

PROPOSED HARDING TOWNSHIP ESTABLISHMENT

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DC21/0013/2021



VOLUME 1 OF 2

SEPTEMBER 2021

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THE REPORT WAS COMPILED BY:

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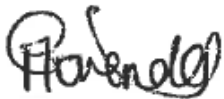
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Independence:

I, Prisantha Govender declare that this report has been prepared independently of any influence or prejudice as may be specified by the KwaZulu- Natal Department of Economic Development, Tourism and Environmental Affairs. I hereby confirm that all comments received from I&APs will be included into the Comments and Response Report. I also undertake that the Plan of Study for the Environmental Impact Report will be implemented, and the findings will be presented in the Environmental Impact Report.



Ms Prisantha Govender
K2M Environmental (Pty) Ltd
Environmental Assessment Practitioner

September 2021

Date

THE REPORT WAS REVIEWED BY:

Environmental Assessment Practitioner:

Mr Gert Watson

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K2M Environmental is an established environmental consultancy since 2008. The consultancy has been involved with more than 100 Environmental Impact Assessments and other environmental related projects in KwaZulu-Natal, Mpumalanga, Gauteng and the North-West Province over the last 11 years.

Independence:

I, Gert Watson declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Economic Development, Tourism and Environmental Affairs. I hereby confirm that all comments received from I&APs will be included into the Comments and Response Report. I also undertake that the Plan of Study for the Environmental Impact Report will be implemented and the findings will be presented in the Environmental Impact Report



Mr. Gert Watson
K2M Environmental (Pty) Ltd
Director

September 2021

Date

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1 BACKGROUND INFORMATION

1.1 INTRODUCTION AND BACKGROUND

The Umuziwabantu Local Municipality has, through its IDP process, and extensive consultation with respective stakeholders within the Umuziwabantu Municipality, identified the need to provide affordable housing in its area of jurisdiction. This process was initiated as a means to address the municipality's backlog in terms of the provision of affordable human settlements.

The Harding Township Establishment forms part of the Umuziwabantu Municipality's strategic objective of regeneration of the town of Harding and bring in new housing opportunities in the area for affordable and middle-income housing. The project area was previously subdivided into 82 residential erven with an average site size of 1000m². However, this layout does not support the municipality's densification framework. The proposed development thus entails the consolidation and redevelopment of the existing erven in line with the municipality's densification framework. More specifically, the proposed development entails the establishment of a Township together with supporting infrastructure, and includes construction of the following:

- **Approximately 343 residential erven (These erven will comprise of FLISP Housing and Serviced Sites).**

FLISP stands for Finance Linked Individual Subsidy Programme. The FLISP Housing Subsidy programme was developed by the Department of Human Settlement to enable first time home ownership opportunities to South African citizens. The subsidy is targeted at households whose monthly income range from a minimum of R13 500 to a maximum of R 22 000 and are South African citizens.

Serviced Sites are vacant plot of land that contain the necessary infrastructure for services such as water, sewage and electricity. These sites are ready for construction of a top structure upon purchase by the beneficiary.

- **4 storey residential blocks with approximately 210 social housing units**

Social housing is essentially rental housing which is intended to assist individuals who earn between R1 500 – R7 500.

- **Pipelines for the transportation of water supply and waterborne sewage**

The Ultimate Water Design Flow for the proposed development is 22.26l/s and will require a 150mm diameter water supply pipeline.

The sewer reticulation from the development will tie into the existing sewer system by means of 160mm diameter pipelines. The proposed sewer reticulation will be directed through underground pipelines to the south east portion of the site where it will be discharged, into the existing pumpstation. Upgrades will be required to the existing sewer pumpstation.

- **Internal roads and stormwater infrastructure**

The internal road network will have a road width between 3 – 5.5 m and a road reserve width between 6 – 10 m.

The proposed stormwater will be directed through underground pipes (proposed internal stormwater pipelines will have a diameter of 450mm and 600mm) to the south of the site where it will be discharged, into the existing stormwater located on the east of the site. The stormwater is collected from the roadways and piped into the valley, where an attenuation feature will be constructed.

- It should be noted that erven will be set aside for commercial, conservation, active and public open space as well as a hospital facility.

The total extent of the project area is approximately 34.65 hectares and is situated within Ward 3 of the Umuziwabantu Municipality. The site is currently vacant, with an unchanneled valley bottom wetland and seepages areas centrally located within the site. The proposed development will entail infill of portions of the seepage area and 22m wetland buffer zone. A total wetland area of 4.2 ha and a buffer area measuring 2.7 ha will be lost as a result of the development. In order to accommodate for the encroachment and loss of the seepage areas and buffer zone, a wetland compensation strategy focussing on on-site rehabilitation by means of redirecting stormwater has been compiled.

An illustration of the project area in relation to the municipal wards is depicted in Map 1.1 below and is attached **Appendix D1**.

Map 1.1: Location of Project Area



1.2 ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS

The 2014 Environmental Impact Assessment Regulations (as amended) promulgated in terms of Section 24(5) of the National Environmental Management Act, (Act No. 107 of 1998) as amended, requires Environmental Authorisation from the competent authority which is the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) for activities listed in Government Notices R327, R325 and R324. Table 1.1 below identifies the activity triggered.

Table 1.1: Triggered Listed Activity

Activity	Activity Description (in terms of relevant notice)	Description of listed activity as per project description
Activity 9 of GN.R 327	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water and stormwater – (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 railway line reserve; or (b) where such development will occur within an urban area.	The proposed development will entail the construction of stormwater pipelines with a diameter of 450mm and 600mm. This activity was initially applied for however since the site is located within an urban area, (b) of the exclusion this activity applies.
Activity 10 of GN.R 327	The development and related operation of infrastructure exceeding 1000 metres in length for 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 the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	This activity was initially applied for however the internal sewer reticulation from the development will tie into the existing sewer system by means of 160mm diameter pipeline. Furthermore, the site is located within an urban area (b) of the exclusion this activity applies.
Activity 12 of GN.R. 327	The development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more; Where such development occurs –	The proposed development will entail the construction of infrastructure and structures with a physical footprint of 100 square metres or more within a

	<p>(a) within a watercourse</p> <p>(c) if no development setback exists, within 32 metres of a watercourse; -</p> <p>excluding -</p> <p>(aa) the development of infrastructure or structures within existing ports or harbours</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;</p> <p>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or</p> <p>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.</p>	<p>watercourse and within 32m of a watercourse.</p> <p>This activity was initially applied for however since the site is located within an urban area and activity 14 of Listing Notice 3 applies, (cc) and (dd) of the exclusion this activity is applicable.</p>
<p>Activity 19 of GN.R 327</p>	<p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging of, excavation, removal of soil, sand, shells, shell grit, pebbles or rocks of more than 10 cubic metres from a watercourse:</p> <p>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> <p>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</p> <p>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.</p>	<p>The proposed development will entail the infill of seepage areas within the site.</p>

<p>Activity 28 of GN.R. 327</p>	<p>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after the 01 April 1998 and where such development:</p> <p>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</p> <p>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</p> <p>Excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>A portion of the proposed site was used for agricultural purposes during the early 2000s.</p>
<p>Activity 15 of GN.R 325</p>	<p>The clearance of an area of 20 hectares or more of indigenous vegetation, excluding 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>	<p>The proposed development may entail the removal of approximately 23,38 hectares of indigenous vegetation.</p>
<p>Activity 4 of GN.R 324</p>	<p>The development of a road wider than 4 metres with a reserves less than 13,5 metres.</p> <p><u>(d) In Kwazulu-Natal:</u></p> <p>x. Areas designated for conservation in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purposes;</p> <p>xiii. Inside urban areas:</p> <p>(aa) Areas zoned for use as public open space</p>	<p>The proposed development may entail the construction of roads wider than 4m with a reserve less than 13,5m within an area earmarked as passive open space.</p>
<p>Activity 12 of GN.R 324</p>	<p>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p><u>(d) In KwaZulu-Natal:</u></p> <p>vii. On land, where, at the times of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning;</p> <p>xi. Areas designated for conservation in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose;</p>	<p>The proposed development may entail the clearance of approximately 23,38 hectares of indigenous vegetation in an area classified as passive open space.</p>

Activity 14 of GN.R 324	The development of – (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. <u>(d) In KwaZulu-Natal:</u> xi. Inside 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;	The proposed development entails the construction of housing units within 32m of a watercourse within an area earmarked as passive open space.
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1.3 TERMS OF REFERENCE

Regulation 15 (1) of the Environmental Impact Assessment Regulations of 2014 (as amended) states that it is the duty of the EAP to identify whether a Basic Assessment or Scoping and Environmental Impact Report is required. For this particular project a Scoping and Environmental Impact Report is required.

K2M Environmental (Pty) Ltd has been appointed as the independent Environmental Practitioner (EAP) by the applicant and will therefore be responsible for the Scoping and Environmental Impact Report concerned with the proposed development as specified in Sections 21 to 23 of Government Notice R326.

The competent authority with regard to providing the required Environmental Authorisation is the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA). K2M Environmental has submitted the completed Application for Environmental Authorisation to DEDTEA (**Appendix C1**) and has been allocated with Reference Number DC21/0013/2021 (**Appendix C2**). Upon

acceptance of the Final Scoping Report on the 19 July 2021 (**Appendix C3**), DEDTEA required clarity on the aspects highlighted in Table 1.2 below.

Table 1.2: Aspects to be address in EIR

DEDTEAs Comments	EAPs Response
Ensure that the needs and desirability study is conducted	Refer to Appendix G2 wherein the Market Study that was undertaken for the proposed development is include.
Ensure that the EIAR is sent to the Department of Human Settlements (Housing, Water and Sanitation Directorate)	Noted. A copy of the draft EIR will be submitted to the Department of Human Settlements (Housing, Water and Sanitation Directorate).
Conservation Management Plan must be included in the EIAR	Noted. Conservation management measures have been included in the Wetland Compensation Strategy Report (see Appendix G3).
Please ensure that a wetland offset strategy is compiled focusing on site rehabilitation by means of redirecting the stormwater	Noted. Refer to Appendix G3 wherein the Wetland Compensation Strategy Report is included.
It is the EAPs responsibility to make sure that all the issues raised are addressed appropriately, if not this may prejudice the application.	Noted. All comments received by IAPs and been included and addressed in the Comments and Response Report (Appendix A).

1.4 APPROACH AND METHODOLOGY

The overall approach to this project included the following activities:

- ✚ An initial analysis of the proposed development, the area where it will take place, and the identification of potential impacts during the scoping phase. The impacts were identified from both the initial technical analysis, as well as the public participation process described in the approved Scoping Report.
- ✚ The EIA report and draft EMPr was compiled in line with the plan of study for the EIA as contained in the approved Scoping Report. Of specific relevance is the focus on key issues identified in the Scoping Report and the conducting of more detailed specialist studies to further investigate these

issues and recommend appropriate mitigation and management measures as well as discussing alternatives.

- ✚ The draft Environmental Management Programme outlined in Section 7 provides an indication of appropriate mitigation and management measures that will have to be implemented to ensure that the identified potentially significant impacts are appropriately mitigated to a reasonable level.

The following aspects were identified in the Scoping Report as specific issues requiring detailed investigation:

- Assessment of Layout alternatives.
- Assessment of Infrastructure alternatives.

Aspects to be addressed by specialists and included in the Environmental Impact Report are listed below:

- Preliminary Engineering Report
- Municipal Services
- Stormwater Management Plan
- Preliminary Geotechnical Investigation
- Heritage Impact Assessment
- Traffic Impact Assessment
- Biodiversity Assessment
- Wetland Impact Assessment
- Market (Needs and Desirability) Study
- Wetland Offset Strategy & Conservation Management Plan

In addition to the above, the following needs to be considered in the Draft EIR:

- The layout and proposal preferred by the applicant;
- The option of not proceeding with the activity

Sufficient baseline information for both the Scoping Phase and Environmental Impact Assessment Phase of the study was available from a variety of desktop data sources, reports and relevant data bases, and site visits to the project area by the project team. The specific issues of concern identified during the Scoping Report have been further analysed in detail by various specialist studies.

1.5 REPORT STRUCTURE

- ✚ **Section 2** consists of a summary description of the proposed development and alternatives considered.
- ✚ **Section 3** consists of summary of the Engineering Services.
- ✚ **Section 4** analyses the project area in terms of its biophysical and socio-economic characteristics and includes relevant summary information from the specialist studies conducted.
- ✚ **Section 5** consists of an analysis of the potential impacts of the proposed development on the environment. It describes the impact assessment criteria, the evaluation of potential impacts, a comparative assessment of the alternatives considered and an environmental impact statement.
- ✚ **Section 6** describes the public participation process conducted during the scoping phase and the EIA phase of the project.
- ✚ **Section 7** outlines a draft Environmental Management Programme (EMPr) for the mitigation and management of the identified potential impacts.
- ✚ Supporting documents, reports, correspondence and other relevant information are contained in various Appendixes attached to this report.

Appendix 3 of Government Notice R326 requires specific content to be addressed in the Environmental Impact Report. Table 1.3 has been included to assist the reader to find the relevant section in the report.

Table 1.3: NEMA Requirements for Environmental Impact Assessment Report

Section		Requirements For EIR	Sections in Report
3(a)	Details of-		
(i)	The EAP who prepared the report; and		Just after cover page and Section 1.9
(ii)	The expertise of the EAP, including a curriculum vitae;		Appendix I and Appendix J
3(b)	The location of the activity, including:		
(i)	The 21-digit Surveyor General code of each cadastral land parcel;		Section 2.1.2

(ii)	Where available, the physical address and farm name;	-
(iii)	Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 2.1.1
3(c)	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is-	Section 2.1.1
(i)	A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	Not Applicable
(ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Not Applicable
3(d)	A description of the scope of the proposed activity, including-	
(i)	All listed and specified activities triggered and being applied for; and	Section 1.2
(ii)	A description of the associated structures and infrastructure related to the development;	Section 2.3.2, 2.3.3 and Appendix D2.
3(e)	A description of the policy and legislative context within which the development is proposed and an explanation of how the proposed activity complies with and responds to the legislation and policy context;	Section 1.7
3(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 4.9
3(g)	A motivation for the preferred site, activity, and technology alternative;	Section 2.3
3(h)	A full description of the process followed to reach the proposed preferred alternative within the site, including:	
(i)	Details of the development footprint alternatives considered;	Section 2.4
(ii)	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 6
(iii)	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Appendix A
(iv)	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 4.7
(v)	The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 2.4
(vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 5
(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 4.7
(viii)	The possible mitigation measures that could be applied and level of residual risk;	Section 4.8
(ix)	If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Section 2.4

(x)	A concluding statement indicating the preferred alternative development location and the approved site;	Section 2.3
3(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including-	Section 4.7 and 5.
(i)	A description of all environmental issues and risks that were identified during the environmental impact assessment process; and	
(ii)	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	
3(j)	An assessment of each identified potentially significant impact and risk, including-	Section 5
(i)	Cumulative impacts;	
(ii)	The nature, significance and consequences of the impact and risk;	
(iii)	The extent and duration of the impact and risk;	
(iv)	The probability of the impact and risk occurring;	
(v)	The degree to which the impact and risk can be reversed;	
(vi)	the degree to which the impact and risk may cause irreplaceable loss of resources; and	
(vii)	the degree to which the impact and risk can be mitigated;	Section 5 and 7
3(k)	Where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 4.5
3(l)	An environmental impact statement which contains-	
(i)	A summary of the key findings of the environmental impact assessment;	Section 8
(ii)	A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	Section 2.3.2 and Appendix D4.
(iii)	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 8
3(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for the inclusion as conditions of authorization;	Section 7 and 8
3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 2.3
3(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 8
3(p)	A description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.6
3(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 8

3(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	-
3(s)	An undertaking under oath or affirmation by the EAP in relation to:	Just after cover page and Section 6
(i)	The correctness of the information provided in the reports;	
(ii)	The inclusion of comments and inputs from stakeholders and I&APs;	
(iii)	The inclusion of inputs and recommendations from the specialist reports where relevant; and	
(iv)	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	
3(t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	-
3(u)	An indication of any deviation from the approved scoping report, including the plan of study, including-	-
(i)	any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	
(ii)	A motivation for the deviation	
3(v)	Any specific information that may be required by the competent authority; and	See Table 1.2
3(u)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	-

1.6 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to the EIA:

- ✚ It is assumed that the information provided by the various specialists and project engineers are accurate.
- ✚ Several assumptions and limitations are noted in the various specialist reports. The EIA project team is of the view that an adequate level of information is, however, provided in order to facilitate the required assessment of potential impacts of the proposed project alternatives and decision-making in this regard.
- ✚ The study involves the assessment of impacts on the current conservation value of affected land and not on either the historic or potential future conservation value.
- ✚ Predictions and graphical representation of socio-economic characteristics of the surrounding community are based on the 2011 census information.

