and plan of study for Environmental Impact Assessment (EIA) which was submitted by you in respect of the abovementioned application and received by the Department on 16 October 2013 has been accepted by the Department subject to consideration of amendments to the subject Plan of Study for EIA indicated below. You may accordingly proceed with undertaking the EIA in accordance with the tasks outlined in the Plan of Study for EIA as well as amendments thereto as indicated below.

The following must be considered during the EIA process and must form part of EIA report:

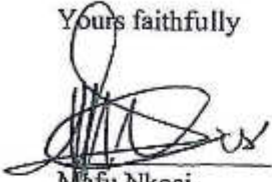
1. The ecological specialist studies for fauna and flora must meet the Department's Directorate of Nature Conservation requirements for Biodiversity assessments.
2. In terms of Biodiversity Conservation Plan Version 3 part of the site is designated as an important and Ecological Support area. Therefore the EIAR must report on the possible impacts on the subject site.
3. All relevant stakeholders (council of Geo-Science and the Local Authority etc.) must be consulted during the EIA process and their comments and/or responses should be included in the EIA Report.
4. Comments from the Hennopsvallei Conservancy must be included in the Final EIA report as stated in a letter from City of Tshwane Metropolitan Municipality : Environmental Managements Services Department dated 26 August 2013.
5. All comments and issues raised by interested and affected parties must be incorporated into the report.

A handwritten signature in black ink, appearing to be a stylized name.

6. A detailed project specific Environmental Management Plan (EMP) must be compiled and included in the EIR.

If you have any queries regarding the contents of this letter please contact the relevant official of the Department at the number indicated above.

Yours faithfully



Mafu Nkosi

Director: Environmental Impact Management

Date: 10/12/13



Annexure F

Layout Plan





Annexure G

SPECIALIST REPORTS





Annexure G(i)

Town Planning Memo





**APPLICATION FOR A PROPOSED TOWNSHIP, IN TERMS OF
SECTION 96 OF THE TOWN PLANNING AND TOWNSHIPS
ORDINANCE, 1986, ON A PART OF THE REMAINDER OF PORTION
5 OF THE FARM MOOPLAATS 355-JR, AND PART OF PORTION 2
OF THE FARM SWARTKOP 383-JR:
MONAVONI EXTENSION 51**

**M&T DEVELOPMENT (PTY) LTD.
P.O. Box 39727
FAERIE GLEN
0043**

**Tel No.: (012) 676-8584
Fax No.: (012) 676-8585**

**Project No.: MONAVONI EXTENSION 51
Ref No.: MON X 51 MEMO**

Enquiries: Pieter Heukelman

Date: 2 June 2011

CONTENTS

- 1. INTRODUCTION**
- 2. PURPOSE OF THE APPLICATION**
- 3. GENERAL INFORMATION**
 - 3.1 Township Name**
 - 3.2 Property Description**
 - 3.3 Extent**
 - 3.4 Existing Zoning**
 - 3.5 Registered Owner**
 - 3.6 Title Deed**
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ANNEXURE "A"	PROOF OF TOWNSHIP NAME
ANNEXURE "B"	LOCALITY PLAN
ANNEXURE "C"	LAND USE PLAN
ANNEXURE "D"	TOWNSHIP LAYOUT PLAN
ANNEXURE "E"	SCHEDULES
ANNEXURE "F"	APPLICATION FORM
ANNEXURE "G"	TITLE DEEDS
ANNEXURE "H"	POWER OF ATTORNEY AND COMPANY RESOLUTION
ANNEXURE "J"	LG DIAGRAMS

MEMORANDUM IN SUPPORT OF THE APPLICATION IN TERMS OF THE TOWN PLANNING AND TOWNSHIPS ORDINANCE, 1986 FOR THE ESTABLISHMENT OF A TOWNSHIP TO BE KNOWN AS

MONAVONI EXTENSION 51

SITUATED ON A PART OF THE REMAINDER OF PORTION 5 OF THE FARM MOOIPLAATS 355-JR AND PART OF PORTION 2 OF THE FARM SWARTKOP 383-JR

1. PURPOSE OF THE APPLICATION

This application made in terms of Section 96(1) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986) is for the establishment of a township consisting of twenty six (26) erven.

Monavoni Extension 51 will comprise of:

- 5 erven zoned "**Industrial 2**";
- 10 erven zoned for "**Business 2**";
- 5 erven zoned for "**Residential 2**" purposes with a density of **25 units/ha**
- 5 erven zoned "**Private Open Space**"
- 1 erf zoned "**special**" for access control and engineering services

2. GENERAL INFORMATION

2.1 Township Name

The name **Monavoni Extension51** has been allocated to the proposed township by the City of Tshwane Metropolitan Municipality.

2.2 Property Description

The township is situated on **Part of the Remainder of Portion 5 of the Farm Mooiplaats 355 - JR and Part of Portion 2 of the Farm Swartkop 383 - JR.**

2.3 Extent

The extent of the farm areas of **Part of the Remainder of Portion 5 of the Farm Mooiplaats 355 - JR and Part of Portion 2 of the Farm Swartkop 383 - JR.** is as follows:

Portion	Area in ha
Part of the Remainder of Portion 5 of the Farm Mooiplaats 355-JR	40,3053
Part of Portion 2 of the Farm Swartkop 383-JR	1,4569
Total Area	41.7622

2.4 Registered owner

Part of the Remainder of Portion 5, of the Farm Mooiplaats 355 - JR is registered in the name of JR 209 Investments (Pty) Ltd as set out in Deed of Transfer T173587/2004.

Part of Portion 2 of the Farm Swartkop 383 - JR is registered in the name of JR 209 Investments (Pty) Ltd as set out in Deed of Transfer T119977/2005.

2.5 Title Deed

There are no restrictive title conditions that will impact the application in a negative way.

2.6 Servitudes & Encumbrances

There are no servitudes and encumbrances that will impact the application. A copy of the land surveyor's certificate is enclosed as part of this application (**Annexure "B"**).

2.7 Mineral rights

There are no Mineral rights certificate issued in respect of the properties that affect the township and as the State are now the custodian of all mineral rights, the comment from the Department of Mineral & Energy Affairs will be obtained on the township application and this will include the consent from them as the mineral rights owner.

2.8 Mortgage Bonds

There are no Mortgage Bonds registered over the farm portions.

2.9 The site

2.9.1 Locality

The proposed township is situated to the east of the proposed PWV-9, west of the R55, to the north of the M34 (Ruimte Road) and the N14, south of Mimmosa Road, south-west of Sunderland Ridge, and to the east of Gardener Ross Golf Estate, as shown on the enclosed locality plan. (**Annexure "D"**)

2.9.2 Topography and Hydrology

The property has a gentle downwards slope in a north eastern direction. The property is not affected by a 1:50 and 1:100 year floodlines as indicated on the layout plan. The topography will therefore not have any constraints in regards to the township application.

2.8.3 Geology

A Geotechnical Investigation will be conducted to determine the Geology of the site. As soon as the Geotechnical Report is finalised, the report will be handed in at the Council for Geoscience. The comments from the Council of Geoscience will be provided to the council, as soon as we receive it.

A copy of the geotechnical report will also be handed to the Council once it is finalised.

2.8.4 Existing Land use

The application site is vacant and undeveloped.

2.10 **Environment**

An Environmental Impact Assessment is required for this proposed development in compliance with the Environmental Impact Assessment (EIA) regulations, in terms of the Section 21 of the Environment Conservation Act (Act No. 73 of 1989) as well as the National Environmental Management Act (No. 107 of 1998). The proposed development requires an environmental authorisation from GDACE as some of the activities which forms part of the proposed development may have a detrimental impact on the environment.

An EIA process has been initiated by the following Environmental Consultant:

LANDSCAPE ARCHITECTS, ENVIRONMENTAL CONSULTANTS, GIS SPECIALISTS & WATER LICENSING

145 Club Ave Waterkloof Pretoria

P.O. BOX 11375

MAROELANA

0161

TEL: (012) 346 3810

FAX: (012) 460 7079

2.11 **Legal and Administrative controls**

The property is subject to the following legal and administrative controls:

2.11.1 Tshwane Town Planning Scheme, 2008

The property falls within the area of the jurisdiction of the Tshwane Town Planning Scheme, 2008 and is presently zoned for "Agricultural" purposes as set out in the enclosed zoning certificate (Annexure E).

2.11.4 Monavoni and Western Farms Development Framework 2020 (November 2008)

A development framework was drafted in terms of which areas were earmarked for urban expansion during the period 2008 to 2020. A Development Edge was also proposed in terms of this framework to provide a guideline for the type of land uses that can be allowed inside and outside the Development Edge.

The properties that form part of this application fall within the boundaries of the Development Edge. This area was further divided into a number of Land use Management zones. The aim of these zones is to promote the development of a specific land use character through the application of land use mix and density.

The portion of the proposed township has been earmarked for **Residential Estate**, which aim to provide areas for low-density residential estate development. Residential densities will be subject to the geotechnical conditions and environmental sensitivities with a maximum density of **10 units per hectare**. Land uses proposed should be residential supporting and can include schools, religious facilities and other social facilities.

To the north-east as an **Industrial zone** with the aim to maintain and enhance the residential character of typical residential neighbourhoods. A minimum residential density of 10 Units per hectare is supported by Zone 2 with a maximum density of 25 units per hectare. Medium-density types such as cluster housing will be supported within this zone.

1.10.5 Tshwane Open Space Framework (November 2005)

In terms of the Tshwane Open Space Framework the property is situated within a Green node, regarded as a protected area. Protected areas are strategically important Ecological Structuring elements within the Tshwane Open Space Framework and should be conserved. This property however falls in an area, which is regarded to have a **low** Ecological sensitivity. The property is also situated adjacent to a Brown node, the Gardener & Ross Golf estate, which includes informal and formal recreational open space areas such as sports facilities and recreational parks. The property is also affected by a Blue Way, a water course, which is protected in the design and layout of the township.

In terms of provisional environmental impact assessments and sensitivity maps, the proposed township development will not have a detrimental impact on the environment and will be in line with the requirements of the Tshwane Open Space Framework.

3. MOTIVATION

3.1 PROPOSED USES

This application is for the establishment of a residential township **Monavoni Extension 51** with the following proposed land uses:

- 5 erven zoned "**Industrial 2**";
- 10 erven zoned for "**Business 2**";
- 5 erven zoned for "**Residential 2**" purposes with a density of **25 units/ha**
- 5 erven zoned "**Private Open Space**"

The proposed uses are more clearly defined below as set out in the Tshwane Town Planning Scheme, 2008.

Dwelling units

Some group housing erven are spread through the development with varying densities. Dwelling units will be developed on these erven in line with a proposed site development plan.

The Tshwane Town Planning Scheme 2008 defines dwelling units as: "self contained suite of rooms mutually connected and consisting of habitable room(s), a bathroom(s), toilet(s) and not more than one kitchen without the permission of the Municipality for the purpose of residence by a single family, or a single person or two unmarried persons and may include outbuildings which are ancillary and subservient to the dwelling-unit and may include a Home Enterprise"

Offices

Five office erven have been included into the township adjacent to Mimosa Street to create a buffer between the road and residential erven and to provide some local office space to residents in the area.