1.7 APPLICABLE LEGISLATION, POLICIES AND GUIDELINES

In addition to the Environmental Impact Assessment Regulations of 2014, the following legislation and guidelines identified in Table 1.4 have been considered in the preparation of this Environmental Impact Report.

Table 1.4: Applicable Legislation and Policies

Legislation	Relevance to the development
National Water Act (No. 36 of 1998)	A Water Use License Application will be required for the proposed development, as the proposed housing development will be within 500m of a wetland as well as within the project area.
National Environmental Management Act (No. 107 of 1998)	This development requires a full Environmental Impact Assessment to be conducted as per the 2014 EIA Regulations, in terms of Chapter 5, Section 24(5), 24M and Section 44 of the National Environmental Management Act.
KwaZulu-Natal Heritage Act (No. 4 of 2008)	Documentation has been submitted to AMAFA, as the proposed development is larger than 5 000 m ² . AMAFA in their interim comment indicated that a Heritage Impact Assessment is required for the proposed development, which has been undertaken by Umlando: Archaeological Surveys and Heritage Management in August 2021 (See Appendix G5 for Heritage Impact Assessment Report).
National Environmental Management: Biodiversity Act (No. 10 of 2004)	A Biodiversity Assessment was undertaken to identify sensitive areas within the project area and to ensure that proper mitigation measures are in place to protect any endangered flora or faunal species that may be identified (See Appendix G1).
Umuziwabantu Local Municipality Spatial Development Framework (2017-2022)	The Umuziwabantu Local Municipality's Draft SDF has identified areas within the township of Harding for densification in order to allow for a greater variety housing options. As such, the proposed project is aligned with the municipal SDF.
Umuziwabantu Integrated Development Plan (2019/2020)	The Harding Housing Development has been identified in the IDP to assist in reducing the housing backlog within the municipality.

Ugu District Environmental Management Framework, 2018	Harding has been identified within the Urban EMZ which is aligned to the proposed development.
Occupational Health and Safety Act (No. 85 of 1993)	The contractor needs to manage his/her staff and crew in strict accordance with the Occupational Health and Safety Act in order to prevent injuries to staff.
Provincial Growth and Development Plan	The proposed development is aligned with the PGDP as it addresses the first goal of the PGDP which is that of job creation, which will take place during the construction phase and operational phase.
Constitution of the Republic of South Africa (Act No. 108 of 1006)	The proposed development will assist in providing basic housing and services to the beneficiaries that will occupy the houses.
Agricultural Land Act (Act 70 of 1970)	The land for the proposed development belongs to the Umuziwabantu Local Municipality; therefore, Act 70 of 1970 does not apply to this project.
Polluters Pay Principal	The Polluters Pay Principal has been included into the preparation the EMPr.
National Environmental Management: Waste Act (No. 59 of 2008)	The overall purpose of the Waste Act is to manage waste in a manner that can protect the health of people as well as the environment (plants, animals, land, air, water etc). The management of waste during the construction phase has been taken into consideration and included into the Environmental Management Programme.
National Environmental Management: Air Quality Act and National Dust Control Regulations	Mitigation measures have been included into Section 7.3.10 of the EIR which provides recommendations on how to manage pollution and dust during the construction phase.
Noise Regulations R2544	Section 7.3.10 of the EIR provides recommendations on how to manage noise during the construction phase.
National Building Regulations and Building Standards Amendment Act no 45 of 1995	The purpose of this Act is to provide for the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities.

1.8 THE APPLICANT

The details of the applicant are as follows:

Applicant name : Umuziwabantu Local Municipality
Contact Person : Mr W.T. Gumede (Municipal Manager)
Tel : 039 433 3500
Email : mm@umuziwabantu.gov.za
Address : Murchison Street, Harding, 4680

1.9 THE INDEPENDENT ENVIRONMENTAL ASSESSMENT PRACTITIONER

K2M Environmental (Pty) Ltd was appointed as the Independent EAP responsible for the following tasks:

- ✚ Processes, information, plans and reports produced in complying with the Regulations
- ✚ Ensuring that the relevant authority has access to all information
- ✚ Public participation process as per the 2014 EIA Regulations (as) amended for the proposed development

The contact details of the independent Environmental Assessment Practitioner are as follows:

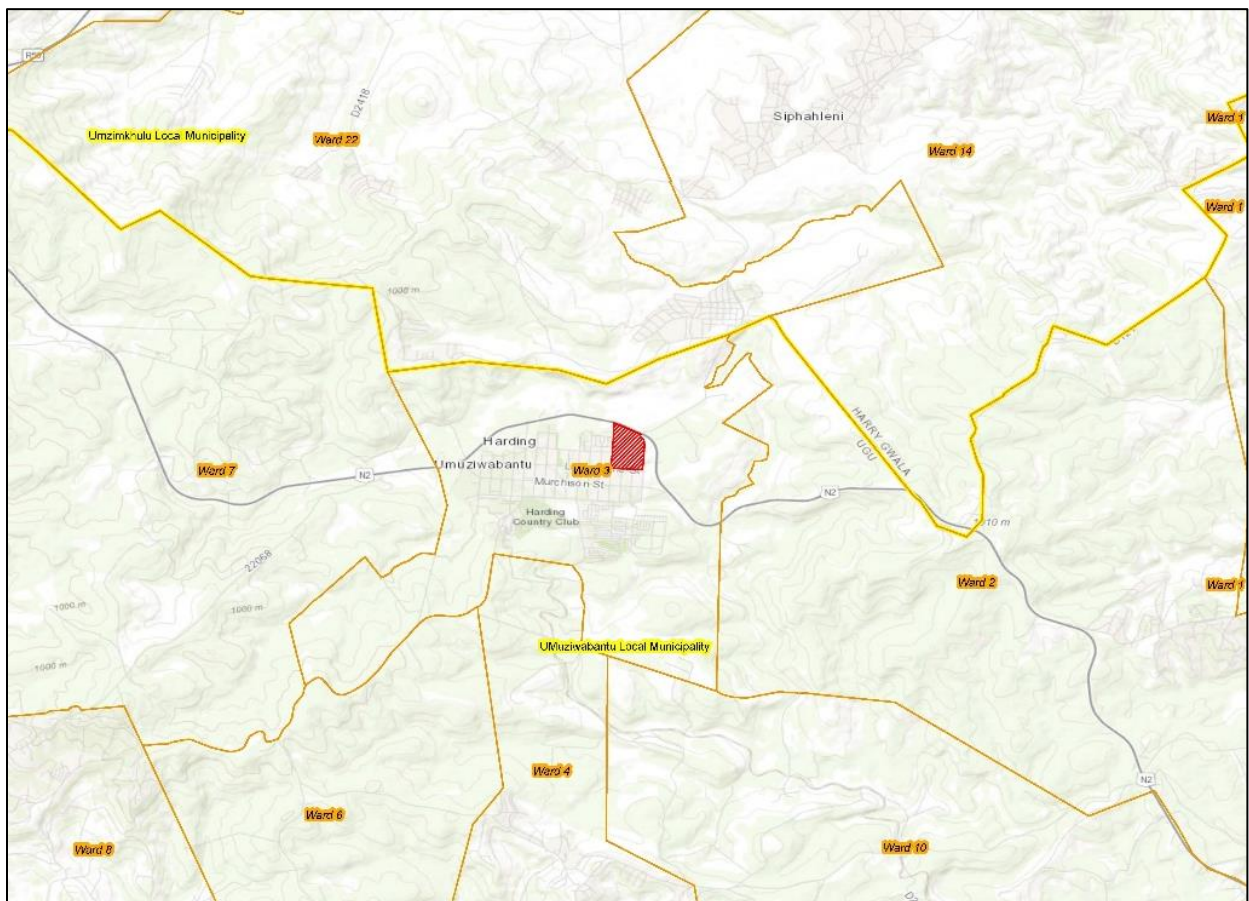
Name : K2M Environmental (Pty) Ltd
Contact Person : Mr Gert Watson
Telephone : 031 – 764 6743
Fax : 031 – 764 2354
E-mail : gert@k2m.co.za
Postal Address : PostNet Suite #509, Private Bag X4, Kloof, 3640

2 DESCRIPTION OF PROPOSED ACTIVITY

2.1 PROJECT LOCATION

The proposed Harding Township Establishment is centrally located within Ward 3 of the Umuziwabantu Local Municipality and falls just outside of the Harding town to the north east. As stated in the Umuziwabantu Municipal IDP (2019/20 Review), Harding is the primary town (and only proclaimed town); and is also the primary service node within the Municipality. The project area is located at 80km west of Port Shepstone and 60km east of Kokstad. The site is well located in relation to road infrastructure, as the east west N2 link between Port Shepstone and Kokstad is adjacent to the northern boundary of the site. Figure 2.1 below provides topographically depicts the project area in relation to the municipal and ward boundaries.

Figure 2.1: Location of Project Area



2.1.1 Geographical Co-ordinates

The geographical co-ordinates for the proposed development are illustrated in Table 2.1 below.

Table 2.1: Geographical co-ordinates

Latitude / Longitude	Degrees/Minutes/Seconds
South	30° 34' 19.02"
East	29° 53' 50.17"

2.1.2 Surveyor- General

The 21-digit surveyor general reference numbers for the properties forming part of this development is indicated in Table 2.2 below.

Table 2.2: 21 Digit Surveyor General Reference Number

Erf Number	Township	21 Digit Code
Erf 10 000	Harding	NoES01300001000000000
Erf 452	Harding	NoES01300000045200000
Erf 474	Harding	NoES01300000047400000
Erf 814	Harding Extension 2	NoES01300000081400000

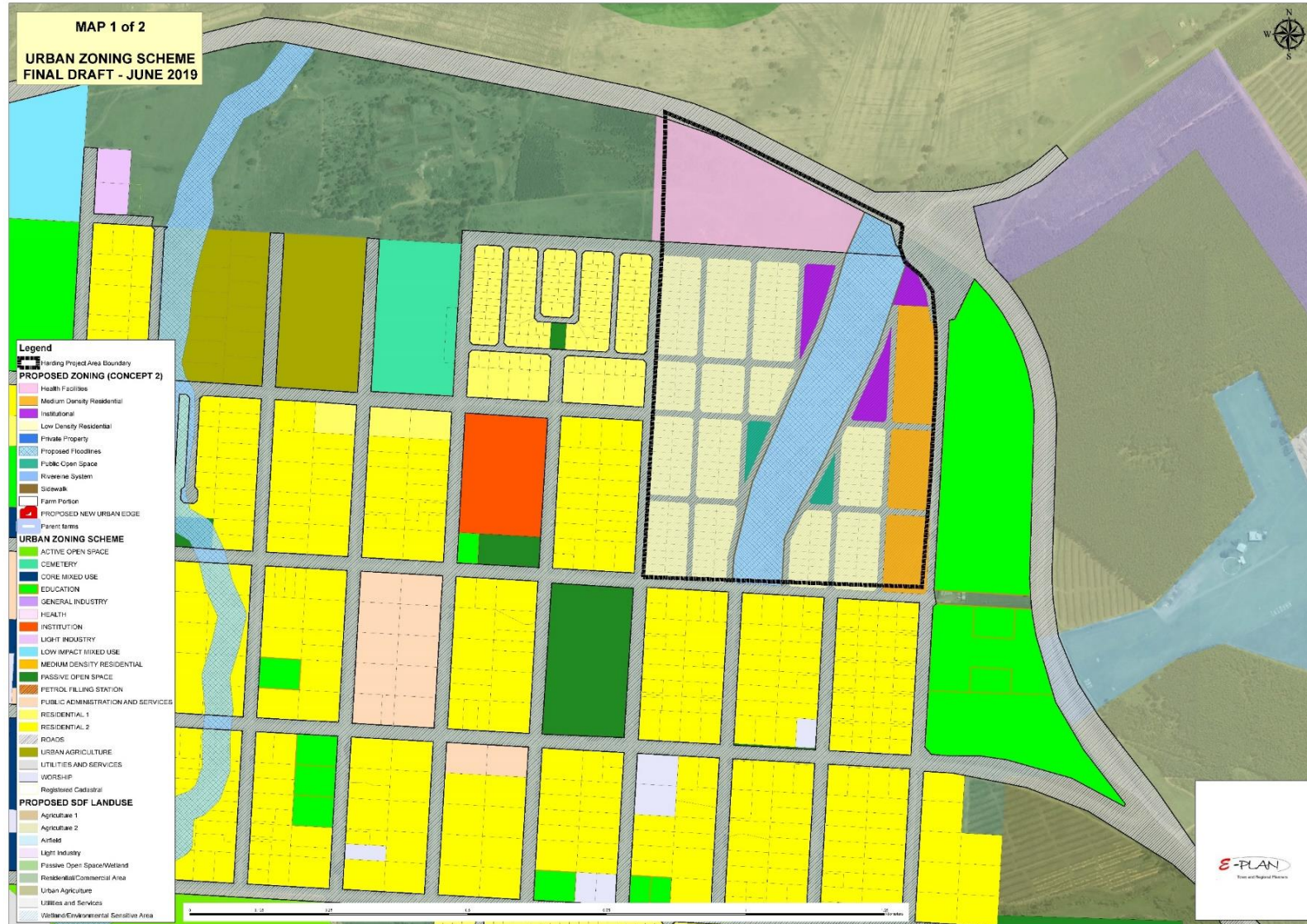
2.2 ZONING OF PROPERTY

The zoning of the properties that make up the project area, as per the Umuziwabantu Municipal Urban Zoning Scheme (Final Draft), 2019, is tabulated in Table 2.3 below and is graphically depicted in Map 2.1 below.

Table 2.3: Zoning of properties

Property Description	Zoning
Erf 10 000, Harding	Health facilities, medium density residential, institutional, low density residential, proposed floodline, public open space
Erf 452, Harding	Low density residential
Erf 474, Harding	Public open space, proposed floodline
Erf 814, Harding Extension 2	Low density residential

Map 2.1: Zoning Map



Source: Umuziwabantu Municipal Urban Zoning Scheme (Final Draft), 2019

2.3 ACTIVITY DESCRIPTION

2.3.1 Extent of development

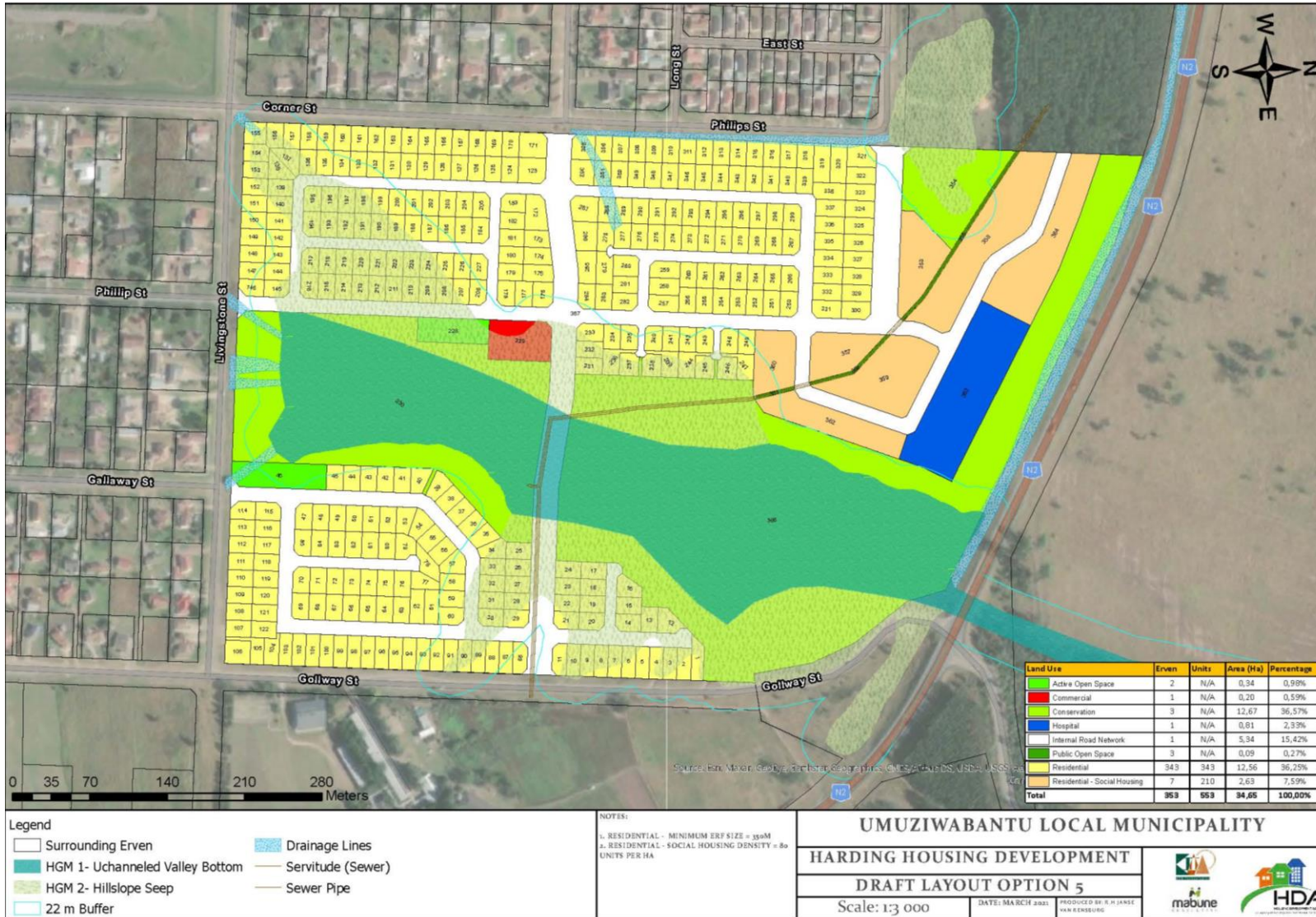
The properties making up the project area has a total extent of approximately 34.65 hectares with a development footprint of approximately 21.54 hectares. The preferred draft layout was prepared by K2M Technologies in December 2020 and is attached as **Appendix D2** and depicted in Map 2.2 below. The area of each of the proposed land uses are tabulated in Table 2.4 below.