The Tshwane Town Planning Scheme 2008 defines offices as: "land and buildings or part of a building used for professional, clerical, administrative, management, marketing and consulting services, but excludes a call centre, security and emergency response vehicles, courier services in post, parcels and money".

Private Open space:

The migration corridor for threatened fauna species was included into the township as Private Open Space that will be managed and maintained by the Section 21 Company. The private open space areas will also be used for walkways, stormwater drainage and thoroughfares for services.

Industrial

To the north-western boundary a strip of proposed industrial stands are situated. The stands will form part of the industrial development to the north namely Monavovi Extension 52. The industrial stands can be defined as:

Means land and buildings where a product or part of a product is manufactured, mounted, processed, repaired, rebuilt or packed, including a power station and incinerator plant and may include a cafeteria and a caretaker's flat and any other activities connected to or incidental to the activities mentioned herein, excluding noxious industries, light industries and retail industries.

3.2 Need

M&T owns a substantial amount of property within the area of the application site, and have developed various developments in the area. With the developments M&T spent a considerable amount of money to obtain engineering services to the adjacent townships. The already installed services will therefore be optimally utilized as was planned from the previous developments that M&T developed in the adjacent area of the application site.

It was therefore always the idea to expand the Monavoni precinct. The market demand is the main factor that the township has not yet been proceeded with. In the last two years the development market has slowed down considerably with the global recession. Indicators and previous recessions have shown that the recession will end in the near future, therefore, the development will be at the end stages when the recession is over.

The application site is also located within the urban edge. This is an important aspect to take cognisance of, the reason being that there is limited space available within the urban edge for new developments. It is therefore important to develop new developments within the urban edge, to combat urban sprawl, to save valuable agricultural land.

The application site is in close proximity to informal settlements. The planned industrial parks and office developments within the proposed development will have a big impact on the informal settlements as it will create work opportunities and have a mixed use development close to the informal settlement, that will enhance the sense of place of the area.

The recent trend has emerged over the last couple of years for offices and industrial properties situated outside of the CBD. The reason for this being that business owner and their workers can live closer to work, and in close proximity to other amenities such as convenient stores. There is also unprivileged work force that can benefit from jobs.

There is three residential erven within the development, and in recent years the residential market has grown significantly to provide for a growing number of home owners. The growth in the residential market can be contributed to a few factors, which include favourable interest rates, a larger amount of investors in residential property as a result of increasing house prices and more potential home owners. Cost of residential property have increased continuously for the last five years and even though the market has slowed down some in the last 2 years, in line with a decline in the global economy, indications are that the residential market is recovering and house prices are again starting to increase as banks are approving more home loans and people again start to invest in property and property development. Interest rates have again reduced substantially which will ensure a renewed interest in residential development.

A trend in residential development that has not changed is a need for smaller, more affordable residential units, where you can buy a lock-up-and-go unit in close proximity to amenities.

There is a need to provide a diversity of land uses and type of residential units in an area. This proposed development will be situated to the north west of the Sevilla, Silverstone, Silverwood and Thornfield estate. The erven in this development is full title stands of approximately 500 square meters. Most of the erven in this estate is exclusive and with the establishment of this development you can live at the right address in a secure environment with all the surrounding amenities, but at much more affordable rates. This development caters for sectional title units and will be developed in such a way as to optimally make use of the surrounding open space areas.

This residential development will provide the opportunity for the first home buyer to own a unit within a group housing development without having to bear the high costs. The development will also be very attractive for the pensioner, who wishes to retire in a smaller residential unit, within a secure environment, and still having the benefits of a beautiful and peaceful environment.

The north western erven in the development, situated directly adjacent to the proposed Mimosa Street will be developed for offices. There is a need for some office developments in any residential development to provide professional suites, medical suites and other offices that are required to be situated in close proximity to Residential erven, but with good access from the region. This will also contribute towards a sense of place by having a mixed use zoning.

This township is part of a large property where development up to now, was mainly used for agricultural purposes. Most of the property can be developed at high densities, due to minor environmental sensitivities, such as ridges and important waterways. This property has no sensitivity areas and is not affected by a 1:50 or 1:100 year floodlines, but the creation of open space green lungs through the development will still be provided. The open space areas provide for a green lung through the development where residents can interact with the surrounding natural environment, to create a sense of place.

Security has become the number one priority for new home owners. Throughout South Africa there has been a general move towards safer and secure neighbourhoods. This has also been proven by the amount of street closures for security purposes in traditional neighbourhoods and the fact that most of the new residential and office developments throughout South Africa include security and access control as the main attraction point for new home buyers.

This proposed residential development will provide in a need for secure development where a lifestyle with peace of mind will be established. The development will have 24 hour interactive security, an electric perimeter fence around the development, and manned access control point will be provided at the entrance.

The park area will be retained in its natural state and where landscaped, it will be in line with a detailed master landscaping plan. Some walkways and other recreational facilities within a natural environment will be created for the residents.

The erven in this development will be set in a pleasant environment, with good access to work opportunities. The development will be attractive to a wide range of homeowners, and businesses with added benefit of security and have access to amenities close by.

3.3 DESIRABILITY

Several factors will contribute towards the desirability of the proposed development and these aspects will be discussed in more detail. As will compliance with regards to the Development Facilitation Act and the IDP of

Centurion. The quality and desirability of the living environment which is proposed will also be addressed.

3.3.1 Desirability of land uses

This proposed development is situated in an area that has a very moderate climate and which lends itself to an outdoor lifestyle. The central theme and the main focus of this development is a generous open space system which represents a portion to the total area of the township. The residential group housing developments will face onto the open space area. These aspects will contribute towards maintaining the rural character of the estate and will ensure that this development will optimise and promote an outdoor lifestyle for the residents residing in the residential estate, making the most of the picturesque setting of development.

The communal open space area will be landscaped to ensure a pleasant environment for the residents of the environment, and the open space will open be landscaped for the reticulation of stormwater

The proposed township is situated within a node of estate development such as Stone Ridge Country Estate, Silver Wood Estate, Silver Wood Estate, Raslow Lifestyle Estate, and Heuwelsig Estate that already constitutes a node for development in the area and this proposed development will complement the existing residential node in the area. The developer has already invested in bringing services to this area and these existing services should be utilised optimally. The development should also facilitate the sensible and economic growth of the area.

All the above elements will contribute towards the creation of a unique lifestyle environment which will be in harmony with the surrounding area and natural elements of the site.

3.3.2. Locality

The proposed township is situated on part of a portion of land in the south western section of the Tshwane metropolitan area. The proposed development is situated in close proximity to two major highways, one existing and one proposed. The N14 (R28) is a major east west link through Tshwane which connects with the N1 highway to form one of two major movement spines through the area.

The proposed PWV 9 situated to the west is a new proposed highway which is one of the few provincial roads which are planned to be constructed as soon as possible. The construction of this highway will alleviate pressure from the N1-21 highway which is to capacity in peak hour traffic. Access to this area will be obtained via Mimmosa Street.

Mommosa street is another important north south link which will affect this property. Mimmosa Street runs through the development site in an north-east, south-western direction.

The site is therefore strategically located within the region and sufficient north south and east west links could be provided to ensure adequate distribution of traffic through the area, based on the current development patterns for the area.

3.3.3. Access & traffic distribution

The access to the township will be obtained from Mimmosa Street, and several planned roads through to be constructed through Monavoni Extension 49.

Mimosa Street will then provide access to the two parts of the development, one to the north and the other on the south. The density of the township was largely determined by the amount of traffic the proposed roads can accommodate. Some road upgrading will be required as part of this township development to accommodate the additional

traffic which would be generated for this development. The details of the road upgrading are set out in the detailed traffic impact study.

A detailed traffic study is included as part of this application.

3.3.4 Existing and proposed surrounding and adjoining land uses

The property is situated in an area which is currently characterised by the following land uses.

- To the west is a rural residential area with many small farming and business operations spread through the area.
- To the south and east are some residential estate developments.
- Situated to the north is an informal settlement.

The proposed application site is well situated for its proposed use and the proposed development will be compatible with the surrounding adjoining and adjacent land uses as shown on the attached land use plan.

3.3.5 Development Facilitation Act, 1995

The proposed development will ensure a coordinated development of the larger area by creating a residential enclave in harmony with the open space area. The density for the development will ensure that as many units which can be accommodated on this are being developed, without compromising the surrounding environment. Therefore existing resources will be optimally utilised for this development.

The proposed development will therefore comply in broad terms with the principles of the Development Facilitation Act, 1995 in that it will balance the economic and social needs of the developer with that of surrounding property owners and developments to create a development which will benefit the larger area.

The development will optimise the utilisation of existing resources, including resources relating to agriculture, land, minerals, bulk

infrastructure, roads, transportation, and social facilities. This development was planned taking full cognisance of the physical aspects of the property and all aspects relating to existing resources of bulk infrastructure, roads, and transportation were investigated in detail. All existing resources will be fully optimised and the provision of additional service infrastructure will be to the benefit of the larger area.

The natural environment played an integral part in the design of the township and is a very important component of the township establishment process. Cognisance was taken of environmental sustainability and environmental sensitivity of surrounding land uses.

From the above mentioned it is evident that this proposed development takes cognisance of the development principals as set out in the Development Facilitation Act and will aim at compliance with the principles in broad terms.

3.3.6 Streets

For this township it is proposed that one street be zoned private to give access to the Residential component of the development. All the other streets within the township will be public streets that will give access to the various erven in the township, and will also give access to future developments within the surrounding proposed developments such as Monavoni Extension 52..

3.3.7 Street names

Mimosa Street will be used, therefore no street name will be required for Mimosa Street. The other Street names will be obtained from the council for the development.

3.4 **ENGINEERING SERVICES**

Detailed engineering services reports will be submitted as part of this application for township establishment. Engineering services have been designed to the standards of the City of Tshwane for a township where all internal services will be taken over by the Council with the exception of roads.

3.4.1 **Roads**

Access to the township will be obtained via Mimosa Street. Certain upgrading will be required in line with recommendations of the traffic impact study.

The geometric street layout of the proposed internal roads for Monavoni Extension 51, are in accordance with the standard of City of Tshwane Metropolitan Municipality.

3.4.2 **Stormwater**

All roads will be drained through pipe and open channel networks towards the public open space areas and roads, within the boundaries of the township. Within the open space migration corridor area created on erven Erven 19 and 24 in the township will also be utilised for stormwater reticulation.

The township is not affected by the 1:50 and 1:100 year flood line as indicated on the township layout plan.

3.4.3 Water

The Services Scheme Report will in detail describe how water will be supplied to the application site.

3.4.4 Sewerage reticulation

The Services Scheme Report will in detail describe how the sewerage reticulation will be removed and handled to the application site.

3.4.5 Electricity

The Services Scheme Report will in detail describe how electricity will be supplied to the application site.

4. PLANNING AND DESIGN

The design principles which were incorporated in this development were derived from the Client's brief as well as the incorporation of appropriate engineering and town planning standards. Thi/s was done in order to ensure a development which would promote overall safety, from a traffic point of view, cost effectiveness in terms of required engineering services, as well as promoting an integrated, sustainable, and liveable environment. These principles were all adhered to whilst fostering a unique sense of place and creating a unique environment.

The following design principles were adhered to and included in the design:

- Access to and from the township is restricted to access from Mimosa Street. Mimosa Street and Road (25m) will be the main access road to the development. Access from this road is restricted to a few designated access points. The importance of these design criteria is the manner in which it creates the capacity to establish a “walled-in” security estate which ensures the safety and security of all inhabitants.
- The **traffic distribution** within the development is regulated by means of a circular road system where possible to ensure that all vehicular movement is distributed in the most efficient manner possible. Road widths within the township are wide enough to ensure free and save pedestrian movement within the proposed township.

5. DEVELOPMENT CONTROLS

The development controls proposed for the erven in the township are as follows:

5.1 ERVEN 16 – 18, 20 & 21 Monavoni Extension 51

1	Use Zone	II: Residential 2
2	Uses permitted	Table B, Column 3
3	Uses with consent	Table B, Column 4
4	Uses not permitted	Table B, Column 5
5	Definitions	Clause 5
6	Density	20 units per hectare
7	Coverage	Table E

8	Height	2 storeys
9	Floor area ratio	NA
10	Site development plan and landscape development plan	<ol style="list-style-type: none"> 1. A site development plan and a landscape development plan, unless otherwise determined by the City of Tshwane Metropolitan Municipality, compiled by a person suitably qualified to the satisfaction of the Municipality, shall be submitted to the Municipality for approval prior to the submission of building plans. 2. The landscaping, in terms of the landscape development plan, shall be completed by completion of the development or any phase thereof. The continued maintenance of the landscape development shall be to the satisfaction of the Municipality.
11	Building lines	Table A
12	Parking requirements	Table G
13	Paving of traffic areas	All parts of the erf up on which motor vehicles are allowed to move or park shall be provided with a permanent dust-free surface, which surface shall be paved, drained and maintained to the satisfaction of the Municipality.
14	Access to the erf	Entrances to and exits from the erf shall be sited, constructed and maintained to the satisfaction of the Municipality.
15	Loading and off-loading facilities	In accordance with the site development plan
16	Turning facilities	In accordance with the site development plan
17	Physical barriers	NA
18	Health measures	Any requirements for air pollution-, noise abatement-or health measures set by the Municipality shall be complied with to the satisfaction of the Municipality without any costs to the Municipality.
19	Outdoor advertising	Advertisements and/or signboards shall not be erected or displayed on the erf without the written consent of the Municipality first being obtained in terms of municipal by-laws for outdoor advertising.

20	General:
	1. In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Tshwane Town-Planning Scheme, 2008.

5.3 ERVEN 6 – 15 Monavoni Extension 51

1	Use Zone	Business 2
2	Uses permitted	Offices
3	Uses with consent	Table B, Column 4
4	Uses not permitted	Table B, Column 5
5	Definitions	Clause 2
6	Coverage	40%
7	Height	3 storeys
8	Floor area ratio	0,4
9	Density	N/A
10	Site development plan and landscape development plan	<p>1. A site development plan and a landscape development plan, unless otherwise determined by the City of Tshwane Metropolitan Municipality, compiled by a person suitably qualified to the satisfaction of the Municipality, shall be submitted to the Municipality for approval prior to the submission of building plans.</p> <p>2. The landscaping, in terms of the landscape development plan, shall be completed by completion of the development or any phase thereof. The continued maintenance of the landscape development shall be to the satisfaction of the Municipality.</p>
11	Building lines	<p>Table A</p> <p>1. Except for the physical barrier referred to in clause 17, a swimming bath or any essential stormwater drainage structure, no building,</p>

		<p>structure or other thing which is attached to the land, even though it does not form part of that land, shall be erected nor shall anything be constructed or laid under or below the surface of the erf within a distance less 16m of the boundary of the erf abutting on Road K52 nor shall any alteration or addition to any existing structure or building situated within such distance of the said boundary be made except with the consent in writing of the Gauteng Provincial Administration: Roads Branch.</p> <p>2. All other boundaries: In accordance with the Site Development Plan.</p>
12	Parking requirements	Table G
13	Paving of traffic areas	All parts of the erf up on which motor vehicles are allowed to move or park shall be provided with a permanent dust-free surface, which surface shall be paved, drained and maintained to the satisfaction of the Municipality.
14	Access to the erf	Entrances to and exits from the erf shall be sited, constructed and maintained to the satisfaction of the Municipality:
15	Loading and off-loading facilities	In accordance with the site development plan
16	Turning facilities	In accordance with the site development plan
17	Physical barriers	All Boundaries: In accordance with the site development plan.
18	Health measures	Any requirements for air pollution-, noise abatement- or health measures set by the Municipality shall be complied with to the satisfaction of the Municipality without any costs to the Municipality.
19	Outdoor advertising	Not applicable
20	General:	<p>1) A engineer must be appointed before building plans are submitted, who must submit, together with the building plans, a certificate which states that he has studied the relevant geological report and that he has established the necessary measures with regard to building work, drainage of the buildings and</p>

	<p>the site and the installation of the wet services so that the whole development is safe as far as possible from a geological point of view. On completion of the buildings he must certify that all his specifications have been met.</p> <p>2) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Centurion Town-Planning Scheme, 1992.</p>
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5.4 ERVEN 1 – 5, Monavoni Extension 51

1	Use Zone	Industrial 2
2	Uses permitted	Offices
3	Uses with consent	Table B, Column 4
4	Uses not permitted	Table B, Column 5
5	Definitions	Clause 2
6	Coverage	40%
7	Height	3 storeys
8	Floor area ratio	0,4
9	Density	N/A
10	Site development plan and landscape development plan	<p>1. A site development plan and a landscape development plan, unless otherwise determined by the City of Tshwane Metropolitan Municipality, compiled by a person suitably qualified to the satisfaction of the Municipality, shall be submitted to the Municipality for approval prior to the submission of building plans.</p> <p>2. The landscaping, in terms of the landscape development plan, shall be completed by completion of the development or any phase thereof. The continued maintenance of the landscape development shall be to the satisfaction of the Municipality.</p>
11	Building lines	<p>Table A</p> <p>1. Except for the physical barrier referred to in clause 17, a swimming bath or any essential</p>

		<p>stormwater drainage structure, no building, structure or other thing which is attached to the land, even though it does not form part of that land, shall be erected nor shall anything be constructed or laid under or below the surface of the erf within a distance less 16m of the boundary of the erf abutting on Road K52 nor shall any alteration or addition to any existing structure or building situated within such distance of the said boundary be made except with the consent in writing of the Gauteng Provincial Administration: Roads Branch.</p> <p>2. All other boundaries: In accordance with the Site Development Plan.</p>
12	Parking requirements	Table G
13	Paving of traffic areas	All parts of the erf up on which motor vehicles are allowed to move or park shall be provided with a permanent dust-free surface, which surface shall be paved, drained and maintained to the satisfaction of the Municipality.
14	Access to the erf	Entrances to and exits from the erf shall be sited, constructed and maintained to the satisfaction of the Municipality:
15	Loading and off-loading facilities	In accordance with the site development plan
16	Turning facilities	In accordance with the site development plan
17	Physical barriers	All Boundaries: In accordance with the site development plan.
18	Health measures	Any requirements for air pollution-, noise abatement- or health measures set by the Municipality shall be complied with to the satisfaction of the Municipality without any costs to the Municipality.
19	Outdoor advertising	Not applicable
20	General:	3) A engineer must be appointed before building plans are submitted, who must submit, together with the building plans, a certificate which states that he has studied the relevant geological report and that he has established the

	<p>necessary measures with regard to building work, drainage of the buildings and the site and the installation of the wet services so that the whole development is safe as far as possible from a geological point of view. On completion of the buildings he must certify that all his specifications have been met.</p> <p>4) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Centurion Town-Planning Scheme, 1992.</p>
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5.5 ERVEN 19 & 22 – 25 Monavoni Extension 51

1	Use Zone	21: Private Open space
2	Uses permitted	Table B, Column 3
3	Uses with consent	Table B, Column 4
4	Uses not permitted	Table B, Column 5
5	Definitions	Clause 2
6	Coverage	Not applicable
7	Height	Not applicable
8	Floor area ratio	Not applicable
9	Density	Not applicable
10	Site development plan and landscape development plan	Not applicable
11	Building lines	Not applicable
12	Parking requirements	Not applicable
13	Paving of traffic areas	Not applicable
14	Access to the erf	Entrances to and exits from the erf shall be sited, constructed and maintained to the satisfaction of the Municipality:
15	Loading and off-loading facilities	Not applicable
16	Turning facilities	Not applicable

17	Physical barriers	To the satisfaction of the Municipality
18	Health measures	Any requirements for air pollution-, noise abatement- or health measures set by the Municipality shall be complied with to the satisfaction of the Municipality without any costs to the Municipality.
19	Outdoor advertising	Not applicable
20	<p>General:</p> <ol style="list-style-type: none"> 1. The erven shall be registered in the name of the Section 21 Company (home owners association) of which all the owners of the security development must be members. 2. In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Tshwane Town-Planning Scheme, 2008. 	

5.6 ERF 28, Monavoni Extension 51

1	Use Zone	28: Special
2	Uses permitted	Access and access control, and municipal services, walkways and ancillary uses.
3	Uses with consent	None
4	Uses not permitted	All other uses
5	Definitions	Access purposes are defined as access control, private street and uses for access control purposes.
5	Density	Not applicable
6	Coverage	In accordance with the Site Development Plan
7	Height	In accordance with the Site Development Plan
8	FSR	In accordance with the Site Development Plan
9	Site development plan and landscape development plan	1. A site development plan and a landscape development plan, unless otherwise determined by the Municipality, compiled by a person suitably qualified to the satisfaction of the Municipality shall be submitted to the Municipality for approval prior to the

		<p>submission of any building plans.</p> <p>2. The landscaping, in terms of the landscape development plan, shall be completed by completion of the development or any phase thereof. The continued maintenance of the landscape development shall be to the satisfaction of the Municipality.</p>
10	Building lines	In accordance with the site development plan
11	Parking requirements	Taxi on and off loading facilities must be provided at the entrance of the township to the satisfaction of the Municipality.
12	Paving of traffic areas	All parts of the erf upon which motor vehicles are allowed to move or park, shall be provided with a permanent dust-free surface, which surface shall be paved, drained and maintained to the satisfaction of the Municipality.
13	Access to the erf	Entrances to and exits from the erf shall be sited, constructed and maintained to the satisfaction of the Municipality.
14	Health measures	Any noise, air pollution or health control measures set by the Municipality shall be complied with to the satisfaction of the Municipality, at no cost of the Municipality.
15	Outdoor Advertising	Advertisements and/or signboards shall not be erected or displayed on the erf without the written consent of the Municipality first being obtained in terms of municipal by-laws for outdoor advertising.
<p>16 GENERAL</p> <p>1) The erf shall be registered in the name of the Section 21 Company (home owners association) of which all the owners of the security development must be members.</p> <p>2) In addition to the above conditions the erf and buildings thereon are further subject to the general provisions of the Tshwane Town-planning Scheme, 2008.</p>		

6. CONCLUSION

This is an application in terms of Section 96(1) of the Town Planning and Townships Ordinance, 1986 for the establishment of the proposed township Monavoni Extension 51 situated on Part of the Remainder of Portion 5 of the Farm Mooiplaats 355 - JR and Part of Portion 2 of the Farm Swartkop 383 - JR.