Table 2.4: Proposed Land Uses

Land Use	Erven	Units	Area (Ha)	Percentage (%)
Active Open Space	2	N/A	0.34	0.98%
Commercial	1	N/A	0.20	0.59%
Conservation	3	N/A	12.67	36.57%
Hospital	1	N/A	0.81	2.33%
Internal Road Network	1	N/A	5.39	15.57%
Public Open Space	3	N/A	0.09	0.27%
Residential Erven - Serviced Sites and FLISP Housing	342	342	12.51	36.11%
Residential Erven - Social Housing	7	210	2.63	7.59%
Total	352	552	34.65	100.00%

As indicated in Table 2.4 above, majority (12.67 ha) of the site is set aside for conservation. Approximately 12.51 ha is set aside for residential erven - serviced sites and FLISP housing, whilst approximately 2.63 ha is set aside for residential erven – social housing. Approximately 0.34 ha for active open space, 0.20 ha for commercial, 0.81 for a hospital, 0.09 ha for public open space and the remainder 5.39 ha for the internal road network.

Map 2.2: Preferred Development Layout



2.3.2 Description of the proposed activity

The Harding Township Establishment forms part of the Umuziwabantu Municipality's strategic objective of regeneration of the town of Harding and bring in new housing opportunities in the area for affordable and middle-income housing. The project area was previously subdivided into 82 residential erven with an average site size of 1000m². However, this layout does not support the municipality's densification framework. The proposed development thus entails the consolidation and redevelopment of the existing erven in line with the municipality's densification framework. More specifically, the proposed development is a greenfield development and will entail the establishment of a Township together with supporting infrastructure, and includes following:

- Removal of indigenous vegetation
- **Approximately 343 residential erven (These erven will comprise of FLISP Housing and Serviced Sites).**

FLISP stands for Finance Linked Individual Subsidy Programme. The FLISP Housing Subsidy programme was developed by the Department of Human Settlement to enable first time home ownership opportunities to South African citizens. The subsidy is targeted at households whose monthly income range from a minimum of R13 500 to a maximum of R 22 000 and are South African citizens.

Serviced Sites are vacant plot of land that contain the necessary infrastructure for services such as water, sewage and electricity. These sites are ready for construction of a top structure upon purchase by the beneficiary.

- **4 storey residential blocks with approximately 210 social housing units**
Social housing is essentially rental housing which is intended to assist individuals who earn between R1 500 – R7 500.
- **Pipelines for the transportation of water supply and waterborne sewage**
The Ultimate Water Design Flow for the proposed development is 22.26l/s and will require a 150mm diameter water supply pipeline.

The sewer reticulation from the development will tie into the existing sewer system by means of 160mm diameter pipelines. The proposed sewer reticulation will be directed through underground pipelines to the south east portion of the site where it will be discharged, into the existing pumpstation. Upgrades will be required to the existing sewer pumpstation.

- **Internal roads and stormwater infrastructure**

The internal road network will have a road width between 3 – 5.5 m and a road reserve width between 6 – 10 m.

The proposed stormwater will be directed through underground pipes (proposed internal stormwater pipelines will have a diameter of 450mm and 600mm) to the south of the site where it will be discharged, into the existing stormwater located on the east of the site. The stormwater is collected from the roadways and piped into the valley, where an attenuation feature will be constructed.

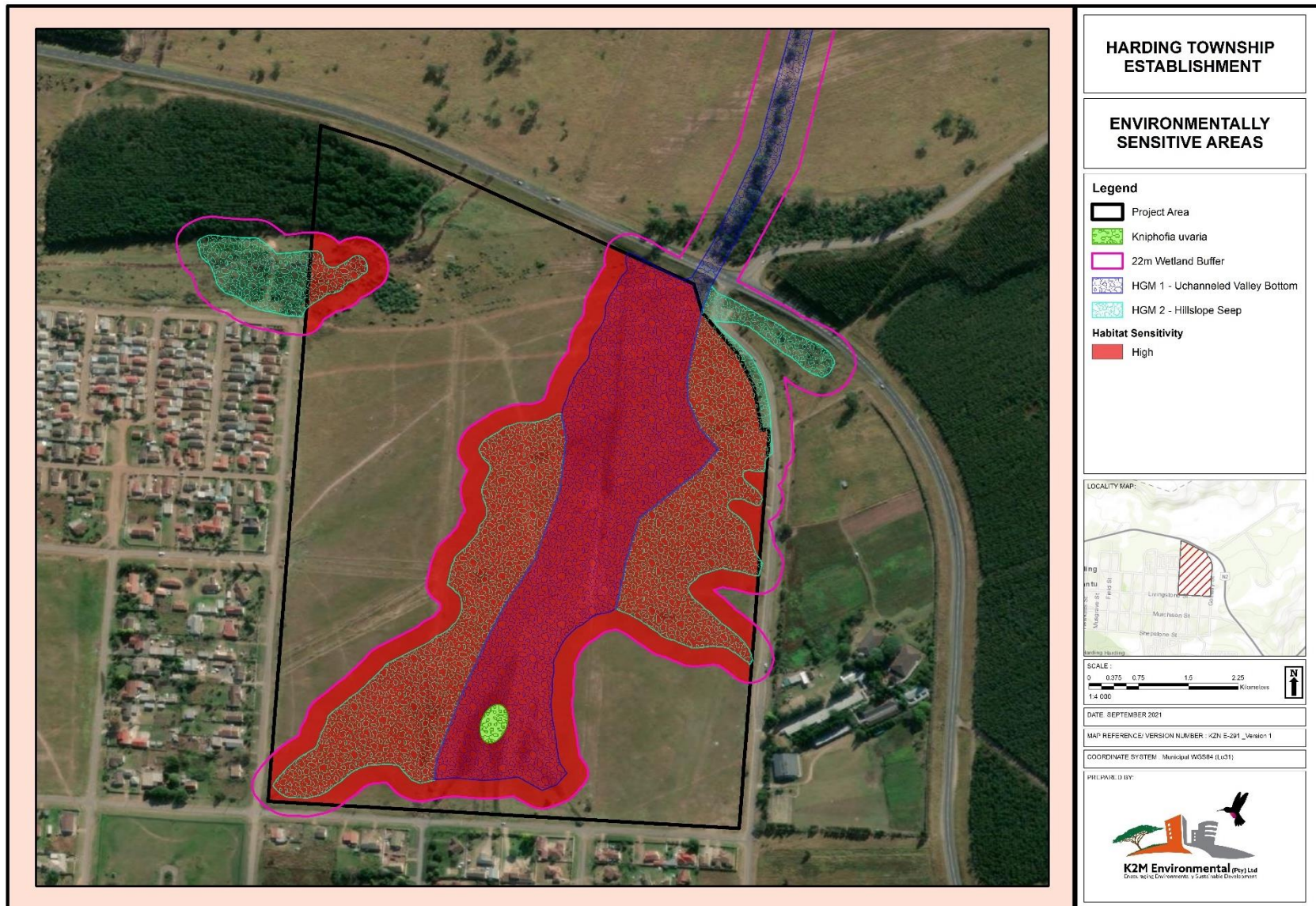
- Reservation of land for a commercial, conservation, active and public open space as well as a hospital facility.

Map 2.3 below illustrates the environmentally sensitive attributes that are located within the proposed site. The environmentally sensitive attributes include the following: the unchanneled valley bottom wetland, the hillslope seepage areas, the 22m wetland buffer zone, the high habitat sensitivity areas as well as the location and general extent of the *Kniphofia uvaria* species which is a protected species under the KwaZulu-Natal Nature Conservation Ordinance (Ordinance 15 of 1974). A high sensitivity rating was given to the following habitats: the unchanneled valley bottom wetland due to the flora species found within this habitat being disparate to the other habitat types on site and the *Kniphofia uvaria* was limited to this habitat; the hillslope seep due to the hydrological links to the valley bottom wetland; the grassland that is located within the 22 m wetland buffer zone because any anthropogenic activity within the buffer will have considerable negative impacts to the associated wetlands.

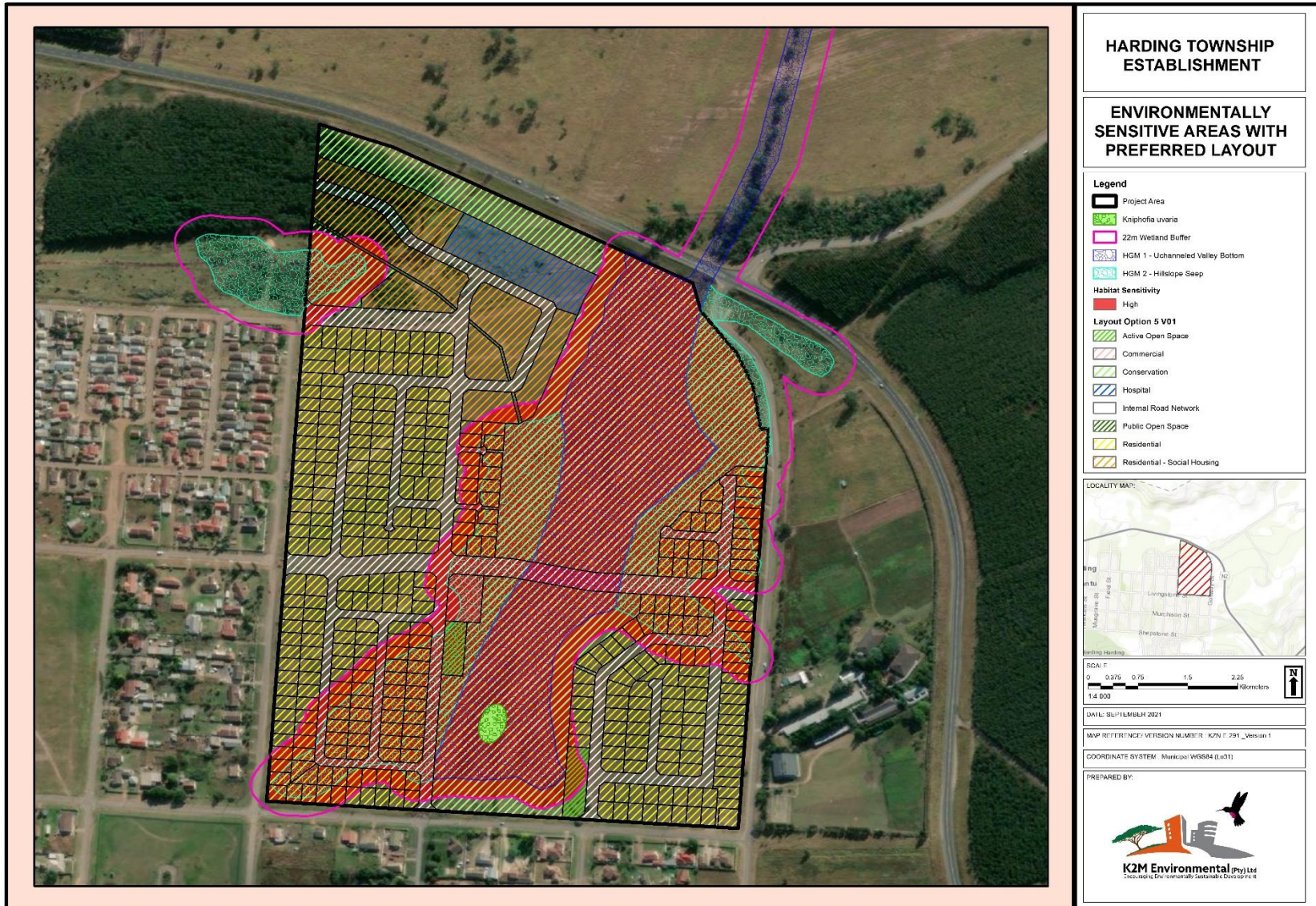
Map 2.4 illustrates the environmentally attributes within the project area overlain with the preferred development layout. As indicated on the map, the proposed development will entail infill of portions of the seepage area and 22m wetland buffer zone. A total wetland area of 4.2 ha and a buffer area measuring 2.7 ha will be lost as a result of the development. In order to accommodate for the encroachment and loss of the seepage areas and buffer zone, a wetland compensation strategy focussing on on-site rehabilitation by means

of redirecting stormwater was compiled as per the specialist' recommendation. This will in turn decrease the extent of the wetlands and improve the integrity of the wetlands significantly (see **Appendix G3** for a copy of the Wetland Compensation Strategy).

Map 2.3: Environmentally Sensitive Areas



Map 2.4: Environmentally Sensitive Area with Preferred Development Layout



2.3.3 Access to the proposed development

Head south on the N2 Highway towards Port Shepstone. Travel for approximately 109km and take exit 45 for N2/R102 towards Marburg/Kokstad/Port Shepstone. After approximately 550m turn right onto N2, travel for a further 73km and turn left onto Murchison Street. After approximately 1km turn right onto Conner Street, travel for approximately 400m and the site will be on the right.

2.3.4 Existing/Current Situation

As depicted in Figure 2.2 below, majority of the site is currently vacant and small north western portion contains tree plantations.

Figure 2.2: Existing Situation on Site



Source: Google Earth, 2021

2.3.5 Project phasing and construction program

The construction of the project is scheduled to commence as soon as all the processes to comply with applicable legislation are completed.

2.4 CONSIDERATION OF ALTERNATIVES

The identification and consideration of alternatives is recognised as required practice in environmental assessment procedures globally. The 2014 EIA Regulations (as amended) required that alternatives be considered during the EIA process. Alternatives are seen as different means of meeting the general purpose and need of a proposed activity. Alternatives could include, amongst others, the following:

- Activity Alternatives: This requires a change in the nature of the proposed activity. This alternative is most appropriate at a strategic decision-making level.
- Location Alternatives: Alternative locations for the entire project proposal, or for components of the project proposal.
- Layout Alternatives: This alternative allows different spatial configurations of an activity on a specific site.
- Scheduling Alternatives: also refer to alternative phasing options for the development. This alternative considers different phasing options during the implementation of the development.
- Infrastructure/ Input Alternatives: Also referred to as technological or equipment alternatives. This option considers various alternatives that will result in the same end result.

Layout and Infrastructure (technology) alternatives are the most pertinent to this EIA process, however all the above-mentioned alternatives are briefly explored in the subsections below as well as the alternative of maintaining the status quo, commonly known as the “no-go” option.

2.4.1 Activity alternatives

Activity alternatives refer to the consideration of alternatives requiring a change in the nature of the proposed activity to be undertaken.

Due to the high demand for formal housing within the Umuziwabantu Local Municipality, the preferred activity is to construct housing units, together with supporting facilities and infrastructure (such as water and sewerage pipelines). Should the preferred activity not be granted, the housing demand will remain high within the municipality. One alternative is to leave the site vacant, however this would not be feasible as it will leave the site vulnerable to illegal occupancy, land invasions and dumping.

2.4.2 Location alternatives

The location for the proposed Harding Township Establishment has been identified by the Umuziwabantu Local Municipality (Applicant) as it is a municipal project which is funded by the Department of Human Settlements. Furthermore, the site was identified prior to the commencement of the EIA Process and forms part of the extension of the Harding Township, therefore no location alternatives were considered.

2.4.3 Layout Alternatives

The preferred draft development layout was prepared by K2M Technologies in December 2020 and is attached as **Appendix D2**. It should be noted that due to the community opposing the development of low income housing (BNG) which was included in the Scoping Report, the Layout Alternatives were revised, as such new layout alternatives were considered as part of the EIR Phase. The advantages and disadvantages of the preferred and alternative layouts are tabulated in Table 2.5 below.