Monavoni Extension 51 will comprise of:

- 5 erven zoned "**Industrial 2**";
- 10 erven zoned for "**Business 2**";
- 5 erven zoned for "**Residential 2**" purposes with a density of **25 units/ha**
- 5 erven zoned "**Private Open Space**"
- 1 erf zoned "**special**" for access control and engineering services

It has been shown that there is a need for the proposed land use; that the proposed land use will fit in with the surrounding and adjoining land uses, as well as the strategic planning for the area and is desirable; that the site will have good access; and that all external engineering services can be provided for the development.

This application has considerable merit, has been discussed with officials at the Council where possible and should be favourably considered.



Annexure G(ii)

Geotechnical Report





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A REPORT

ON

A DOLOMITE STABILITY INVESTIGATION
FOR THE PROPOSED TOWNSHIPS OF MONAVONI EXTENSIONS 50 AND 51
ON PORTION OF PORTION 5 OF MOOPLAATS 355-JR,
CENTURION (TSHWANE METRO),
GAUTENG.

BY

RELLY, MILNER AND SHEDDEN
PRETORIA

DATE: September 2009



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1. INTRODUCTION

This report (09117mona50) presents the results of a dolomite stability investigation carried out for the proposed proclamation of Monavoni Extensions 50 and 51 situated on portion of Portion 5 of the farm Mooiplaats 355-JR in Centurion (Tshwane Metro), Gauteng (see locality plan overleaf).

The purpose of this investigation was to collate existing borehole information from various phases of exploratory drilling over the past 5 years and then assess the dolomite stability of the site with respect to the formation of sinkholes and/or dolines (compaction subsidences). Existing information has confirmed the presence of dolomitic sediments underlying this site.

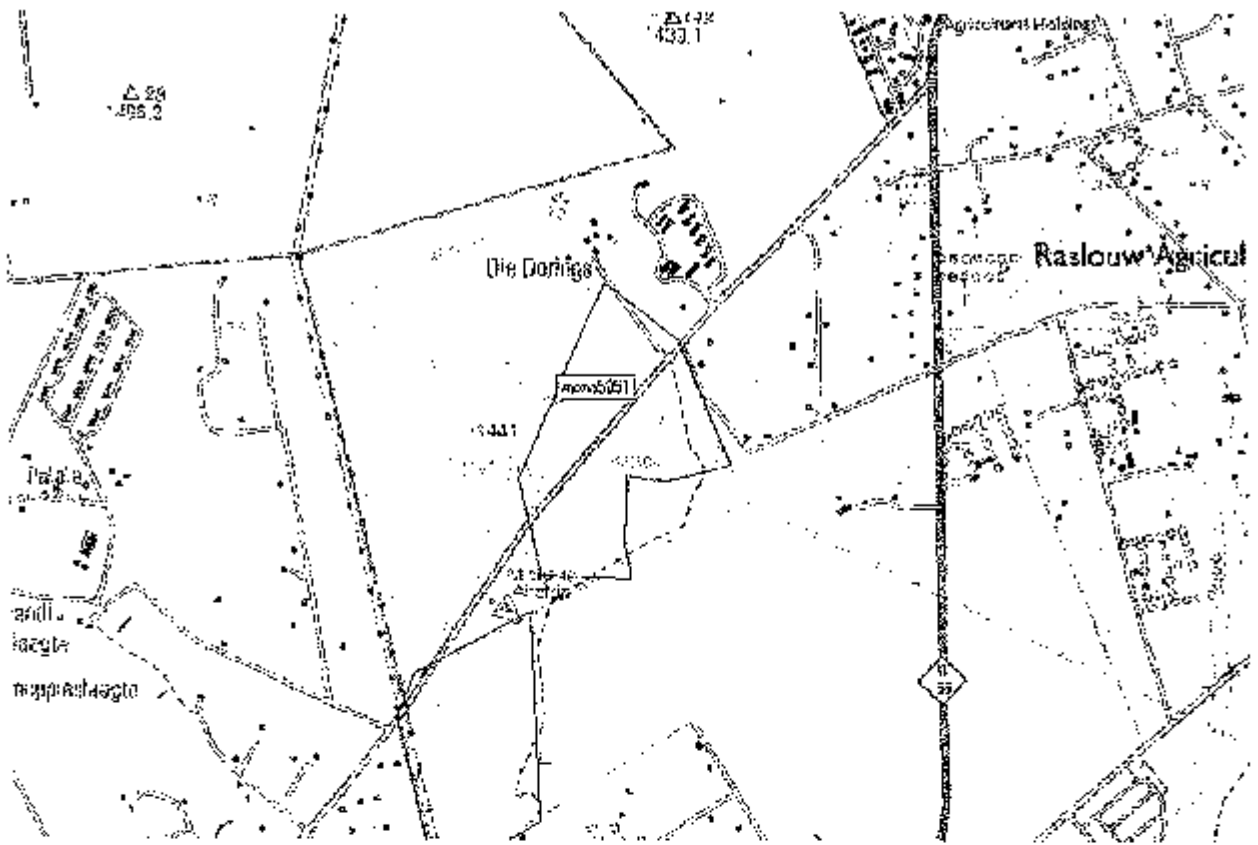
This project was commissioned at the written request of M&T Development (Pty) Ltd, the owner and prospective developer of the site.

An earlier phase of drilling was undertaken by another consultant (VGi) between April and May 2006. This firm was appointed in 2009 and was involved in a single phase of drilling which was undertaken in June 2009.

2. SITE DESCRIPTION

Monavoni Extensions 50 and 51 occupy an irregular shaped area of about 73ha. The Extensions are sandwiched between Monavoni Extension 52 (CGS No: F 3679) in the north and Monavoni Extensions 19, 23 and 45-48 (CGS No: F 3051.1) in the south. The western boundary is formed by Portion 7 of Mooiplaats 355-JR and the eastern boundary is Lochner Road at the western end of the Raslow Agricultural Holdings. A gravel road (Mimosa Avenue) almost bisects the site into north-western and south-eastern halves. Access to a large landfill site to the north of the properties is provided by a gravel road turning north out of Mimosa Avenue some 200m into Extension 50 from the southwest.

The main access to the site is to be via a newly constructed and partly re-aligned Mimosa



LOCALITY PLAN

MONAVONI EXTENSIONS 50 AND 51,

CENTURION, PRETORIA

GAUTENG.

Avenue. This road (Mimosa Avenue) will be an arterial route and intersects the provincial road R55 a short distance to the west of Extension 51. The R55 is presently being upgraded. Existing roads, which are to be upgraded and extended within the various Monavoni Extensions to the north and south, will provide additional access routes.

The entire site is undeveloped farmland previously used for cattle grazing. The developer has excavated a 1,5m deep, 2m wide trench around most of the site in an effort to limit illegal dumping.

Vegetation on the site consists of typical veld grasses with very occasional thorn trees.

The relief of the site is low with an overall cross-fall of about 30m from the south-western corner to the north-eastern corner where Mimosa Avenue exits the properties. The overall gradient of the slope is about 2,5% to the NE. The northern portion of Extension 51 slopes towards the east.

3. GEOLOGY

According to the 1:50 000 Geological Series, Sheet No. 2528CC Lyttelton, the area is underlain by dolomite and chert of the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup. The abundance of waddy soil associated with shallow dolomite in the area suggests the dolomite belongs to the top of the Oaktree Formation of the Malmani Subgroup.

The chemical sediments have been intruded by numerous sills and dykes of syenite in this region. The geological map indicates a small sill of syenite at the south-western end of Extension 50. Evidence of syenite was intersected at varying depths in a numerous boreholes throughout both extensions. The word syenite has been used loosely as a collective term to indicate the presence of igneous intrusives. Some consultants have referred to the intrusives as diorite.

The hard rock geology is mantled by an irregular layer of overburden material comprising both

colluvial and residual soils. Dolomite rock crops out sporadically in the flatter lying areas.

An idealised cross-section through the site has been drawn up in an attempt to understand the regional relationship between the intrusive syenite and sedimentary dolomite. The cross-section is presented in Appendix F.

4. EXISTING INFORMATION

An unpublished report covering the proposed Greater Monavoni Area 2 was prepared by VGI Consult in 2006 and was made available to this firm by the client. The area covers most of Extensions 50 and 51. The VGI report indicates three different inherent risk characterisation (IRC) categories ranging from Class 4(S) through to Class 6(4). The report was not submitted to the Council for Geoscience. Some existing boreholes at the eastern end of Extension 51 were originally part of the stability investigation for Monavoni Extension 23.

5. METHOD OF INVESTIGATION

This investigation focused on the collation and re-assessment of existing drilling information and initiating further drilling in areas where subsurface information was regarded as insufficient. A number of phases of drilling under RMS supervision were undertaken on an "area" basis until it was realized that a more regional approach would best serve the client. The areas have been consolidated into a two townships, namely Monavoni Extensions 50 and 51.

A composite residual gravity map covering the Greater Monavoni Area was used to position some of the RMS boreholes. The composite map represents a residual map made up of a number of separate surveys undertaken between 2004 and 2006. The map is included in Appendix B.

6. PERCUSSION DRILLING

A total of seventy-two, 165mm ϕ , rotary percussion boreholes, totaling 1249m, were drilled in and immediately adjacent to Extensions 50 and 51. This firm supervised the drilling of thirty-one boreholes (total of 576m). The RMS boreholes were drilled by JK Developments cc using a Super Rock rig operating at a pressure of 1 500kPa (15Bar). The contractor was instructed to drill the boreholes to a maximum depth of 60m or at least 6m into solid rock, whichever occurred first, but with a minimum depth of 10m. Boreholes range in depth from 10m to 27m below the surface with an average depth of 17m. The depth of the boreholes, drilled under the supervision of previous consultants, vary in depth from 10m to 47m below the surface.

Samples were recovered (where possible) for every metre advanced and retained in small labelled plastic bags. The penetration time per metre advance was recorded together with any other information regarding air loss, the presence of cavities and/or the presence of ground water during drilling operations. Where possible, water rest levels were recorded when the boreholes were backfilled some days after completion of the drilling operations.

Detailed descriptions of the samples recovered are given in the Borehole Profiles in Appendix C and the positions of the boreholes are shown on the plan in Appendix D.

7. DRILLING RESULTS

A summary of the results from seventy-two percussion boreholes drilled on or adjacent to this site is presented in a table in Appendix C.

7.1 Overburden Material: This refers to the "loose, unconsolidated" soil material that overlies the bedrock and includes all residual soils.