Table 2.5: Advantages and Disadvantages of the Preferred and Alternative Layouts

Layout	Advantages	Disadvantages
Preferred Layout (Appendix D2)	Smaller portion of the seepage area is encroached on by the development layout.	Fewer number of residential units are proposed.
	12.51 ha set aside for conservation.	
	Erven set side for active open space.	
Alternative Layout 1 (Appendix E1)		Proposes commercial land uses directly adjacent to the valley bottom wetland.
		Over supply of commercial land use.

		The layout encroaches into a greater portion of the seepage area.
Alternative Layout 2 (Appendix E2)	More residential units are proposed.	Proposes high density residential land use directly adjacent to the valley bottom wetland.
		The layout encroaches into a greater portion of the seepage area.
Alternative Layout 3 (Appendix E3)		No erven set aside for conservation.
		Land uses are proposed encroach into the valley bottom wetland ie. institutional land uses.
		The layout encroaches into a greater portion of the seepage area.
		No erven set aside for active open space.

2.4.4 Scheduling alternatives

The detailed time frame for implementation and completion of the proposed residential development is not currently available. However, given the housing backlog within the Umuziwabantu Local Municipality, it is anticipated that construction will commence as soon as approval of necessary statutory processes and authorizations (including environmental authorization) is obtained. No scheduling alternatives were therefore considered.

2.4.5 Input alternatives

Various types of materials can potentially be utilized during the construction phase of the project for both infrastructure and top structure purposes. This may include different material types (e.g. brick types, roof types and furnishings as well as green building designs). Green Building Guidelines have been recommended in this report to encourage sustainable development. It should be noted that the sections below have been adopted from the Green Building Guideline: Medium Density Affordable Housing and the Msunduzi Green Building Guidelines.

2.4.5.1 SANS 10400-XA Regulations

It is recommended that these regulations include aspects such as orientation towards north, window sizing and positioning, shading, choice of materials with regards thermal and insulation properties, solar heating, natural cooling and daylighting. Non-compliance with the SANS 10400: XA poses the risk of penalties under the National Building Regulations and Building Standards Act. It is also anticipated that over time these standards will become more stringent, and may become incorporated into existing and not only new buildings. It is thus critical that developers and building managers heed these requirements in both design and operation of buildings so as to future proof their portfolios.

SANS 10400-XA is presented in three sections:

- XA1 – Energy efficiency standards in buildings: Energy efficiency standards in buildings. The focus is to design the building in an energy efficient manner that still provides adequately for the needs of the users, its function and geographical location. This excludes garages, storage areas, equipment and plants that are required for conducting the business.
- XA2 – Energy efficiency in water heating: Energy efficiency in water heating. At least half of the water, 50% (by volume), that is required to be heated shall be provided by solar heating, heat pumps, heat recovery or fuel from renewable energy (sun, wind, geothermal, biomass, etc.). A typical geyser with resistance heating is discouraged.
- XA3 – Three routes to illustrate compliance with SANS 10400 XA: There are three ways in which the property developer can show compliance with regards to the design and construction of the building:
 - Compliance Route 1 – The prescriptive route where all the requirements are met as stipulated in the regulations.
 - Compliance Route 2 – The reference building route is where a competent person can demonstrate the energy usage of the building is equivalent to or better than a “reference building”, which would have been achieved through the prescriptive route.
 - Compliance Route 3 – The performance route is where the building has a theoretical energy usage performance, determined using certified thermal calculation software, less than or equal to that of a reference building in accordance with the regulations.

2.4.5.2 Hot Water Systems

SANS 10400-XA refers to SANS 10252: At least half of the annual average hot water heating requirements shall be provided by means other than electrical resistance heating. The alternative means could be via but not

limited to heat pumps, solar water heating, heat recovery from other processes or heating via gas. Hot water installations need to comply with further SANS requirements as provided in section 4.1 of SANS 10400-XA:

- All hot water pipes must be clad with insulation
- Solar hot water systems must comply with the following standards which govern the quality and functioning of these systems: SANS 1307, SANS 10106, SANS 10254 and SANS 10252-1.

2.4.5.3 Insulation for Roof and External Walls

The installation of insulation lowers the thermal conductivity of a building element. Once the thermal conductivity of the building element decreases its insulating properties increase. The thermal conductivity of the building is defined to be the quantity of heat that flows through a unit area in a unit of time, per unit difference in temperature. It is expressed in Watts per square meter Kelvin (W/m^2K). It provides an indication of how much heat is transmitted through a material, but also includes losses due to convection and radiation. Insulation reduces the heat gained during warm summer months and reduces the heat lost during cold winter months

2.4.5.4 High Efficiency Geyser for Hot Water

This initiative investigates the different energy sources that can be used to deliver hot water to a development. For this purpose, three fuels or sources of energy were investigated these include: electrical resistance, Liquid Petroleum Gas (LPG) and Natural Gas. The water heater selected must have a high efficiency. The different sources of energy are discussed further below:

- Electrical Resistance: This is a standard storage tank style water heater that suffers inefficiencies or losses in energy due to standby loss. As the hot water sits in the tank, heat may escape through the walls of the tank. Therefore, when considering increasing geyser efficiencies, a geyser blanket would be a good addition.
- LPG and Natural Gas: Water heaters that utilise gas can operate within both a conventional storage tank and tank less application. In the case of storage tanks, they may suffer the same heat losses as experienced with a conventional electric option unless a sealed combustion vent is included.

The purpose of having a high efficiency geyser specified is to reduce the demand for electricity that would otherwise be required.

2.4.5.5 Solar Photovoltaics: Renewable Energy Generation

Photovoltaics (PV) utilises solar radiation to produce electrical energy. The outputted Direct Current (DC) voltage requires a solar panel array provision of 10m² for 1kWp/day (required for 25% of project annual consumption). The DC can be converted to standard mains Alternating Current (AC) via an inverter for residential consumption. PV has a reduction in cost per kWh a proportion of the difference can be utilised to finance the uplift via alternative financing. It will also reduce the CAPEX associated with upfront electrical connection charges and provide a resilience buffer to power shortages.

2.4.5.6 Internal Lighting – Energy Savings Bulbs

Energy efficient lighting is commonly available in South Africa in the form of Compact Fluorescent Lamps (CFLs) and these have largely replaced traditional incandescent lighting as the preferred lighting choice due to reduced energy consumption and heat generation and longer life spans. While 75W incandescent bulbs require electrical resistance to heat a metallic element 'white hot', a 13W CFL bulb contains a gas mixture of argon and mercury which is excited by a small electric current. In 4W Light Emitting Diodes (LEDs) electrons are encouraged to 'jump' between energy levels releasing photons.

2.4.5.7 Low Flow Fixtures and Fittings

In order to reduce the water demand per unit, it is recommended that low flow water fixtures and fittings be utilised. This includes: low flow showerheads, hand basin taps, water closets and kitchen taps. The difference between these fixtures and normal fixtures would be the application of a flow restrictor that determines the flow rate of the fixture or fitting.

2.4.6 **Infrastructure alternatives**

2.4.6.1 Sanitation

For the purposes of this project two potential sanitation levels of services will be considered, such as:

- Onsite septic tanks, or
- Waterborne sewage system

A brief description has been provided.

2.4.6.1.1 *Onsite Septic Tanks (Alternative Option)*

The option of an onsite septic tank to treat sewage on site was considered as an option. However, the disadvantage of a septic system is that it poses the risk of ground water contamination especially at the density proposed on the draft conceptual layout plan. Furthermore, once the tank has reached the end of its life cycle the sludge needs to be pumped out or a new system needs to be constructed.

2.4.6.1.2 *Waterborne Sewage System (Preferred Option)*

Just as the 'in-home connection' is viewed as the ultimate goal for water supply planners, utilities and households, the private sewer connection represents the highest level of service for household sanitation. The sewer reticulation from the development will tie into the existing sewer system by means of 160mm diameter pipes. The proposed sewer reticulation will be directed through underground pipes to the south east portion of the site where it will be discharged, into the existing pumpstation. Upgrades will be required to the existing sewer pumpstation.

It should be noted that due to the district municipality presently having some potential issues with their pumpstation, it is recommended that the developer make allowance for a sewer attenuation chamber, to cater for the excess sludge and sewer demands, as an interim solution.

2.4.6.2 Water Supply

2.4.6.2.1 *Boreholes*

The establishment of a new borehole source to supply the development with water supply was considered as an alternative. However, the Ugu District Municipality's Water Services Department indicated that borehole water in the Harding area is normally not suitable for human consumption. Furthermore, it is very costly in the long term due to the regular testing of water samples by an accredited laboratory to ensure that the water is safe at all times.

2.4.6.2.2 *Connection to the Municipal Water supply*

Connection to the municipal water supply is the preferred alternative in terms of water supply for the proposed development. It should be noted that the Ugu District Municipality has confirmed that there is sufficient water supply to accommodate the proposed development (See **Appendix F4**).

2.4.6.3 Housing Structure

Due to the nature of the project being an integrated mixed-use housing development, there is a number of three housing typologies that will be included as part of this project namely FLISP Housing, Serviced Sites and social housing units.

2.4.7 “No-go” alternative

The “no-go” alternative should in all instances be considered as part of the EIA process. It assumes that the activity does not proceed, implying a continuation of the current situation of status quo. Should this development not go through, the following will apply:

- The housing demand will remain the same within the municipality, unless there are other housing operations where construction has commenced or has been completed.
- The vacant piece of land will be left vulnerable to illegal occupancy, dumping and informal housing.
- Indigenous vegetation will not be removed; however the site will continue to be used for illegal dumping.
- No soil erosion or soil pollution will occur.
- There will be no development within wetlands/watercourses.
- The wetland and watercourses will not be loss and impacted upon

3 ENGINEERING SERVICES

The Engineering Design Report for the Harding Township Establishment was prepared by Undasa Project Partners in September 2021 and is attached as **Appendix F1**.

3.1 EXISTING BULK SERVICES

3.1.1 Bulk Water Supply

There is a 110mm diameter bulk water line located along Livingstone road, south of the site.

3.1.2 Existing Bulk Sewerage

There is a 160mm diameter sewerage pipeline that runs through the site, which maybe be relocated, depending on levels.

3.1.3 Roads and Stormwater

Access to the site will primarily be from the existing Livingstone Street, located to the south of the site, as well as Gallaway Street, just off the N2.

There is an existing piped stormwater culvert bordering north of the site. On site attenuation will be used to attenuate the post-development runoff to predevelopment. This will ensure that the capacity of the existing pipe is not exceeded.

3.1.4 Electricity

There is an existing overhead electric cable which runs along Livingstone Street, south of the site.

3.2 PROPOSED SERVICES

3.2.1 Water Reticulation

Water reticulation pipework will be by means of conventional pipework. A section the existing 110mm diameter water pipe, approximately 180m, will be required to be upgraded to 150mm for the proposed development.

A 600m³ storage reservoir and booster pump is proposed for the development as well as the hospital site, due to the additional flow requirements of the development, and to ensure that there is consistent supply of water for consumption and fire flow storage.

The water demand calculations are shown in **Appendix 5 of the Engineering Design Report**. The Ultimate Water Design Flow for the proposed development is 22.26l/s and will require a 150mm diameter supply pipe.

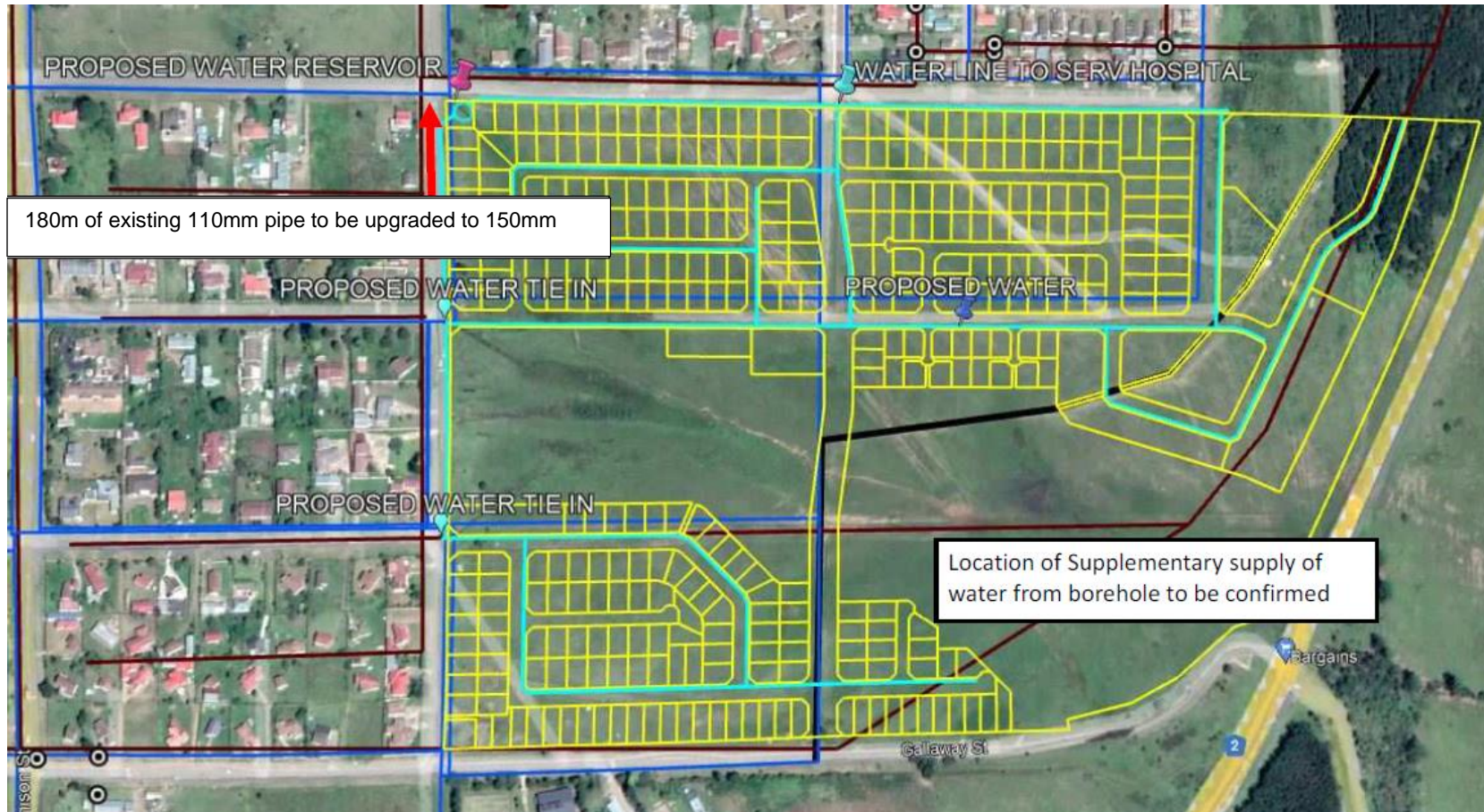
It should be noted that the Ugu District Municipality has confirmed that there is sufficient water supply to accommodate the proposed development (See **Appendix F4**).

The design of the water reticulation would be based on the following:

Average daily demand (ADD)	:	500 litres/erf/day
Peak summer demand (PSD)	:	1.5 X ADD
Daily peak demand	:	4 x PSD
Maximum velocity of flow	:	2.5m/sec
Fire risk	:	Low risk
Minimum diameter of pipes	:	50mm
Minimum cover over pipelines	:	900mm

Figure 3.1 below illustrates the layout of the existing and proposed water reticulation.

Figure 3.1: Layout of Existing and Proposed Water Reticulation



Source: Engineering Design Report, 2021

3.2.2 Sewer Reticulation

The sewer reticulation from the development will tie into the existing sewer system by means of 160mm diameter pipes. The proposed sewer reticulation will be directed through underground pipes to the south east portion of the site where it will be discharged, into the existing pumpstation. Upgrades will be required to the existing sewer pumpstation.

A waterborne sewerage system is proposed with individual connections to each site. The design of the sewer network has been based on the following:

Average dry weather flow	:	500/erf/day
Peak factor (PF)	:	According to the Hacmon formula
Daily peak demand	:	4 x PSD
Infiltration:	:	15%
Ultimate Design Factor	:	1.5
Maximum velocity of flow	:	2.5m/sec
Fire risk	:	Low
Minimum diameter of pipes	:	160mm
Minimum cover over pipes	:	900mm

Minimum pipe cover:	Verges – 800mm
	Roadways – 1 000mm
	Road crossings – 1 200mm

Manholes: Manholes will be spaced at a maximum of 80m. They will be constructed from precast concrete rings with concrete covers. Type 2 Heavy Duty Ductile Iron covers will be used in the roads.