The number of boreholes drilled on this site precludes the ability to comment on each and every geological sequence that is intersected. However, the site can be divided into four different geological profiles depending on whether or not intrusive syenite or

residual wad is present. Wad is the insoluble residue of iron and manganese oxides and other impurities after the dissolution of dolomite rock. This material is highly variable and may be present as silt, clay, a combination of both or as "blocky" fragments that still retain some of the original rock fabric. Waddy soil can be highly compressible and is easily erodible in some forms particularly when present as silt. The four different geological profiles used in assessing this site are discussed in more detail in the following paragraphs.

- Syenite only: Only one borehole (BH GVM 34) intersects syenite from surface to the bottom of the hole. Residual syenite, in the form of silt or sand, grades, with depth, into hard rock syenite. The presence of only syenite in a borehole is an exception on this site. Borehole GVM 72 intersects syenite from surface to the bottom of the hole except for a 5m thick lens of dolomite between 8m and 13m below the surface. Other boreholes that intersect mostly syenite are BH's GVM 46 and 51/09 in the central part of Extension 51.
- Syenite and dolomite: Most of the boreholes drilled in the two extensions intersect a combination of dolomite and syenite within the ground profile. In most profiles syenite overlies dolomite as a single layer. The syenite varies in thickness from a metre or two (BH's 50/11 and 51/17) up to about 13m (BH's 50/02 and 51/02). In some boreholes syenite is intersected as two layers separated by a layer of dolomite. A characteristic of most of the boreholes that intersect both syenite and dolomite is the abundance of wad either above or below the intrusive syenite yet in one or two boreholes there are very abrupt contacts between the host rock (dolomite) and the intrusive.

The presence of residual dolomite and/or dolomite bedrock both above and below syenite confirms the sill-like nature of the intrusions. The sills are fairly extensive but it is difficult to assess whether or not the sills represent a single phase of intrusion along planes of weakness in the host rock (possibly along shale partings within the dolomite bedrock) or whether a number of different

hard rock at least 6m thick. The definition is necessary to avoid any confusion between large dolomite boulders (floaters), often metres in diameter, and solid bedrock.

According to the above definition, bedrock (syenite or dolomite) is encountered in all of the boreholes drilled on this site. The depth to dolomite bedrock ranges from surface (outcrop) to 41m (BH 26/29) below the surface while the depth to syenite bedrock ranges from 3m (BH GVM 46) to 19m (BH GVM 34) below the surface. Hard rock syenite tends to characterise those boreholes drilled in the central portion of Extension 51. Dolomite forms the bedrock over the remainder of the site with one or two exceptions in Extension 50 (BH's 1 and GVM 72).

The process of weathering is significantly different for dolomite and syenite. Syenite exhibits a typical weathering profile ranging from residual silt/clay (completely weathered) through sand to very soft rock then soft rock and eventually hard rock at depth. The percussive effect of the drilling often results in very soft rock syenite being recovered as silty sand/sandy silt. The dissolution (weathering) of dolomite tends to result in either soil (residual dolomite) including wad (insoluble dolomite residue) or hard rock dolomite. There is seldom, if ever, a zone of gradational weathering from very soft rock dolomite through to hard rock dolomite.

A feature of a number of the boreholes that have intersected dolomite is the fairly rapid penetration times recorded for a considerable depth in what appears to hard rock dolomite. There is no visible reason for penetration times to suddenly increase to greater than 3 minutes per metre advance. Examples can be seen in BH's 50/03, 50/14, 51/01 and 51/15 in which hard rock dolomite appears to have been intersected from a shallow depth although, in terms of penetration times, hard rock is only indicated at depth. In most instances it has been assumed that fracturing is the reason for the more rapid penetration times although the dolomite appears to be slightly "shaly" or graphitic in some boreholes. It is often difficult to assess whether or not the zones in which slightly weathered dolomite fragments in a soil matrix

associated with rapid penetration times are fracture zones within bedrock or boulders. The writer has assumed boulders in a soil matrix to be present where penetration times are most rapid and fractured bedrock where slightly slower times are recorded.

8. HYDROLOGY

A ground water strike occurred at a depth of 18m below the surface in only one of the new boreholes (BH 50/5) drilled in Extensions 50 and 51. A water rest level was measured at 8m below the surface some 24 hours later. Ground water strikes during drilling operations were recorded in another 5 "old" boreholes (BH's 26/29, 26/30, 26/38 and GVM 77) at depths of between 15m and 30m below the surface. Water rest levels were recorded in a number of boreholes at least 24 hours after completion of the drilling operations. There appears to be four different ground water compartments based on the rest levels recorded when the boreholes were backfilled. The "southern" compartment has a rest level of about 1445m amsl, the southern central portion has a rest level at about 1435m amsl, the east-central and central area has a rest level at about 1424m amsl and the northern area has a rest level recorded at 1418m amsl. No indication of borehole yields were offered by the drilling contractor and it is difficult to assess whether or not the rest levels represent perched water tables. High yields would suggest a permanent water table rather than a perched one.

According to a Department of Water Affairs and Forestry (DWAF) report (No: 3502) by P Hobbs the site is located in the Erasmia Compartment and lies north of the Irene Dyke and south west of the Pinedene Dyke. No separate compartments are suggested within the site on the DWAF map. Ground water level contours indicate a flow direction towards the north from an elevation of about 1435m a.m.s.l in the south to about 1410 m a.m.s.l in the north (see map in Appendix E). The slope of the water level to the north is similar to the topography except at the northern end where the topography slopes towards the south east. The ground water contours from the DWAF report indicate a water level at a depth of between 20m in the south and 10m in the north. Drilling results tend to confirm the DWAF report in terms of rest levels.

The site has been assessed in terms of both a dewatering and non-dewatering scenario. Although the potential for dewatering is difficult to establish, the site is unlikely to be adversely influenced by dewatering since bedrock (either syenite or dolomite) lies well above a permanent water level.

No surface drainage features occur on the site.

9. INTERPRETATION OF THE GEOLOGY

The residual gravity map is characterised by a fairly prominent gravity low trough trending through the eastern side in an almost NS direction. Less well-defined gravity low troughs trend across the site at the northern end and again towards the south-western corner. The majority of the site is characterised by "intermediate" plateaus. The gravity lows do not represent deeply weathered syenite as initially interpreted but rather a variety of geological conditions from wad, syenite and dolomite (BH 51/17) to deeply weathered syenite (BH GVM 34) or a combination of both (BH 50/02). Areas of shallow dolomite as intersected along the western boundary do not give rise to a gravity high as would have been expected. The reason for this is possibly related to the presence of weathered syenite within the dolomite bedrock below the termination depth. The well-defined gravity high that characterises the area south of Extension 50 is underlain by hard rock syenite and not dolomite.

In general terms, the gravity lows tend to be areas where irregular subsurface conditions occur compared to the gravity highs or intermediate areas where fairly regular conditions are intersected be it shallow, fractured dolomite or weathered syenite.

The geological picture to emerge from the gravity survey and drilling is one of shallow dolomite intruded by concordant and slightly transgressive syenite sills of varying thicknesses. It is most probable that more than one age of intrusive is present but this is of academic importance only since all intrusive sills have a beneficial influence on the stability of a dolomitic site.

10. STABILITY

The modern method of assessing dolomite stability (References 3, 4 and 5) requires that the inherent risk of hazard (sinkhole and/or doline) development and potential hazard (sinkhole) size be determined for each borehole. This is achieved by assessing the geological conditions from the drilling results at each borehole according to a set of standard criteria. These results allow a certain inherent risk characterisation and potential hazard (sinkhole) size to be attached to each borehole. Boreholes exhibiting similar conditions are grouped together and an area is then designated as having a particular risk classification in which certain types of development are recommended. The criteria that need to be assessed are:

- i) Nature of the blanketing layer.
- ii) Maximum potential space in which a sinkhole may develop.
- iii) Presence or absence of voids in overburden and bedrock.
- iv) Presence or absence of a mobilising agency.

The probability of instability occurring is related to both the level of inherent risk and the type of development (development risk) that takes place. A high inherent risk area, developed as a cluster, has a greater probability of inducing a sinkhole than a commercial development on the same property because of the higher density of wet services and greater chance of an undetected leak. In an attempt to ensure development is compatible with a certain risk characterisation, appropriate types of development are recommended according to the risk classification of the area.

The comments below are based on the results of the gravity survey and the drilling results from 72 percussion boreholes. An assessment of the drilling results favours the site being subdivided into four inherent risk zones as dictated by the variation in geological conditions.

The various parameters used in the inherent risk characterisation and classification are discussed in the following paragraphs.

Risk Characterisation: A low risk for the development of any size sinkhole and a low risk of doline formation are the inherent risk characterisations (IRC) obtained after evaluating the conditions intersected in the percussion boreholes drilled in this zone. This inherent risk characterisation is applicable to both a dewatering and a non-dewatering scenario since the water table occurs within the dolomite/syenite bedrock. It may be prudent to assess the geological conditions in the vicinity of BH's 26/29 and 26/38 as more typical of Class 6 even though the area was indicated as Class 3a\6 in our report on Moravoni Extensions 19, 23 and 45 to 48 (CGS No: F 3051.1).

A summary of the materials encountered in the boreholes is given in Appendix C.

Inherent Risk Class: A particular risk class may be determined from the risk characterisation of an area. Certain types of development are considered more appropriate in this risk class. These types of development are believed to be compatible with the level of risk provided the appropriate precautionary measures are implemented.

A summary of the risk characterisations for the boreholes drilled in this zone is given below in Table 1.

TABLE 1
Summary of Risk Characterisation

BH No.	RISK of SINKHOLE FORMATION				RISK OF DOLINES	RISK CLASS	DEVELOPMENT TYPE (Draft SANS 1936)
	Small <2m	Medium >2m-<5m	Large >5m-<15m	Very Large >15m			
26/30	L	L	L	L	L	3a	RN3-4;RH2-3; RL2-3 and C1-10
GVM 72	L	L-M	L	L	L	3a	RN3-4;RH2-3; RL2-3 and C1-10
GVM 73	L	L	L	L	L	2	RN1-4;RH1-3; RL1-3 and C1-10
GVM 34	L	L	L	L	L	1	RN1-4;RH2-3; RL1-

BH No.	RISK of SINKHOLE FORMATION				RISK OF DOLINES	RISK CLASS	DEVELOPMENT TYPE (Draft SANS 1936)
	Small <2m	Medium >2m-<5m	Large >5m-<15m	Very Large >15m			
							3 and C1-10
HRP 1	L	L	L	L	M	3a	RN3-4;RH2-3; RL2-3 and C1-10

Notes: Development potential based on draft SANS 1936 document.

An inherent risk classification of **Class 3a** has been assigned to Zone A. The type of residential development that may be considered in Class 3a is restricted categories RN 3-4; RL 2-3 and RH 2-3 provided spatial framework policies are taken into account. Commercial development is unrestricted. It should be noted that most types of development except full title residential (RN3-4) require some form of additional exploratory work (footprint investigations).

ZONE B: CLASS 3b(3a,5)

Locality: Zone B occupies the majority of the site and is located mostly in Extension 50 and in the southern portion of Extension 51.