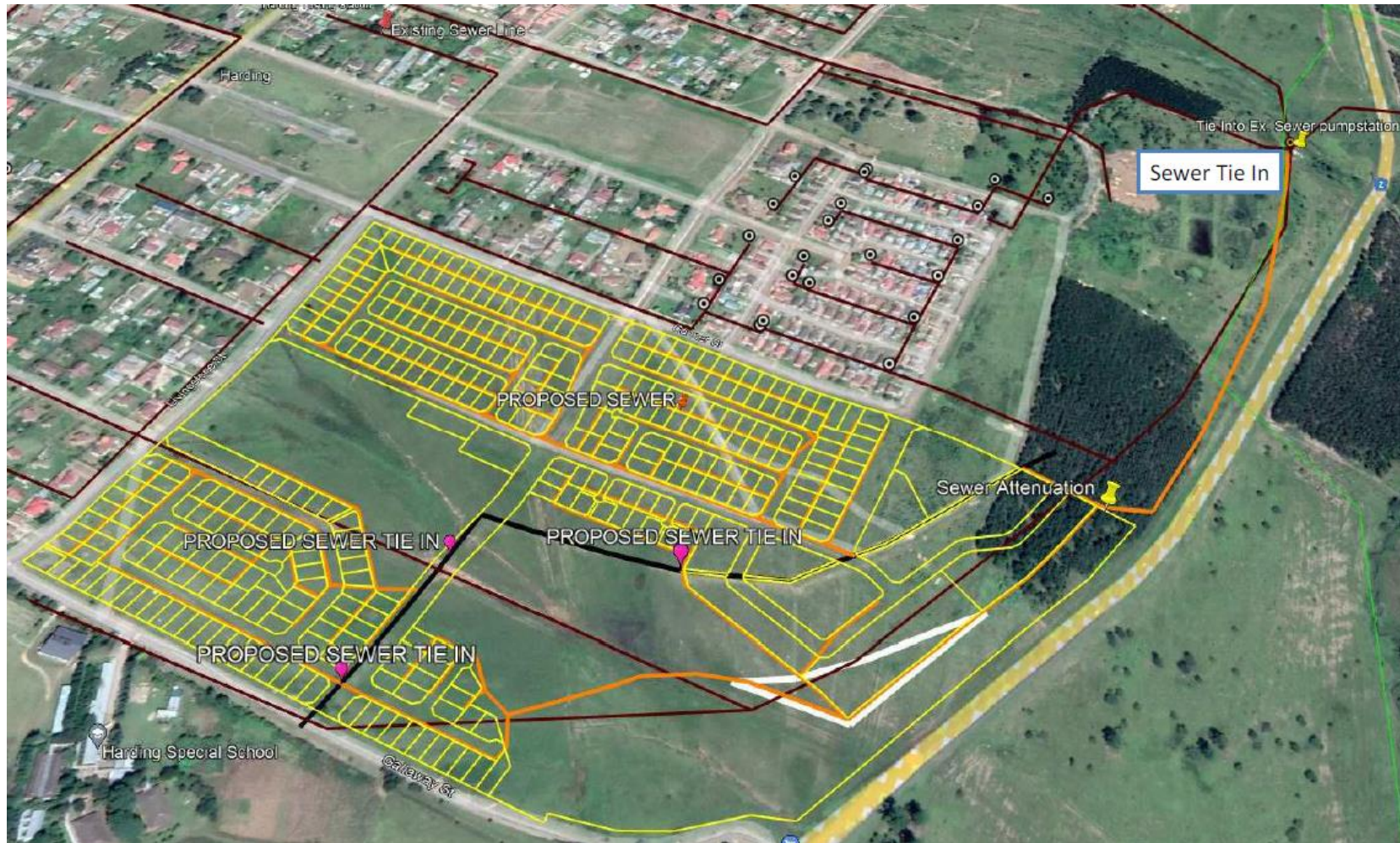
Design: It is proposed that a daily flow of 500 litres per unit for residential units, a peak factor of 3.25 and an infiltration rate of 15% will be used. The minimum design velocity is 0,66m/s. The Ultimate Sewer Design flow for the proposed development is 17.00l/s

Pipe material: Gravity sewer pipes will be one of the following:

- Heavy Duty uPVC complying with SABS 791
- Structured wall pipes complying with SABS 1601

Due to the district municipality presently having some potential issues with their pumpstation, it is recommended that the developer make allowance for a sewer attenuation chamber, to cater for the excess sludge and sewer demands, as an interim solution. The sewer demand calculations are shown in **Appendix 6 of the Engineering Design Report**.

Figure 3.2: Layout of exiting and proposed sewer reticulation layout



Source: Engineering Design Report, 2021

3.2.3 Roads and Stormwater

The existing roads will be upgraded according to the Traffic Impact Assessment. The development will contain a public transport infrastructure such as lay-byes and drop off areas at the entrance. Paved road access will be provided to each stand.

3.2.3.1 Geometric Standards

The internal access roads have been designed in accordance with the “Guidelines for Human Settlement Planning and Design” published by the CSIR, on the following basis:

Road class	Reserve Width (m)	Surface Type	Surfaced Area	Verge Width (m)
Residential Street	10	Asphalt	5.5	2
Residential Street	8	Asphalt	4.5	1.5
Residential Street	6	Asphalt	3	1.5

Source: Engineering Design Report, 2021

The following criteria will be used for the design of the road:

Road Class	Min Radius	Bellmouth Radius	Max Grade	Length Vert curve	Min k Cres	Min k Sag
Residential Street	20m	6-8m	16.5%	20m	2	4

Source: Engineering Design Report, 2021

A kerb and channel will be constructed on the drainage side and no kerb on the opposite side. Pedestrian traffic is catered for on a sidewalk on the main road and on the road hard shoulders, of the minor roads, unless otherwise requested by the Applicant.

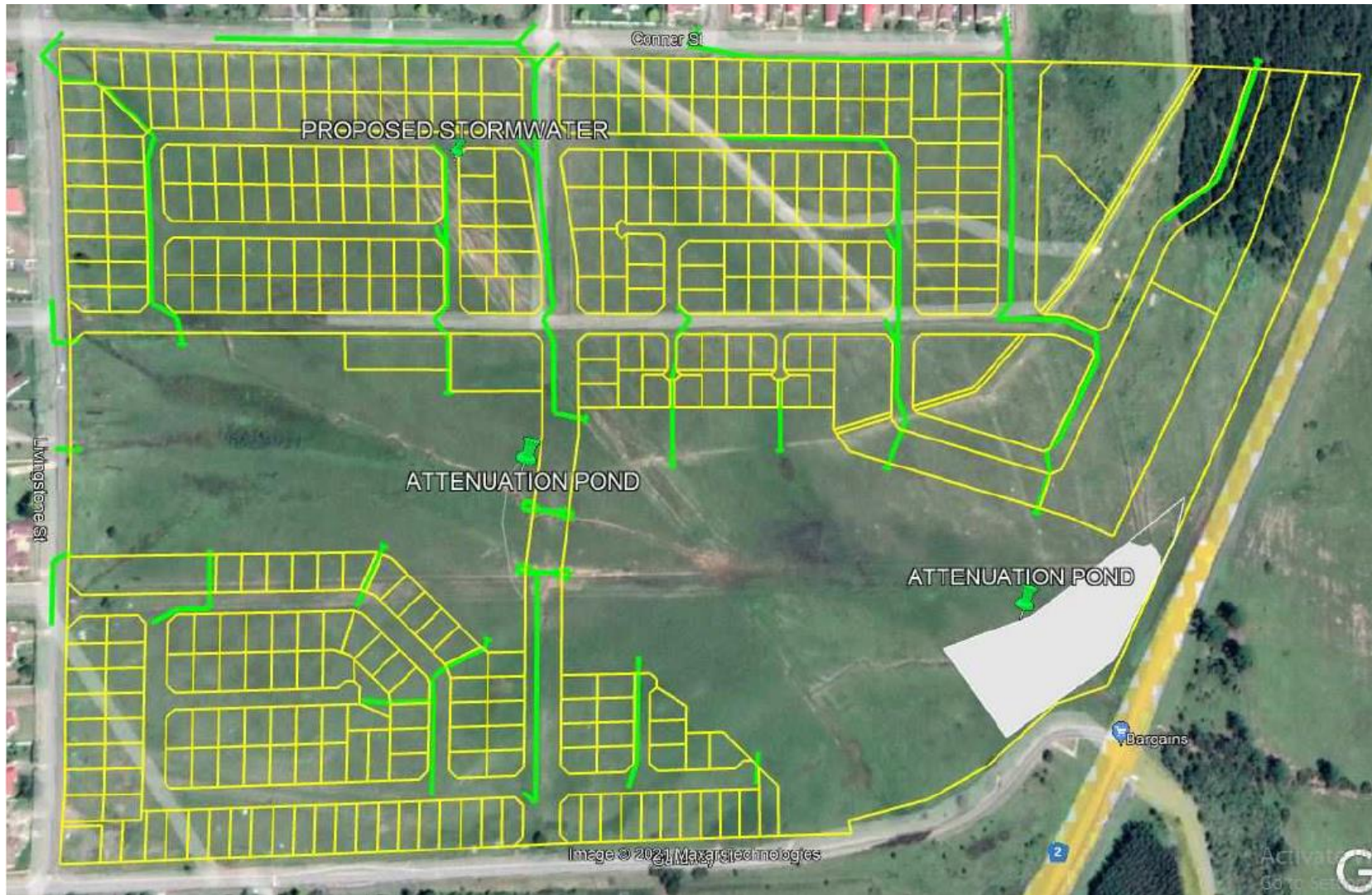
3.2.3.2 Stormwater Drainage

The proposed stormwater will be directed through underground pipes to the south of the site where it will be discharged, into the existing stormwater located on the east of the site.

The stormwater is collected from the roadways and piped into the valley, where an attenuation feature will be constructed. Erosion protection will be provided at all discharge points. There are two attenuation ponds that will be used to attenuate the post-development runoff to pre-development.

The development has proposed adequate stormwater drainage infrastructure to each site and is based on the Sustainable Drainage Systems (SuDS) approach to reduce the rate and volume of surface water runoff, to restrict surface water runoff from development lands to pre-development rates, to manage surface water and minimise flood risk and to integrate with open space and recreation provision.

Figure 3.3: Layout of Existing and Proposed Stormwater Layout



Source: Engineering Design Report, 2021

3.2.4 Electricity Supply

The electrical bulk supply will be designed according to municipal standards. All duct requirements will be met under the construction of the civil works.

3.2.5 Solid Waste

The local authority will supply the service of removing refuse from the project area.

3.3 STORMWATER MANAGEMENT PLAN

The Stormwater Management Plan for the proposed development was prepared by Undasa Project Partners in September 2021 and is attached as **Appendix F2**.

3.3.1 Catchments

The catchments influencing the site are delineated in Figure 3.4 below. Each catchment delineated contributes to a watercourse. The catchments were delineated using contours obtained from the topographical survey. The topographical data was combined with aerial photographs and the findings from the site, in order to determine the variables that describe the behaviour of the catchments under rainfall.

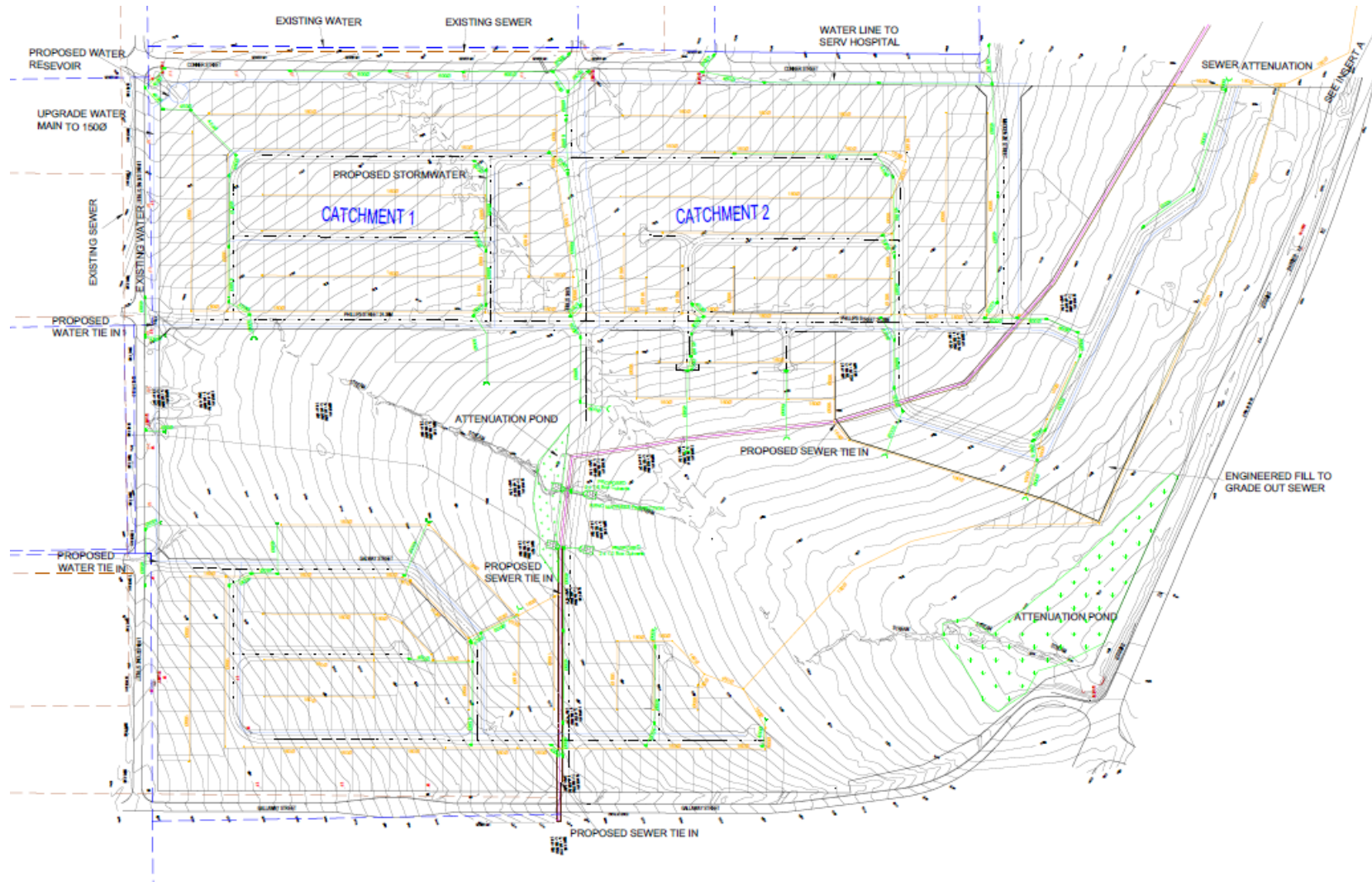
3.3.2 Measures for the infill

Additional measures to be taken when constructing the earthworks for the proposed development:

- Platforms will to be cut/filled with a minimum of 95% Mod AASHTO as compared to the standard 93% Mod AASHTO.
- Layers will be placed in 150mm layers and compacted with a pad foot roller.
- A benching detail and key have also been proposed for the fill operation.

- The houses on the fill section will be done last, to ensure settlement occurs over a 6 month period.
- Regular independent testing will be done.
- The banks can then be planted with indigenous vegetation to ensure that erosion is controlled and minimised.

Figure 3.4: Catchment Layout



Source: Stormwater Management Plan, 2021

3.3.3 Control Measures

The control measures are developed in three distinct stages:

- **Primary**
On-site attenuation will be enforced through the building code of the development. Individual site developments will be responsible for constructing an attenuation chamber that will either tie into the stormwater pipe or to the valley depending on the position of the site.
- **Secondary**
A kerb and channel will be constructed on the drainage side and no kerb on the opposite side. Stormwater will be distributed primarily by means of stormwater culverts and will be attenuated in the stormwater outlet via 2 attenuation ponds.

The pond is sized such that the post-development stormwater runoff will be attenuated to achieve pre-development runoff. The outlet flow will be limited to the 1:10 pre development flow. There will also be Reno mattresses and splitter blocks, at the outlet, for erosion control and stormwater quality control.

- **Tertiary**
The flow will finally be treated within naturally created wetlands. Suitable vegetation will further attenuate the flow, limiting the possibility of erosion and both cleansing and oxygenating the water. This will also form part of the stormwater quality control.

3.3.4 Pre and Post Development Flows and Attenuations

Attenuation consists of the temporary storage of surface water in a suitable chamber below ground level. This chamber needs to be of sufficient size to accommodate the calculated run-off during peak periods of rainfall. The stored water is then gradually released in a controlled manner into a surface water or combined drainage system or watercourse, subsequently effectively reducing the risk of flooding.

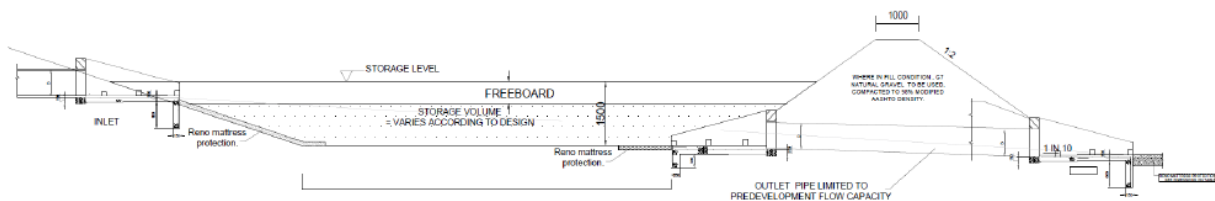
Annexure B of the Stormwater Management Plan illustrates the stormwater runoff estimates. The culverts will be sized for a 1:50 pre-development flow for the major systems and 1:10 pre-development flow for the minor systems. The calculations for the time of concentration and peak discharge for the various catchments are tabulated in **Annexure B of the Stormwater Management Plan**.

All roads will be constructed with a cross fall. Stormwater will be channelled along the kerbs to strategically placed catchpits and kerb inlets draining into concrete pipe culverts. The culverts discharge into the natural watercourses and existing stormwater features. Headwalls will be provided at the end of the pipe culverts with erosion protection at these discharge points. The kerb and channels, kerb inlets and pipe culverts have been sized to accommodate a 1: 10 year storm.

3.3.5 Attenuation

Storage and outlet hydrographs determine the volume required to be attenuated for each catchment. The runoff was limited to the 1:10 year pre-development flow and the capacity of the attenuation system was sized for the maximum of the difference between the pre- and post-development run-off both 1:10 and 1:50 year storms. The drawing below illustrates the attenuation pond. The stormwater attenuation facilities are located outside of wetland units.

Figure 3.5: Typical Cross section of the attenuation ponds



Source: Stormwater Management Plan, 2021

The following options and design considerations will be noted prior to the planning and design of a stormwater disposal system:

Discharge to Valley Bottoms

Use of simple stormwater outfalls for discharge into valley bottoms is not recommended due to the erosion risk. Consequently, it is recommended that the discharge points will be designed in such a manner as to avoid

erosion, and control measures such as keying of headwall onto the bedrock surface, stone pitching or reno mattresses down slope of the headwall, will be considered and incorporated into the design philosophy, funding permitting.

Overland Flow Routes

Overland flow routes will be planned to cater for excessive stormwater runoff from major storms for individual sites and within the road network, as well as low point/valley lines. Surface channels will be created within non-user servitudes in areas where valley lines do not occur but in which overland flow is likely. Roads and verges will be sloped accordingly to ensure that surface runoff will be directly down the overland flow routes with erosion protection measures incorporated such as grassing, erosion strips and check berms.

3.4 TRAFFIC IMPACT ASSESSMENT REPORT

The Traffic Impact Assessment for the proposed development was undertaken in August 2021 by NSA Consulting Engineers and is attached as **Appendix F3**.

3.4.1 Existing Road System

The project area is located within the Harding Primary node. The site is accessible via the N2 which forms part of the northern boundary of the project area and a few local access roads which connects to the N2 north of the project area. The local access roads will serve as the main collector roads within the project area distributing traffic and movement between the local access roads providing access to each individual site and the N2.

It is a common cause that the traffic impacts of new developments are concentrated on the immediate transportation network with these impacts dissipating rapidly further away from the development as more access opportunities become available and traffic disperses onto the broader road network.

Consequently, the impacts of the proposed development are limited to adjacent road network, with the key focus on the intersection Murchison Street and Gallaway Street.

3.4.2 Site Investigation

Observations during the AM peak hour revealed that there is a moderate flow of traffic along Murchison Street. The major intersection of Murchison Street and the N2 is located to the north east of the site and the Harding CBD is located to the west of the proposed development.

3.4.3 Traffic Demand Estimation

3.4.3.1 Assessment Years

Based on COTO: South African Traffic Impact and Site Traffic Assessment Manual TMH 16 Volume 1 we have assumed 2% Growth Rate for 5 Years.

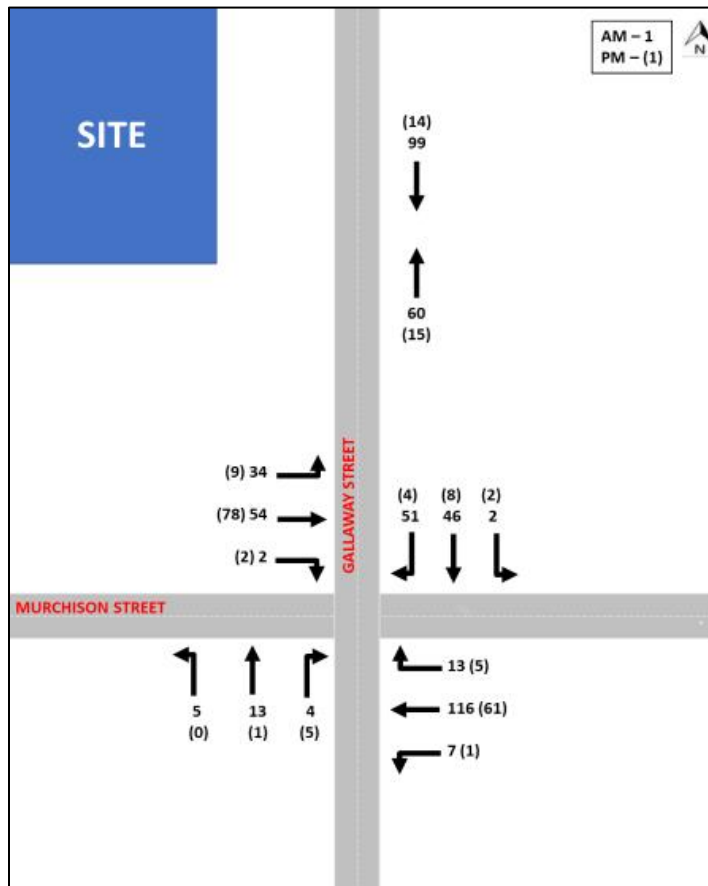
3.4.3.2 Assessment Hours

The weekday AM peak (07:00 – 08:00) and PM peak (16:00 – 17:00).

3.4.3.3 Existing Traffic Counts

Traffic counts have been conducted under normal weather conditions on Thursday 5th August 2021 at the intersection of Murchison Street and Gallaway Street. Existing traffic volumes are illustrated on Figure 3.6 below.

Figure 3.6: Existing Traffic Counts



Source: Traffic Impact Assessment, August 2021

3.4.3.4 Trip Generation Rates

The proposed development will consist of 553 Residential Dwelling Units. The trip generation rate for Single Dwelling residential units as per the ‘guidelines provided by COTO: South African Trip Data Manual TMH 17 Volume 1’ is 1.0 trip/unit during the Weekday AM and PM Peak.

This is consistent with land use code 210 Single Dwelling Units. Summary of the trip generation is illustrated on Table 3.1 below.

Table 3.1: Trip Generation – Residential Dwelling Units

Land Use	Peak	No. of Units	Rate/ Unit	No. of Trips	Split Ratio	Split In/Out
Residential Units	AM	553	1.0	553	25:75	138:415
	PM	553	1.0	553	70:30	387:166

Source: Traffic Impact Assessment, August 2021

The following landuse will not have an effect on the external road network:

- Proposed Commercial
- Proposed Hospital
- Proposed Public Open Spaces

3.4.3.5 Trip Reduction Factors

As per Table 3.2: Trip Generation Adjustment Factors in COTO, the development is classified as a mixed use development in an area with a low vehicle ownership. According to Community Survey of 2016, Umuziwabantu Local Municipality has a total population of 108,576 people with a total of 4730 registered vehicles (eNatis). The unemployment rate is at 31%. This translates to 47 vehicles / 1000 population. It is noted that Umuziwabantu Local Municipality is made up of Harding, Mkoba, Umuziwabantu and Esikhulu. Further, the existing traffic counts reveal that on average nearly 15% of the vehicles in the peak hour are taxis.

It is assumed that 20% of all trips to be intra-zonal as this is a mixed use development stimulating a ‘live-work-play’ environment for these residents. Less than 10% of the population own vehicles and on average 20% of the vehicles are taxis in the peak hour, illustrating that this is an impoverished community with a low vehicle ownership. Therefore table 3.2 of TMH17 Volume 1 allows for a 40% reduction in trips.

Table 3.2: Trip Reduction

Land Use	Peak	No. of Trips	% Reduction	New Trips
Residential Units	Weekday - AM	553	40%	332
	Weekday - PM	553	40%	332

Source: Traffic Impact Assessment, August 2021

3.4.3.6 Summary of Trip Generation

The summary of trip generation for the Proposed Development is tabulated below.

Table 3.3: Summary of Trip generation- Proposed Development

Land Use	Peak	New Trips	% Spilt	Spilt Ratio
Residential Units	Weekday - AM	332	25:75	83:249
	Weekday - PM	332	70:30	232:100

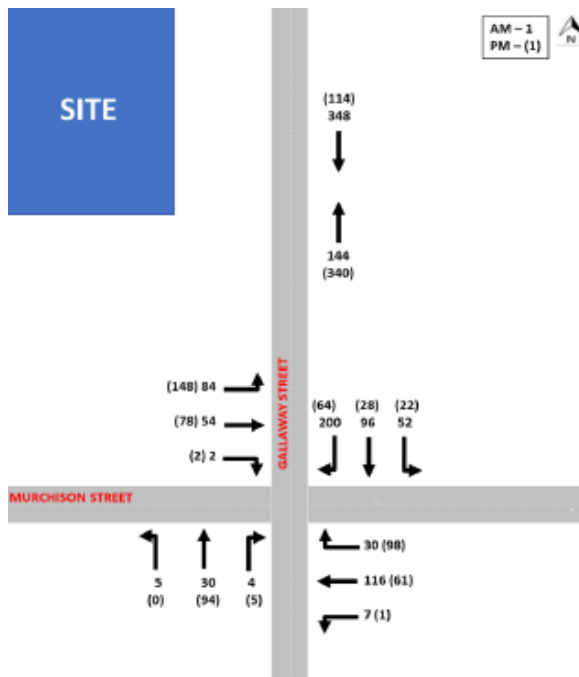
Source: Traffic Impact Assessment, August 2021

Majority of the commuters will be using public transport.

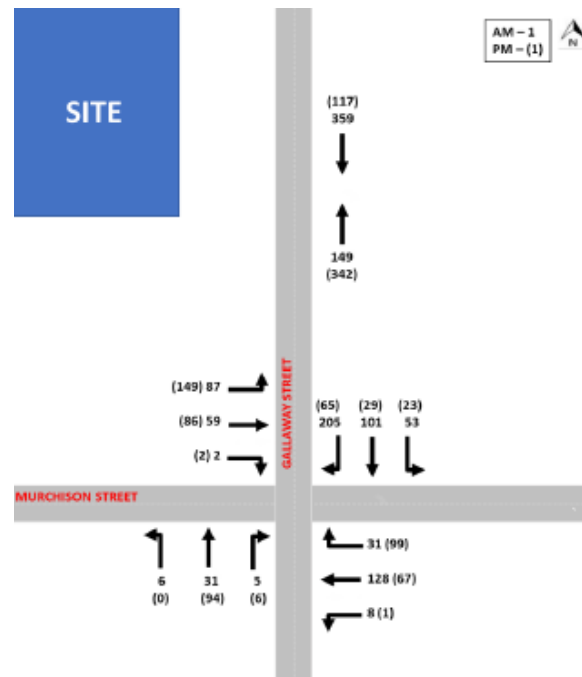
3.4.4 Total Traffic Demand

The total traffic demand which includes background traffic and development traffic for the 2021 analysis year and the forecasted 2026 analysis year diagrams are illustrated on the figures below.

Existing 2021 plus Development



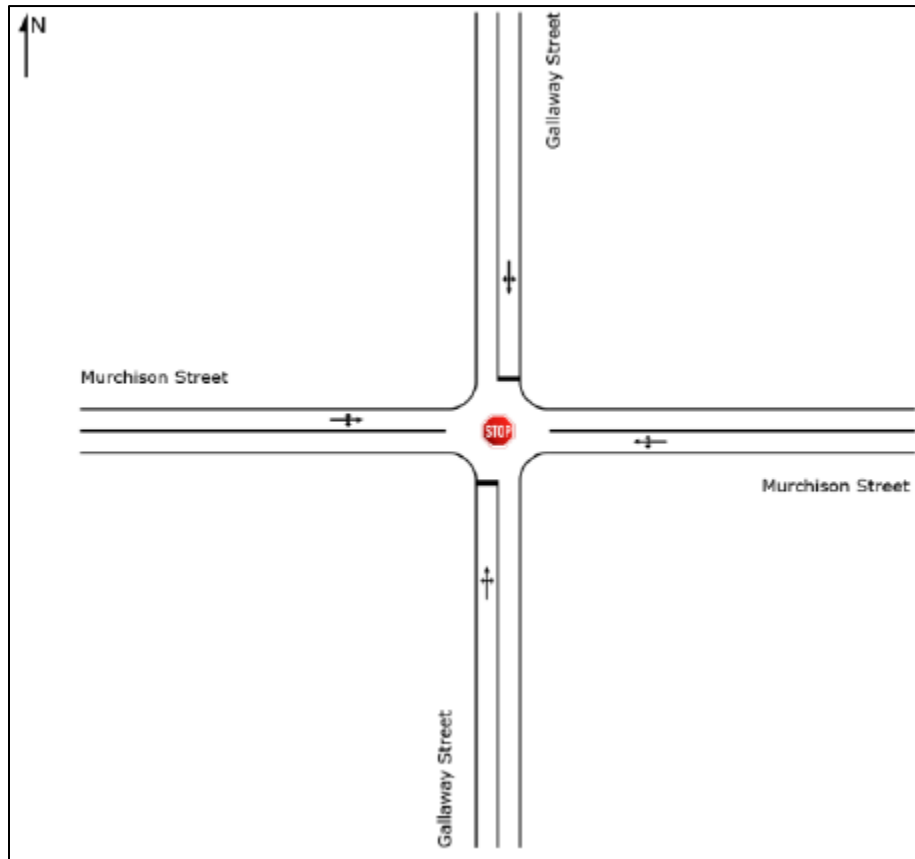
Forecasted 2026 plus Development



Source: Traffic Impact Assessment, August 2021

The intersection will operate under acceptable conditions during the existing, existing plus development and forecasted 2026 as stipulated in the Highway Capacity Manual 2000 Table 17.2 unsignalized intersections.

Figure 3.7: Intersection Layout of Murchison Street and Gallaway Street



Source: Traffic Impact Assessment, August 2021

3.4.5 Pedestrian and Public Transport

3.4.5.1 Public Transport

On average, approximately 15% of the vehicles in the peak hours are taxi. It is clearly evident that the community is impoverished and reliant on public transport. The existing taxi rank is situated within the Harding CBD approximately 1.3km from proposed development. It is recommended taxi bays be provided along collector roads within the development.

3.4.5.2 Pedestrian and Safety

Sidewalks will also be required along all collector roads within proposed development. The collector routes are fairly straight, traffic calming speed humps are required to discourage speeding and increase pedestrian safety.

3.5 PROJECT PHASING AND CONSTRUCTION PROGRAM

The construction of the project is scheduled to commence as soon as all the processes to comply with applicable legislation are completed and will be implemented in one phase.

4 SITUATION ASSESSMENT OF PROJECT AREA AND AFFECTED ENVIRONMENT

4.1 CLIMATE

As per the Umuziwabantu Municipal IDP, the general area is characterised by warm summers and cool winters. In Harding, the mean maximum temperature reaches 25°C in January and a mean minimum temperature of 0.6°C is reached in July. Rainfall is strongly seasonal in the general area, with an excess of 80% of rain occurring as thunderstorms during the period of October to March. At Harding, which is centrally located, 800mm of rainfall occurs annually.