Blanketing Layer: This zone is underlain by subsurface conditions that are similar to those intersected below Zone A except the conditions tend to be more variable. This variation is related to the thickness of intrusive material, the thickness of wad-rich residual dolomite and the depth to dolomite bedrock below the intrusive. The residual syenite layer varies in thickness from 3m (BH 50/11) to about 22m (BH 50/01) although there is often a lens (or inclusion) within the thicker occurrences of syenite. Another feature of this zone is the presence of wad-rich residual dolomite. The waddy layers are below the syenite and are generally between 1m and 3m thick. Areas where wad occurs above the syenite or where layers are in excess of about 3m (from surface) have been excluded from this zone.

The residual syenite is regarded as relatively impermeable and likely to retard the ingress of surface run-off. The residual dolomite, at depth, is assumed to be permeable.

Receptacles: Voids are not present within the residual syenite or syenite bedrock. Voids are assumed to be present within the dolomite bedrock at depth.

Mobilising Agency: Any accumulation of water either on the surface or below the surface from a leaking service is a potential mobilising agency. Infiltration of any mobilising agency should be retarded by residual syenite. Ingress of surface run-off will occur above any protective layer of syenite thereby limiting any instability to the layer above the syenite. The zone is assessed as having a low to medium mobilisation potential for sinkhole and doline development.

Maximum Potential Sinkhole Development Space (MPSDS): This refers to the thickness of overburden in which a sinkhole may develop. The thickness of the MPSDS layer in this zone is limited by the first layer of bedrock which occurs at a depth of between 8m and 15m below the surface. A sinkhole developing in a 15m thick layer of overburden would be classified as medium (>2m-<5m \emptyset) but a protective layer of residual syenite should prevent any sinkhole migrating to surface from the dolomite bedrock below the syenite. The layer of erodible wad that underlies the protective capping of residual syenite is not interpreted as a high risk in terms of instability.

Risk Characterisation: A medium to high risk of small sinkholes forming and a medium risk of medium size sinkholes forming and a medium to high risk of dolines developing are the risk characterisations obtained after evaluating the conditions encountered in the boreholes drilled in Zone B. These conditions are applicable to a non-dewatering scenario and represent the highest risk. Many boreholes intersect a sufficient thickness of residual syenite to favour a low risk characterisation. Dewatering would increase the risk of doline development in places but it has not been established that the permanent water table is at such a shallow depth as suggested by the water rest

levels recorded in the boreholes.

A summary of the materials encountered in the borehole is given in Appendix C.

Risk Class: A particular risk class may be determined from the risk characterisation of an area. Certain the types of development are believed to be more compatible than others for the assessed level of risk provided the appropriate foundation design and precautionary measures are implemented.

A summary of the risk characterisation for each borehole is given below in Table 2.

TABLE 2
Summary of Risk Characterisation

BR No.	RISK of SINKHOLE FORMATION				RISK OF DOLINES	RISK CLASS	DEVELOPMENT TYPE (Draft SANS 1936)
	Small < 2m	Medium >2m-<5m	Large >5m-<15m	Very Large >15m			
50/01	L	L	L	L	L	2(1)	RN1-4;RH1-3; RI 1-3 and C1-10
50/04	L	L	L	L	L	2(3a)	RN3-4;RH2-3; RL2-3 and C1-10
50/05	L	L-M	L	L	L-M	5	RN3-4;RH2-3 and C1-10
50/07	L	L	L	L	L	3a	RN3-4;RH2-3; RL2-3 and C1-10
50/09	L	L	L	L	M	3a	RN3-4;RH2-3; RL2-3 and C1-10
50/08	L	L	L	L	H	3b(3a)	RN3-4;RH2-3; RL2-3 and C1-10
50/11	L-M	L	L	L	M	5(3a)	RN3-4;RH2-3 and C1-10
50/13	M	M	L	L	M	5	RN3-4;RH2-3 and C1-10
50/14	L	L-M	L	L	L-M	3a(3b)	RN3-4;RH2-3; RL2-3 and C1-10
51/02	L	L	L	L	L	3a(2)	RN3-4;RH2-3; RL2-3 and C1-10
51/03	L	L	L	L	M-L	3a	RN3-4;RH2-3; RL2-3 and C1-10
51/09	L-M	L	L	L	H	2	RN1-4;RH2-3; RL2-3 and C1-10
51/12	L	L	L	L	L	7(3a)	RN3-4;RH2-3; RL2-3 and C1-10

BH No.	RISK of SINKHOLE FORMATION				RISK OF DOLINES	RISK CLASS	DEVELOPMENT TYPE (Draft SANS 1936)
	Small < 2m	Medium >2m-<5m	Large >5m-<15m	Very Large >15m			
51/14	L	L	L	L	L	2(3a)	RN3-4;RH2-3; RL2-3 and C1-10
23/47	L-M	M	L	L	M	3b(3a)	RN3-4;RH2-3; RL2-3 and C1-10
23/48	M	L	L	L	M	3b(3a)	RN3-4;RH2-3; RL2-3 and C1-10
23/49	M	M	L	L	M-H	5	RN3-4;RH2-3 and C1-10
23/50	L	L-M	L	L	L	3a	RN3-4;RH2-3; RL2-3 and C1-10
23/52	L	L-M	L	L	L	3a	RN3-4;RH2-3; RL2-3 and C1-10
26/78	M-H	M	L	L	H	5	RN3-4;RH2-3 and C1-10
GVM 35	L	L	L	L	L	3a	RN3-4;RH2-3 and C1-10
GVM 40	M-H	L-M	L	L	M-H	5	RN3-4;RH2-3 and C1-10
GVM 42	M-H	M	L	L	M	5	RN3-4;RH2-3 and C1-10
GVM 45	L	L	L	L	L	2	RN1-4;RH2-3; RL2-3 and C1-10
GVM 46	L	L	L	L	H	3a	RN3-4;RH2-3; RL2-3 and C1-10
GVM 57	H	M	L	L	M-H	5	RN3-4;RH2-3 and C1-10
GVM 58	L	L	L	L	L	2	RN3-4;RH2-3; RL2-3 and C1-10
GVM 70	M-H	M	L	L	M	5	RN3-4;RH2-3 and C1-10
GVM 71	L	L	L	L	L	3a	RN3-4;RH2-3; RL2-3 and C1-10
GVM 74	L	L	L	L	H	3b(3a)	RN3-4;RH2-3; RL2-3 and C1-10
GVM 76	L-M	L-M	L	L	M	3a	RN3-4;RH2-3; RL2-3 and C1-10

Notes: Development potential based on draft SANS 1936 document.

An inherent risk classification of **Class 3b(3a,5)** has been assigned to this zone. The intermittent occurrence and variable thickness of the blanketing layer of syenite precludes the inclusion of this area into Zone A. Commercial and restricted residential development may be considered provided the appropriate requirements of the draft SANS 1936 document are implemented including footprint investigations.

ZONE C: CLASS 5

Locality: The majority of Extension 51 has been included in Zone C.

Blanketing Layer: This zone is characterised by the presence of shallow dolomite bedrock almost from surface with or without the presence of a layer of wad-rich dolomite overlying the bedrock. No boreholes intersected residual syenite within the depths drilled. The boreholes are relatively shallow because of the presence of competent dolomite bedrock from a shallow depth. Dolomite is confirmed for a depth 6m in all of the boreholes drilled in this zone. Boreholes range in depth from 10m (minimum depth) to about 20m below the surface. In some instances the dolomite appears to be "solid" rock in the recovered samples but penetration times rarely exceed 2 minutes per metre advance. The "softer" layers of hard rock dolomite are ascribed to closely fractured zones within the solid bedrock.

The overburden, where present, is regarded as permeable and will not retard the ingress of surface run-off.

Receptacles: Disseminated voids are assumed to be present within the residual dolomite and bedrock.

Mobilising Agency: Any accumulation of water either on the surface or below the surface from a leaking service is a potential mobilising agency. Infiltration of any mobilising agency should take place with ease. The zone is assessed as having a medium mobilisation potential for the development of sinkholes and a medium to high mobilisation potential for the development of dolines where residual dolomite occurs at shallow depths.

Maximum Potential Sinkhole Development Space (MPSDS): This refers to the thickness of overburden in which a sinkhole may develop. The thickness of the MPSDS

layer in this zone is limited by the first layer of bedrock which occurs from surface to a depth of about 5m below the surface. A sinkhole developing in a 5m thick layer of overburden would be classified as small (<2m ϕ).

Risk Characterisation: A high risk of small size sinkholes, a medium risk of medium size sinkholes forming and a high risk of dolines developing are the risk characterisations obtained after evaluating the conditions encountered in the boreholes drilled in Zone C. These conditions appertain to a both a dewatering and non-dewatering scenario since the ground water lies within the solid dolomite bedrock.

A summary of the materials encountered in the borehole is given in Appendix C.

Risk Class: A particular risk class may be determined from the risk characterisation of an area. Certain the types of development are believed to be more compatible than others for the assessed level of risk provided the appropriate foundation design and precautionary measures are implemented.

A summary of the risk characterisation for each borehole is given below in Table 3.

TABLE 3
Summary of Risk Characterisation

BH No.	RISK of SINKHOLE FORMATION				RISK OF DOLINES	RISK CLASS	DEVELOPMENT TYPE (Draft SANS 1936)
	Small < 2m	Medium >2m-<5m	Large >5m-<15m	Very Large >15m			
50/03	H	L	L	L	L	5	RN1-4;RH1-3; RL1-3 and C1-10
51/05	H	L	L	L	H	5	RN3-4;RH2-3; RL2-3 and C1-10
51/06	M-H	M	L	L	H	5(3b)	RN3-4;RH2-3 and C1-10
51/08	H	L	L	L	L-M	5	RN3-4;RH2-3 and C1-10
51/15	H	M	L	L	L-M	5	RN3-4;RH2-3 and C1-10

Blanketing Layer: This zone is characterised by compressible wad (residual dolomite), almost from surface, overlying hard rock dolomite. Although the presence of wad is widespread in this region, an attempt has been made to include areas where the layer thickness is 5m or greater. In some boreholes residual syenite separates the overlying waddy layer from the underlying dolomite bedrock while in others the residual syenite occurs below a layer dolomite rock (BH's 51/07 and 51/16). Bedrock, either as dolomite or syenite, is intersected at depths of between 5m and about 20m below the surface. One borehole (BH 26/29) intersects fractured dolomite bedrock from 19m to 41m before "solid" bedrock is intersected.

The residual dolomite, in the form of waddy silt, is regarded as permeable and highly erodible. Residual syenite, where present, is regarded as relatively impermeable and is likely to retard the ingress surface run-off.

It would appear that boreholes located within gravity low features are more likely to intersect poorer conditions, including pockets of thick wad, than those on gravity highs but not all the boreholes drilled in gravity lows intersect poor subsurface conditions.

Receptacles: Limited disseminated voids are assumed to be present within the wad-rich residual dolomite and dolomite bedrock. Voids are not present within the residual syenite or syenite bedrock.

Mobilising Agency: Any accumulation of water either on the surface or below the surface from a leaking service is a potential mobilising agency. Infiltration of any mobilising agency should take place with ease within the residual dolomite. The zone is assessed as having a medium mobilisation potential for the dolomite bedrock because of the presence of intrusive syenite. A high mobilisation potential is assessed for the wad-rich, residual dolomite layers overlying the residual syenite or dolomite bedrock.