4.2 TOPOGRAPHY AND DRAINAGE

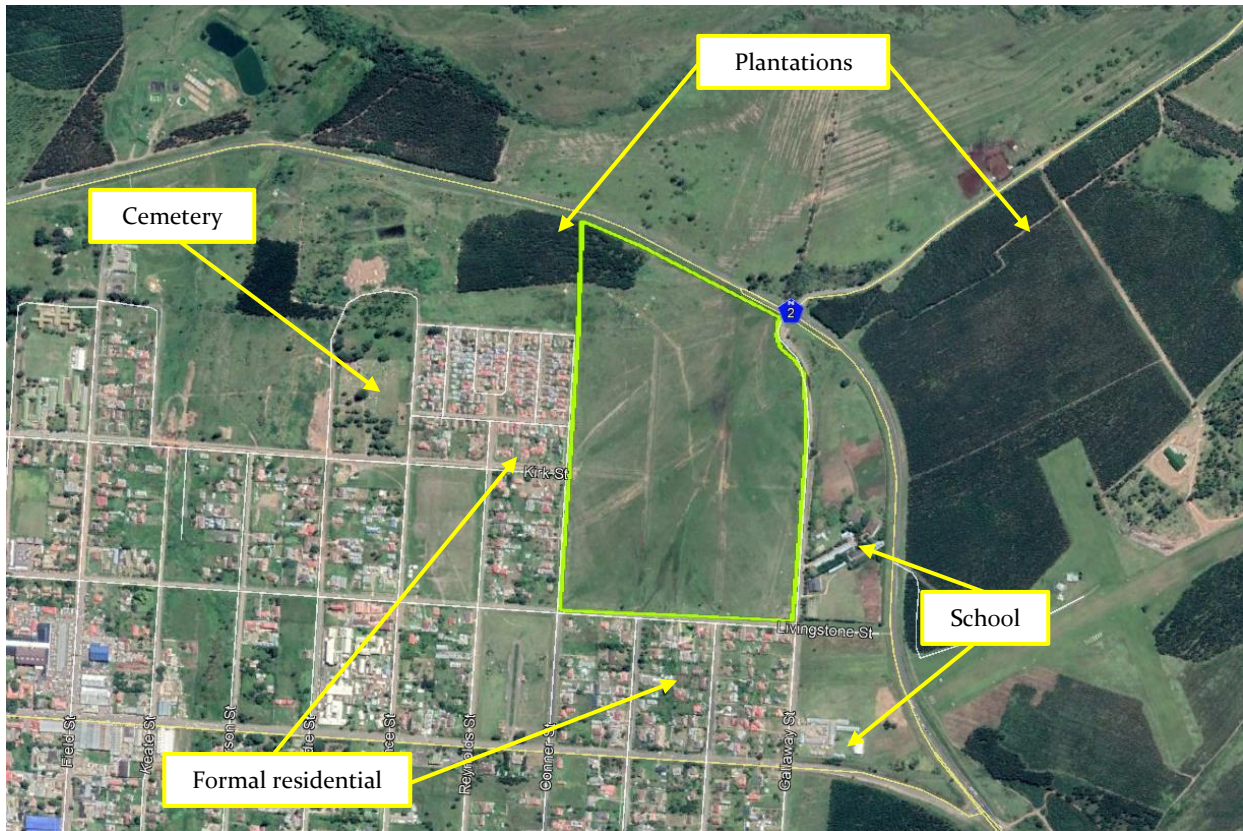
The site is considered gentle to moderately sloping with none to very few topographical features. Elevation generally decreases from the south to north at approximately 848m MSL to the south and 827m MSL in the north.

The primary drainage across this site is governed by the outflow of a small Dam towards the north east of the project area which has resulted in the development of a Marshland/Wetland area culminating in a topographic depression in the central portion of the site. It is anticipated that secondary drainage is likely to be directed towards this topographic depression during severe or intense rainfall events.

4.3 SURROUNDING LAND USE

As depicted in Figure 4.1 below, majority of the site is currently vacant and small north western portion contains tree plantations. In terms of surrounding land uses, formal residential units are located to the west and south of the site; the N2 Highway borders the site to the north and to the east of the project area, two schools are located, namely Harding Special School and Sehole High School.

Figure 4.1: Surrounding Land Uses



Source: Google, 2021

4.4 PHOTOGRAPHIC OVERVIEW OF THE SITE

The following photos provide an overview of the proposed development area.

Photo 4.1: Overview of the Project Area

Eastern View (Opposite Harding Special Needs School)



Western View



Southern View



Northern View



4.5 BIOPHYSICAL ENVIRONMENT

4.5.1 Biodiversity Assessment

A Biodiversity Assessment was undertaken in was undertaken in April 2020 by the Biodiversity Company and is attached as **Appendix G1**.

4.5.1.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. According to the spatial dataset the proposed development is located within a Vulnerable (VU) ecosystem.

4.5.1.2 Ecosystem Project Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. The proposed development is located within a Not Protected (NP) ecosystem.

4.5.1.3 Protected Areas

A "protected area" means a protected area referred to in section 9 of the National Environmental Management: Protected Areas Act (a) where the management of such area was assigned to the Province in terms of section 38 of the National Environmental management: Protected Areas Act; or (b) declared by the MEC as a nature reserve or protected environment in terms of this Act or in terms of section 23 of the National Environmental Management: Protected Areas Act.

According to the protected area spatial datasets from EKZNW, the proposed development does not occur within any protected area and is approximately 30 km from the nearest formally protected area, the Oribi Gorge Nature Reserve.

4.5.1.4 Critical Biodiversity Areas

Critical Biodiversity Areas (CBAs) are natural or near-natural features, habitats or landscapes that include terrestrial, aquatic and marine areas that are considered critical for:

- meeting national and provincial biodiversity targets and thresholds;
- safeguarding areas required to ensure the persistence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or
- conserving important locations for biodiversity features or rare species.

Conservation of these areas is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. The proposed development is not located within a CBA, albeit there are CBAs within 1.5 km of the proposed development area.

4.5.1.5 Important Birds and Biodiversity Areas

Important Bird and Biodiversity Area (IBAs) are places of international significance for the conservation of birds and other biodiversity. The proposed development is not located within an IBA and is located approximately 6 km from the nearest IBA, KwaZulu-Natal Midlands Mistbelt Grassland.

4.5.1.6 Vegetation Type

The project area is situated within the grassland biome. Major macroclimatic traits that characterise the grassland biome include seasonal precipitation and the minimum temperatures in winter. The topography is mainly flat and rolling but includes the escarpment itself. Specifically, the project area is situated across two vegetation types; Dry Coast Hinterland Grassland and the azonal Highveld Alluvial Vegetation.

4.5.1.7 Indigenous Flora

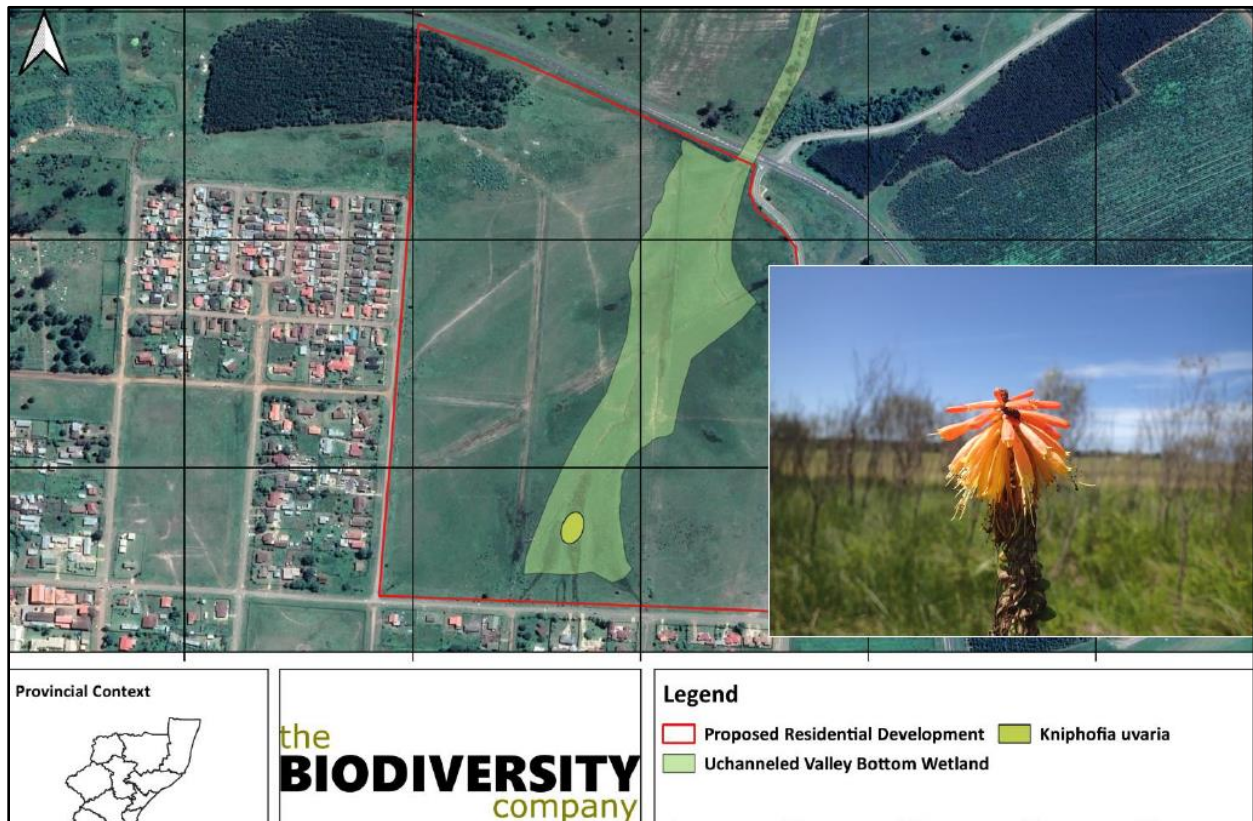
The indigenous flora species richness was relatively low within the assessment area, with only 29 species of indigenous flora recorded. None of the species recorded were threatened, albeit a single species, *Kniphofia uvaria*, is protected under the KwaZulu-Natal Nature Conservation Ordinance (Ordinance 15 of 1974) (see Map 4.2 and Figure 4.2).

Figure 4.2: Indigenous flora recorded within the site. A = *Diclis reptans*, B = *Rhyncosia totta*, C = *Commelina benghalensis*, D = *Polygala hottentota* and E = *Persicaria serrulata*



Source: Wetland and Biodiversity Risk Assessment Report, 2020

Map 4.1: Location and general extent of *Kniphofia uvaria* specimens recorded within the site



Source: Wetland and Biodiversity Risk Assessment Report, 2020

4.5.1.8 Invasive Alien Plants (IAPs)

Twelve (12) species of Invasive Alien Plants were recorded within the assessment area with seven (7) categorised as Category 1b, and must therefore be removed and controlled by implementing an alien invasive plant management programme in compliance with section 75 of the National Environmental Management: Biodiversity Act (NEMBA).

4.5.1.9 Faunal Assessment

4.5.1.9.1 Herpetofauna (Reptiles & Amphibians)

Overall, herpetofauna diversity in the project area was considered depauperate, with only a single species being recorded during the survey based on either direct observation or the presence of visual tracks and signs.

4.5.1.9.2 Avifauna

Avifauna diversity within the assessment was regarded as extremely low as only two (2) species were recorded in the assessment area during the field survey. None were Species of Conservation Concern (SCC).

4.5.1.9.3 Mammals

Overall, mammal diversity in the project area was considered depauperate, with no mammal species being recorded during the survey based on either direct observation or the presence of visual tracks and signs.

4.5.1.10 Habitat Types and Sensitivity

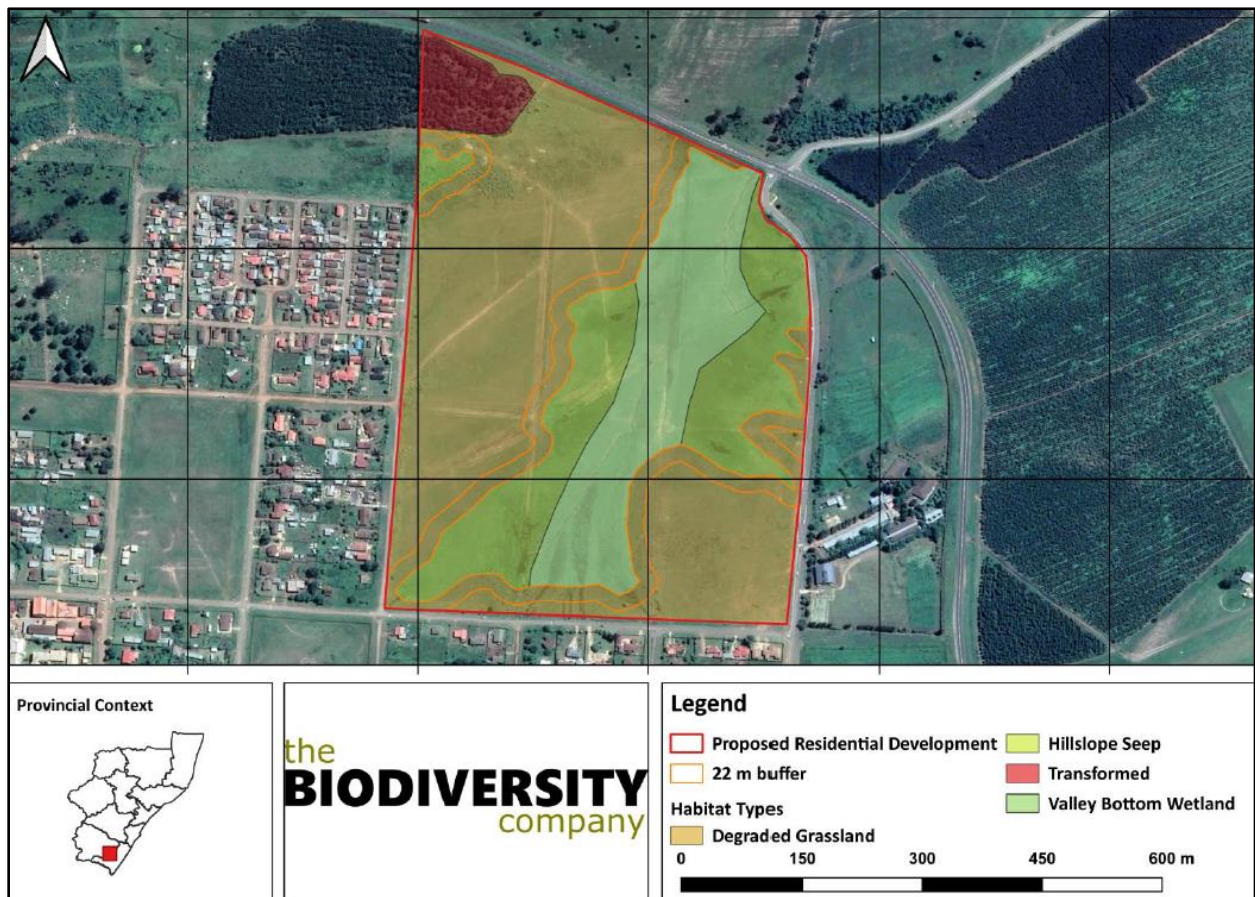
This section details habitats within the assessment at a finer resolution than the vegetation type indicated within the desktop assessment (Mucina & Rutherford, 2006). The different habitat types within the assessment area were delineated and a sensitivity rating was applied to each habitat type. Areas that were classified as having low sensitivities are those areas which were deemed by the specialists to have been most impacted upon and/or were substantially modified from their original condition due to factors such as human activity and/or presence of alien invasive species. Habitats with a high sensitivity are those, that if altered, would have a considerable negative influence on local biodiversity.

Four (4) different habitat types were delineated within the assessment area, and comprised of hillslope seep, unchannelled valley bottom wetland, degraded grassland and transformed (Map 4.2). The unchanneled valley bottom wetland was unique within the assessment and consisted of flora species disparate to the other habitat types. The dominant flora species within this habitat type included *Juncus effusus*, *Setaria sphacelata*, *Commelina benghalensis* and *Persicaria serrulata*. It is important to note that, *Kniphofia uvaria*, was limited to this habitat and this local population is currently threatened by the invasive *Sesbania punicea*. Additional invasive species within this habitat include *Centella asiatica* and *Oenothera rosea*. This habitat type was regarded as possessing high sensitivity, due to the ecosystem services that wetlands provide as well as the presence of protected hydrophytes.