Maximum Potential Sinkhole Development Space (MPSDS): This refers to the thickness of overburden in which a sinkhole may develop. The thickness of the MPSDS layer in this zone is limited by the first layer of bedrock which occurs at a depth of between 5m and 20m below the surface. A sinkhole developing in a 20m thick layer of overburden would be classified as large (>5m<15m ϕ) unless a reasonable thickness of residual syenite occurs within the soil profile. The extensive presence of syenite is likely to limit sinkhole formation and any instability is likely to be in the form of doline development.

Risk Characterisation: A medium risk of small, medium and isolated large size sinkholes forming and a high risk for dolines developing are the risk characterisations obtained after evaluating the conditions encountered in the boreholes drilled in Zone D. In many instances intrusive syenite is present within the ground profile below the wad-rich layer which provides protection against sinkhole development but not doline development. The risk assessment appertains to a both a dewatering and non-dewatering scenario.

A summary of the materials encountered in the borehole is given in Appendix C.

Risk Class: A particular risk class may be determined from the risk characterisation of an area. Certain the types of development are believed to be more compatible than others for the assessed level of risk provided the appropriate foundation design and precautionary measures are implemented.

A summary of the risk characterisation for each borehole is given in Table 4 on the next page.

An inherent risk classification of Class 6 has been assigned to Zone D. The presence of syenite within the ground profile limits the risk of instability in places but the high risk of doline development precludes a lower risk characterisation. The writer is of the opinion that the thick layers of wad at shallow depths pose a significant geotechnical

problem rather than a stability problem. The use of structures incorporating a basement may allow development to take place within this zone provided detailed footprint investigations are undertaken for each structure. Areas underlain by intrusive syenite below the wad-rich dolomite possibly pose the most favourable conditions for development.

TABLE 4
Summary of Risk Characterisation

BH No.	RISK of SINKHOLE FORMATION				RISK OF DOLINES	RISK CLASS	DEVELOPMENT TYPE (Draft SANS 1936)
	Small < 2m	Medium >2m-<5m	Large >5m-<15m	Very Large >15m			
50/02	L	L	L	L	H	6(2)	No residential and C2,4,5,7&9
50/06	M	M	L	L	H	6(3b)	No residential and C2,4,5,7&9
50/10	L-M	M	L	L	H	6	No residential and C2,4,5,7&9
51/01	M	M	L	L	M-H	6(3b)	No residential and C2,4,5,7&9
51/04	L	L-M	L	L	M//H	6(3b)// 6	No residential and C2,4,5,7&9
51/07	L-M	L	L	L	H	6(2)	No residential and C2,4,5,7&9
51/10	L	L	L	L	H	6(3a)	No residential and C2,4,5,7&9
51/11	M-H	L	L	L	H	6(5)	No residential and C2,4,5,7&9
51/13	M-H	L	L	L	H	6(5)	No residential and C2,4,5,7&9
51/16	L	L-M	L	L	H	6(2)	No residential and C2,4,5,7&9
51/17	L	L-M	L	L	H	6(2)	No residential and C2,4,5,7&9
23/51	M-H	L-M	L	L	L-M	5(2)	RN3-4;RH2-3 and C1-10
25/29	M-H	L	L	L	H	6(3a)	No residential and C2,4,5,7&9
26/38	L	L-M	L	L	H	6(3a)	No residential and C2,4,5,7&9
GVM 38	L	L-M	L	L	L-M	5(3a)	RN3-4;RH2-3 and C1-10
GVM 39	L	L-M	L	L	H	6(3a)	No residential and C2,4,5,7&9
GVM 44	H	M-H	M-H	L	H	6	No residential and C2,4,5,7&9
GVM 47	L-M	L-M	L	L	H	6	No residential and C2,4,5,7&9

GVM 48	L-M	M	L	L	H	6	No residential and C2,4,5,7&9
GVM 49	L	L-M	L	L	H	6	No residential and C2,4,5,7&9
GVM 75	M-H	M	L	L	H	6	No residential and C2,4,5,7&9
GVM 77	L	L-M	L	L	H	6	No residential and C2,4,5,7&9

11. CONCLUSIONS AND RECOMMENDATIONS

The geological conditions underlying this site favour the delineation of the site into five zones with risk classifications ranging from Class 3a to Class 6 (References 3, 4 and 5). The development potential of the site is discussed in the following paragraphs.

ZONE A: CLASS 3a

Risk: A low risk for any size sinkhole forming and a low risk of doline development are the inherent risk characterisations in both a dewatering and a non-dewatering scenario.

Development Potential: Restrictions are placed on the type of development that may be considered on Class 3a land. Full title residential development (RN3-4) on stands of 1000m² or greater is permissible according to the draft SANS 1936 document (Appendix H). Multi-storey low-rise (≤ 3 storeys [RL2-3]) and high-rise (>3 but <10 storeys [RH2-3]) residential development may be considered provided appropriate footprint investigations are undertaken. Most forms of commercial, retail and/or light industrial development are permissible (C1 to C10 in SANS Table 1) but all require some form of footprint investigation. The developer has indicated his intention to focus on a mix of commercial and residential development.

Any type of development is conditional upon the implementation of a set of standard precautionary measures detailed in Appendix G.

NHBRC Dolomitic Area Designation: This zone is assessed as D 3.

Location: Zone A is located at the southern end of both Extension 50 and Extension 51. The extent of the zone is indicated on the plan in Appendix D.

ZONE B: CLASS 3b(3a,5)

Risk: A medium to high risk of small size sinkholes developing, a medium risk of medium size sinkholes developing and a medium to high risk of dolines developing are the inherent risk characterisations in both a dewatering and a non-dewatering scenario.

Development Potential: Residential development may be considered in Zone B provided the recommendations of Table 1 in the draft SANS 1936 document are taken into account (Appendix I). The development potential is similar to Zone A although areas of shallow dolomite (Class 5) have more severe restrictions than Class 3. Commercial, retail and light industrial development may be also considered. Detailed footprint investigations are required for any development. The implementation of stringent precautionary measures is essential.

NHBRC Dolomitic Area Designation: This zone is assessed as D 3.

Location: A large portion of the centre of Extension 50 and two small areas in Extension 51. The extent of Zone B is shown on the map in Appendix D.

ZONE C: CLASS 5

Risk: A medium to high risk of small sinkholes and a medium risk of medium size sinkholes forming and a medium to high risk of doline development are the inherent risk characterisations in both a dewatering and a non-dewatering scenario.

stands and high-rise (>3<10 storey) residential development may be considered in this zone provided appropriate footprint investigations are undertaken for the high-rise structures. Commercial, retail and light industrial may be considered. Careful attention should be given to the design and installation of water-bearing services because of the high risk of small sinkhole development.

NHBRC Dolomitic Area Designation: This zone is assessed as **D 3**.

Location: Two small areas at the northern end of Extension 50 and a large portion of the western side of Extension 51. The extent of Zone C is shown on the map in Appendix D.

ZONE D: CLASS 6

Risk: A medium to high risk of small and medium sinkholes forming and a high risk of doline development are the inherent risk characterisations in both a dewatering and a non-dewatering scenario. The presence of extensive pockets of residual, wad-rich dolomite almost from surface poses the greatest problem particularly in terms of suitable founding conditions. The extensive use of footprint drilling should circumvent structures being erected over very poor conditions.

Development Potential: Residential development is not recommended. Zone D is best suited for commercial, retail and industrial development provided additional exploratory work is undertaken to ensure suitable founding conditions. Careful attention should be applied to the design and installation of water-bearing services.

NHBRC Dolomitic Area Designation: This zone is assessed as **D 4** unless proved **D3** by additional exploratory work.

Location: Scattered islands within Extension 50 and the eastern side of Extension 51. The extent of Zone D is shown on the map in Appendix D.

The importance of careful water management cannot be over-emphasised as poor water control in one area may lead to some form of instability in another area. It is essential that prospective developers/owners/tenants in any development are made aware of the importance of the recommended precautionary measures. An indiscretion on one stand may induce some form of instability on an adjacent stand. In an attempt to create and maintain an awareness of the risk of instability in a karst environment, it is essential that a comprehensive Dolomite Risk Management Policy be drawn up for implementation in the proposed township. An example of a DRMP is included in Appendix H. The DRMP should be audited by a committee drawn from the various owners to ensure an integrated approach. The entire community (owners and/or tenants) within the township must be informed of the philosophy behind the risk management plan and what it aims to accomplish. The Local Authorities, under whose control the township is, must be aware of the responsibility they face ensuring the implementation of a risk management plan for the Monavoni Extensions 50 and 51. Responsibility for rapid response to instability must be impressed upon senior officials. Protracted delays in the repair and maintenance of bulk services may lead to catastrophic sinkhole development and loss of life. An effective DRMP can greatly reduce the probability of instability occurring within the established township.

12. GENERAL

It must be borne in mind that in an investigation of this nature, certain generalisations have to be made to avoid the necessity of an extremely costly drilling program. Consequently, it may be found that conditions at variance with those discussed in this report do occur locally. The variant conditions should be inspected by competent personnel to ensure that these conditions do not pose a problem for a specific development.

The National Home Builders Registration Council (NHBRC) requires that a construction report be prepared during the installation of the infrastructure if any residential component is included within the township. The report requires that **all service trenches be inspected** to ensure no variant conditions adversely impact on the development. Failure to map trenches

may lead to difficulty obtaining NHBC enrolment.

Commercial and industrial developments are exempt from NHBC requirements. Large structures require separate footprint investigations.

A handwritten signature in black ink, appearing to read 'E Shedden', with a large, sweeping flourish extending to the left.

E Shedden (Pr Sci Nat)

RELLY MILNER AND SHEDDEN

AUGUST 2009

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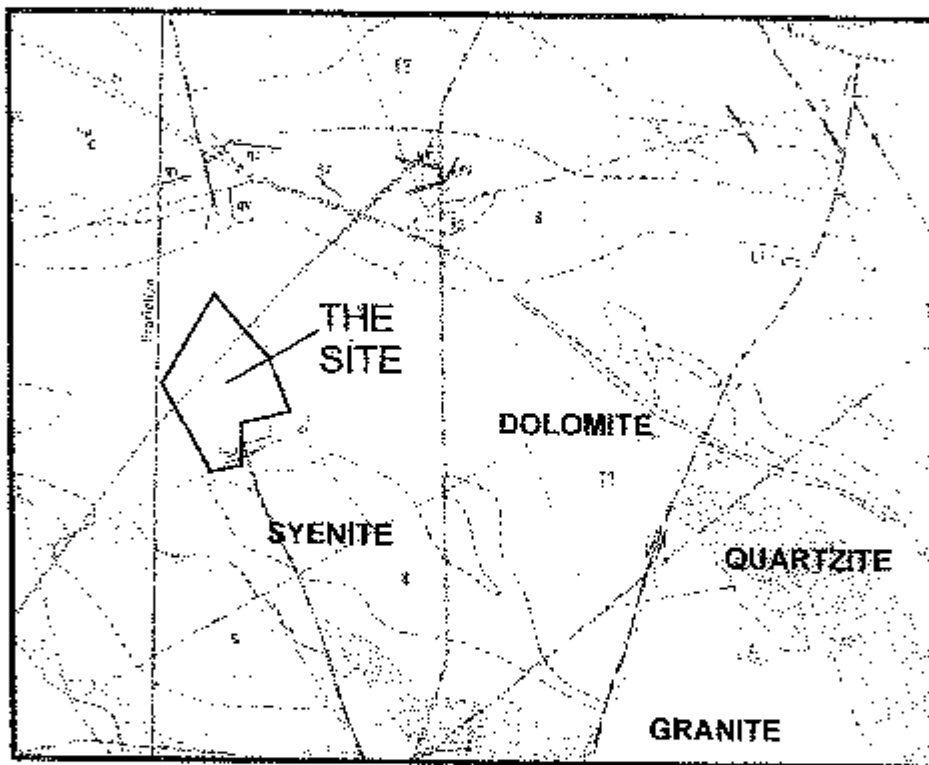
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APPENDIX A

REGIONAL GEOLOGY

REGIONAL GEOLOGY
MONOVANI EXTENSIONS 50 & 51.



Excerpt from 1:50 000 Geological Series,
Sheet No: 2528CC Lyttelton.
[Not to scale]

APPENDIX B

COMPOSITE RESIDUAL GRAVITY MAP

COMPOSITE GRAVITY MAPS

APPENDIX C

PERCUSSION BOREHOLE PROFILES

Monavoni Extensions 50 and 51
SUMMARY OF DRILLING RESULTS

BH No	Colluvium	RESIDUUM				BEDROCK		Bedrock type/IRC	Collar elevation (m amsl)/ Water strike	Water rest level after 24hr (m) Rest level (mamsl)	Remarks (NS; RI)
		Wad	Clay/Silt	Chert	Silt/Sand (Syenite)	Weathered/boulders	Sound				
Monavoni Ext 50											
50/01	0-2S	14-15con			2-14		15-17D 17-22##	Syenite/2(1)	1442/-	-5.5(1436)	-
50/02	0-1sj	1-4			4-17	17-19D	19-24sy 24-25##	Dolomite/6(2)	1442/-	-7(1435)	-
50/03	0-1S			2-3vq		1-2D 3-9D	9-15##	Dolomite/5	1440/-	Dry	-
50/04	0-1S		8-10w		1-8 10-12 14-15	12-14sy 15-18D	18-24##	Dolomite/2(3a)	1444/-	-9(1435)	-
50/05	0-1S	6-7			1-6 12-14	7-12D 14-18sy	18-25D 25-27##	Slate/5	1445/-18m	-8(1437)	Only ho with wa strike
50/06	0-1sj	1-4	4-6w 5-9wsh			9-10D	10-17##	Dolomite/6(3b)	1445/-	Dry	-
50/07	0-2S	9-11			2-9 11-15	15-16D	16-22##	Dolomite/3a	1448/-	-14(1434)	-
50/08	0-1sj	1-3				3-9sy	9-15##	Dolomite/3a	1450/-	-4(1446)	-
50/09	0-1Ss				1-4 5-11	11-16D	16-22##	Dolomite/3a	1450/-	-4(1445)	-

BH No	Colluvium	RESIDUUM				BEDROCK		Bedrock type/IRC	Collar elevation (m amsl)/ Water strike	Water rest level after 24hr (m) Rest level (mamsf)	Remarks (NS, RP)
		Wad	Clay/Silt	Chert	Silt/Sand (Syenite)	Weathered/boulders	Sound				
50/10	0-1si	1-5	5-8sh			7-10D&sh	10-16##	1446/-	Dry	-	
50/11	0-2Ssi	5-6			2-5	6-10D	10-16##	1453/-	-7(1446)	-	
50/12	0-2Ssi	3-4	2-3w			4-9D	9-15##	1449/-	-5(1444)	-	
50/13	0-1S					1-11D	11-17##	1455/-	-5(1450)	-	
50/14	0-2S	7-8 11-13ch				8-11D 13-19D	19-25##	1442/-	-7(1435)	RPT 11-	
EXTENSION 51											
51/01	0-2S	5-9	2-5si			9-15D	15-21##	1433/-	Dry	RPT 6-8	
51/02	0-1S				1-8	8-13sy	13-19##	1432/-	-14(1418)	-	
51/03	0-1si		1-3		3-9		9-14sy 14-15##	1430/-	Dry	-	
51/04	0-2S	9-14			2-7	7-9BD	14-18D 18-20##	1425/-	-7(1418)	RPT 7-8 11-13π	
51/05	0-2si	2-4					4-11##	1430/-	Dry	-	
51/06	0-1si	3-5	1-3w			8-9D	5-8D 10-16##	1434/-	Dry	-	
51/07	0-1si	1-5				5-7D	7-9D 9-14##	1430/-	Dry	-	
51/08	0-1si					1-2D	2-10##	1435/-	Dry	-	
51/09		1-3D			3-4	0-1BD	4-12##	1434/-	Dry	-	
51/10		0-6			6-17	17-18D	18-25##	1431/-	-10(1421)	-	
51/11		2-6DB	0-2w			10-13D	6-10D 13-19##	1433/-	-6(1427)	-	

BH No	Colluvium	RESIDUUM				BEDROCK			Bedrock type/IRC	Collar elevation (m amsl)/ Water strike	Water rest level after 24hr (m) Rest level (mamsl)	Remarks (NS; RP)
		Wad	Clay/silt	Chert	Silt/Sand (Syenite)	Weathered/boulders	Sound					
51/12	0-1S				1-8	8-9sy	9-13sy 13-15##	Dolomite/2(3a)	1436/-	-12(1424)	-	
51/13	0-1S	2-4 7-10BD			1-2 10-15	4-7D	15-21##	Dolomite/6(5)	1436/-	-7(1429)	-	
51/14			0-2w		2-9	9-11BD 11-14D	14-20##	Dolomite/3a	1435/-	Dry	-	
51/15	0-1S					1-6D 11-13D	6-11D 13-20##	Dolomite/5	1432/-	-5(1427)	-	
51/16	0-1si	3-12	1-3w			12-13D	13-16D 16-20##	Syenite/6(2)	1434/-	-8,4(1426)	RPT 6-11	
51/17	0-3si	5-12			3-5	12-13D 13-14sy	14-20##	Syenite/6(2)	1428/-	Dry	-	
26/28*		0-2				2-4BD 4-12D	12-18##	Dolomite/5	1451/-	Dry	-	
26/29*	0-1si	2-5 7-8			1-2 9-19	5-7D 8-9D 19-41D	41-47##	Dolomite/6(3a)	1452/-29m	-28(1424)	Slate 32-3	
26/30	0-1S	10-11			1-10 11-16	16-26D	26-32##	Dolomite/3a	1453/-30m	-29(1424)	-	
26/38*	0-1S	2-7BD			1-2 7-13	2-7BD 13-22D	22-28##	Dolomite/6(3a)	1453/-21m	Dry	-	
VGi Boreholes												
23/47		3-5BD			0-3		5-11##	Dolomite/5(3a)	1430/-	-	-	

BH No	Colluvium	RESIDUUM				BEDROCK			Bedrock type/IRC	Collar elevation (m amsl)/ Water strike	Water rest level after 24hr (m) Rest level (mamsl)	Remark (NS; RP)
		Wad	Clay/Silt	Chart	Silt/Sand (Syenite)	Weathered/boulders	Sound					
23/48		0-5RD			5-12			12-18##	Dolomite/3b(3a)	1429/-	-	-
23/49	0-25	3-4			2-3			4-10##	Dolomite/5	1428/-	-	-
23/50	0-15				1-9			9-154##	Dolomite/3a	1429/-	-	-
23/51		3-5			5-7			0-3D 7-13##	Syenite/5(2)	1427/-	-	-
23/52	0-15	6-7			1-6			7-13##	Dolomite/3a(5)	1431/-	-	-
23/53	0-15					1-2D		2-10##	Dolomite/5	1451/-	-	-
GVM 34	0-25				2-18	18-19		19-25##	Syenite/1	1434/-	-	-
GVM 35	0-15				1-7	7-8sy		8-14##	Dolomite/3a	1431/-	-	-
GVM 37						0-28Dw 8-10sl 10-12D		2-8D 12-18##	Dolomite/5	1437/-	-	-
GVM 38	0-15	4-5			1-4			5-11#	Dolomite/5(3a)	1439/-	-	-
GVM 39	0-15	1-6			6-11			11-17##	Dolomite/6(3a)	1439/-	-	-
GVM 40	0-15							1-10##	Dolomite/5	1439/-	-	-
GVM 41		0-1						1-10##	Dolomite/5	1437/-	-	-
GVM 42								0-10##	Dolomite/5	1439/-	-	-
GVM 44		0-1 3-19BD?						1-3D 19-25##	Dolomite/6	1437/-	-	RPT 9-10; 13-15-17-
GVM 45	0-15				1-8 13-14	12-13Dw		8-12D 14-20##	Syenite/3a	1434/-	-	-
GVM 46		0-1			1-3			3-10##	Syenite/1	1432/-	-	-

BH No	Colluvium	RESIDUUM				BEDROCK			Bedrock type/IRC	Collar elevation (m amsl)/ Water strike	Water rest level after 24hr (m) (Rest level (mamsl))	Remark (NS; RP)
		Wad	Clay/Silt	Chert	Silt/Sand (Syenite)	Weathered/ boulders	Sound					
GVM 47		0-6			9-10	7-9D		6-7D 10-15##	Dolomite/6	1429/-	-	RPT 0-6
GVM 48		0-6			6-7			7-13##	Dolomite/6	1426/-	-	RPT 0-5
GVM 49	0-4ch	4-15						15-21##	Dolomite?/6	1423/-	-	RPT 1-15
GVM 51	0-2S	2-5						5-11##	Dolomite/5(6)	1433/-	-	-
GVM 53	0-1ch							1-10##	Dolomite/5	1428/-	-	-
GVM 54	0-2S					2-5D		5-11##	Dolomite/5	1433/-	-	-
GVM 55						0-1D		1-10##	Dolomite/5	1436/-	-	-
GVM 57	0-3ch					3-4D 13-14sy 14-15D		4-6D 15-21##	Dolomite/5(3a)	1435/-	-	-
GVM 58	0-2si		2-4ch					13-20##	Dolomite/3a	1436/-	-	-
GVM 61	0-2S			2-3				3-10##	Dolomite/5	1435/-	-	-
GVM 70								0-10##	Dolomite/5	1440/-	-	-
GVM 71	0-1S	11-13 14-15				13-14D 15-16D	1-11	16-19sy 19-22##	Dolomite/3a	1443/-20m	-	-
GVM 72	0-1S						1-8	8-13D 13-14##	Syenite/2(3a)	1449/-	-	-
GVM 73							0-14	14-17sy 17-20##	Dolomite/3a	1453/-	-	-
GVM 74	0-1S	1-3					3-10	10-16##	Dolomite/3b(3a)	1452/-	-	-
GVM 75		0-5						5-11##	Dolomite/6	1455/-	-	Outside
GVM 76		5-7				7-13sy	0-5	15-21##	Dolomite/3a	1446/-	-	-