The hillslope seeps and degraded grassland were similar in their floral species composition. The dominant graminoid species comprised of *Aristida junceiformis*, *Melinis repens* and *Cymbopogon caesius*. The ubiquitous herbaceous species within the assessment area included *Nidorella undulata*, *Senecio coronatus*, *Senecio rhomboideus*, *Rhychosia totta* and *Polygala hottentota*. *Trinervitermes sp.* (Isoptera) mounds were important ecological features within the grassland habitat. The hillslope seeps were regarded as possessing 'high' sensitivity due to the hydrological links to the valley bottom wetland (Map 4.3), whereas the degraded

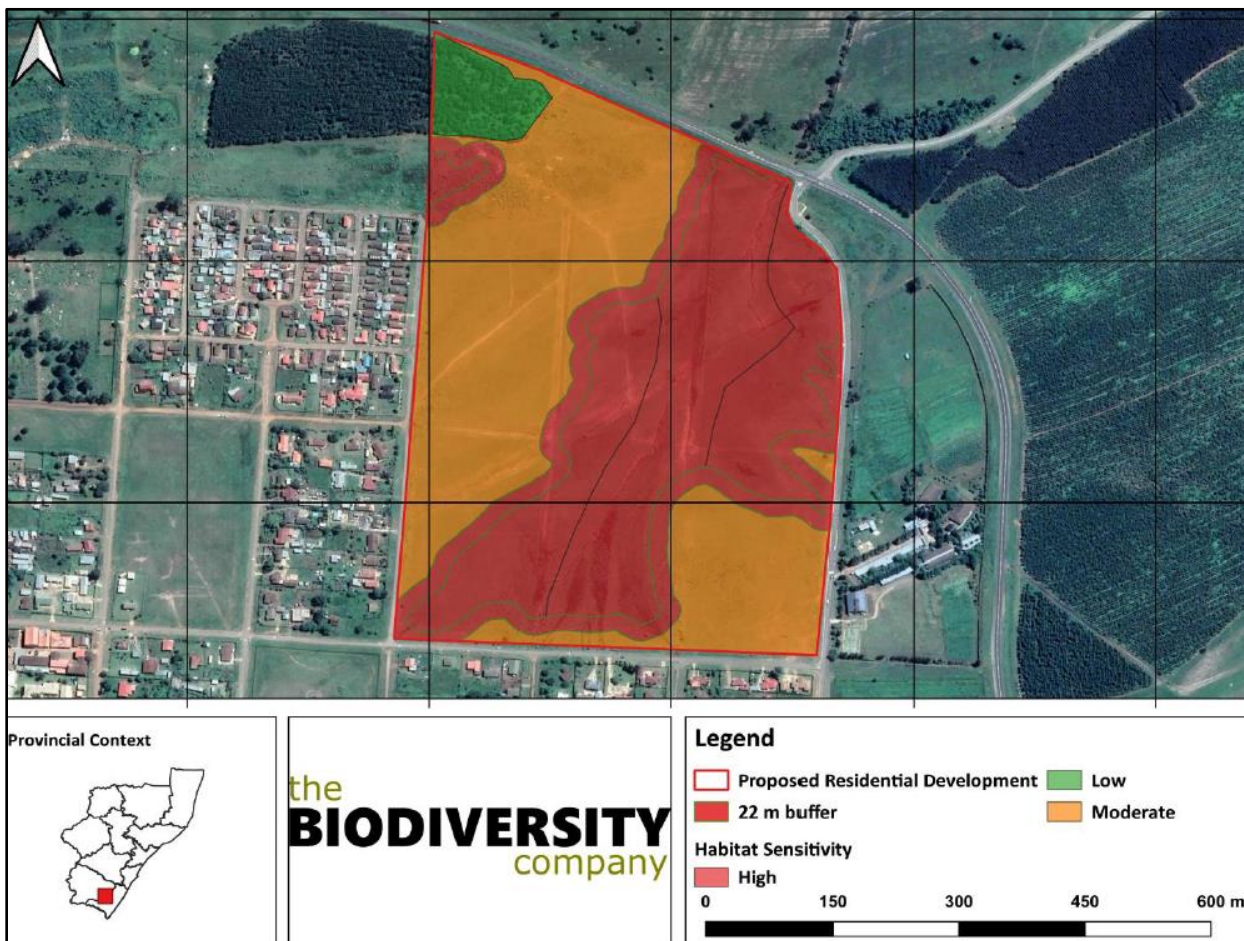
grassland habitat was regarded as possessing ‘moderate’ sensitivity, due to its degraded nature (Map 4.3). It was not regarded as possessing ‘low’ sensitivity due to the presence of *Trinervitermes* sp., as they are important for maintaining soil processes and provide a valuable food source for higher trophic organisms. In addition, their mounds provide important micro-habitats for an array of herpetofauna. However, the grassland that is located within the assigned 22 m wetland buffer zone, was regarded as possessing a high level of sensitivity (Map 4.3) because any anthropogenic activity within the buffer will have considerable negative impacts to the associated wetlands. The transformed habitat comprised of a stand of the invasive *Acacia mearnsii*, and therefore was considered as possessing ‘low’ sensitivity (Map 4.3).

Map 4.2: Map illustrating the habitat types delineated within the site



Source: Wetland and Biodiversity Risk Assessment Report, 2020

Map 4.3: Map illustrating the sensitivity of habitats delineated within the project area



Source: Wetland and Biodiversity Risk Assessment Report, 2020

As aforementioned, the biodiversity survey included actively searching for Formicidae within the assessment in order to inform on the ecological state of the habitats, as they are reliable indicators of vegetation or habitat condition. Only two species of Formicidae were recorded within the assessment area, *Anoplolepis custodiens* (Large Pugnacious Ant) and *Pheidole megacephala* (Big-headed House Ant). Both of these species are widespread and tolerant of habitat degradation via anthropogenic influences. The relatively low species richness and the dominance of the community by tolerant species, denotes that the vegetation within the assessment area is in a degraded state.

4.5.1.11 Potential Impacts Anticipated

The biodiversity impact assessment for the proposed Harding residential development considers the following potential impacts:

- *Construction phase:*
 - Degradation, destruction and/or fragmentation of high sensitive habitats, if construction work or waste material is allowed to penetrate these habitats;
 - Spilling of hazardous chemicals into the soil and nearby surrounding environment
 - Displacement of faunal community due to habitat loss and disturbance (noise, dust and vibration) and/or direct mortalities;
 - Soil erosion and the consequent sedimentation of wetland habitats (especially due to stormwater runoff), if no erosion control measures are implemented; and
 - Spread of IAPs into disturbed areas.

- *Operational phase:*
 - Continued encroachment and establishment of IAPs into disturbed areas;
 - Loss of sensitive wetland habitats if appropriate buffers are not maintained;
 - Sewage surcharges into the surrounding environment and sensitive areas;
 - Installation of electrical transmission lines resulting in bird strikes and electrocutions;
 - Loss of natural vegetation within wetland buffer due to rubbish dumping and erosion; and
 - Increase in pest species due to improper waste disposal

4.5.1.12 Mitigation Measures

- It is recommended that areas to be developed be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All work areas, offices, and access roads must be clearly demarcated from surrounding sensitive areas. All areas outside of the demarcated areas should be declared a 'no-go' area during the construction phase and all efforts must be made to prevent access to this area from construction workers and machinery.
- These must be designated as 'open-spaces' during the operational phase but it is imperative to inform the residents on the importance of these no-go areas and the valid uses and restrictions of them.
- All dumping of waste material, especially bricks and contaminated materials or soils, into the environment must be prevented. Solid waste is to be disposed legally off-site in the relevant waste disposal manner.

- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.
- Any topsoil that is removed during construction must be appropriately removed and stored. This includes on-going maintenance of such topsoil piles so that they can be utilised for re-vegetation purposes when necessary.
- Implementation of an alien vegetation management plan for the site is required. This is especially in areas that are cleared of vegetation and left exposed. Upon completion of construction any exposed areas must be re-vegetated with local indigenous plants to prevent IAP encroachment.
- Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially negatively affecting the functioning of the ecosystem. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.
- Any possible contamination of topsoil by hydrocarbons, concrete or concrete water must be avoided and an emergency spill kit must always be available on site.
- Materials must be stored in leak-proof, sealable containers or packaging.
- No storage of vehicles or equipment will be allowed outside of the designated area.
- Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.
- No servicing of equipment on site unless absolutely necessary.
- Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.
- Have action plans on site, and training for contactors and employees in the event of sewage spills, leaks and other impacts to the surrounding environment.
- A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise is not available on site.
- A qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna that is found during construction.
- If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. This is applicable to all species, especially smaller species such as rodents, reptiles and amphibians.
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited.

- Any open trenches that are left open for more than two hours, should have at least one end that is sloped/tapered, in order to allow animals that fall in, to escape. If this is not possible, then branches should be placed inside the trenches to allow small animals to climb out of the trenches.
- It is imperative that suitable solid waste disposal facilities be available for the housing development during the operational phase as the lack of such facilities will lead to rubbish dumping, thereby leading to an increase in pest species and associated health hazards.
- Bird flaps/markers must be installed on any telephone or electric cables to prevent any bird collisions. This is particularly pertinent to movement to and from the valley-bottom wetland.

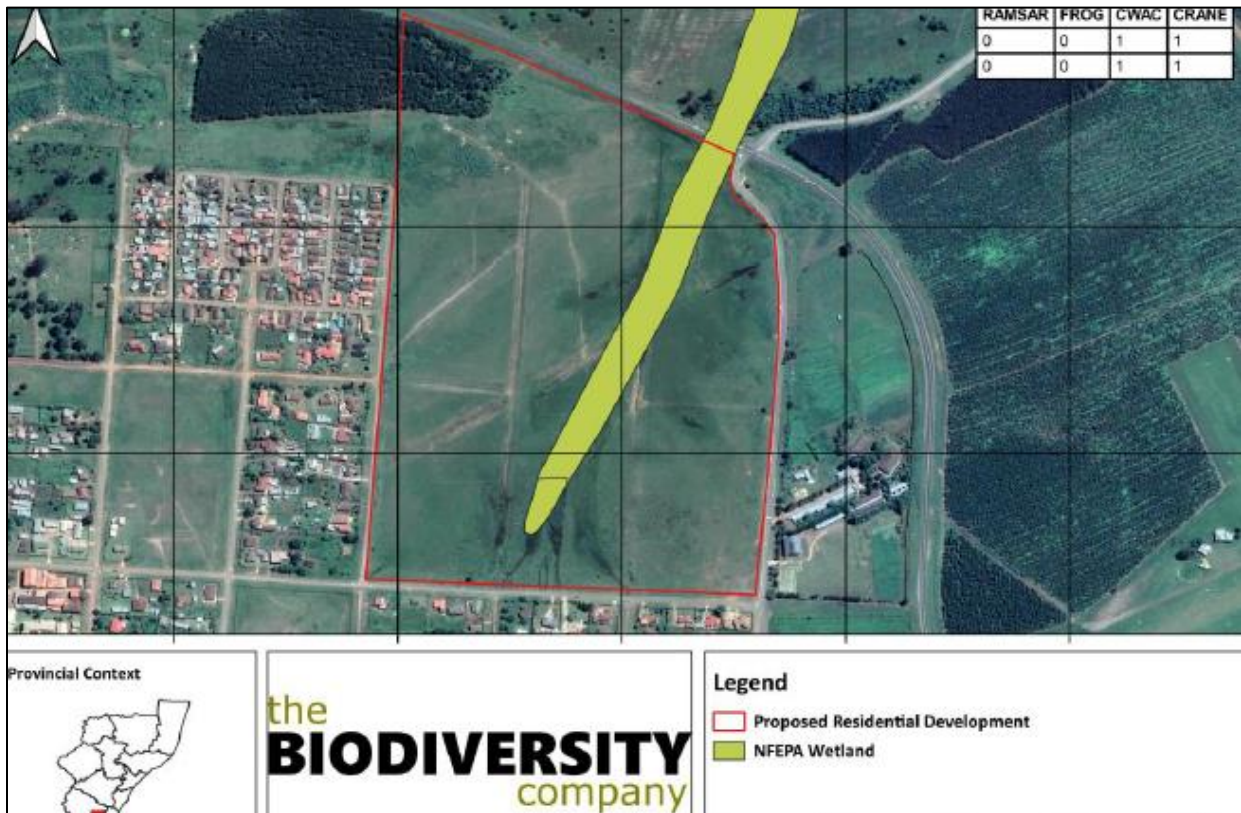
4.5.2 Wetland Assessment

A Wetland Assessment was undertaken in April 2020 by the Biodiversity Company and is attached as **Appendix G2**.

4.5.2.1 National Freshwater Ecosystem Priority Areas (NEPAs)

The National Freshwater Ecosystem Priority Areas (NFEPAs) provides strategic spatial priorities for conserving the country's freshwater ecosystems and associated biodiversity as well as supporting sustainable use of water resources. The proposed development overlaps with NFEPAs wetlands (Figure 4.3).

Figure 4.3: National Freshwater Ecosystem Priority Area Wetlands



Source: Wetland and Biodiversity Risk Assessment Report, 2020

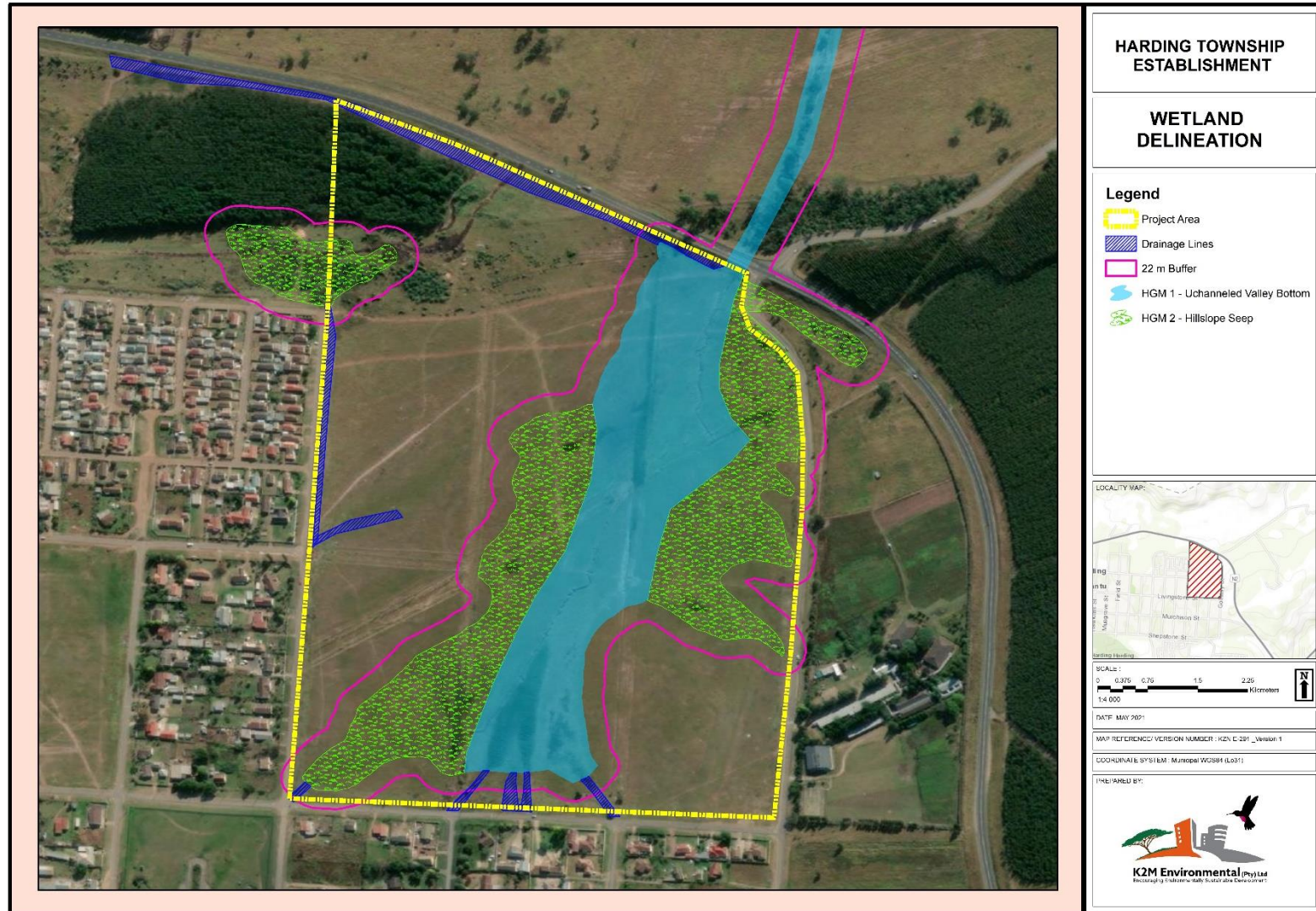
4.5.2.2 Wetland Delineation and Description

The wetland areas were delineated in accordance with the DWAF (2005) guidelines. Two wetland types were identified within the 500 m regulated area, namely:

- an unchanneled valley bottom (HGM 1) and
- a hillslope seep (HGM 2)

In addition to these systems, various artificial drainage lines have been identified throughout the project area. These drainage lines feed the majority of these wetlands, which emphasises the anthropogenic component of the delineated wetlands. HGM 1 is predominantly fed by stormwater inputs south of the project area. This system flows north, crosses underneath the N2 road and is then channelled into a narrow artificially straightened system. HGM 1 also is fed by hillslope seep (HGM 2), which in turn is predominantly also fed by stormwater inputs. Map 4.4 illustrates the location and extent of these wetlands.

Map 4.4: Wetland Delineation with the project area



4.5.2.3 Ecological Functional Assessment

The ecosystem services provided by the wetland units identified on site were assessed and rated using the WET-EcoServices method (Kotze *et al.*, 2008). Both HGM units have been scored “Intermediate” average ecosystem service scores (See Table 4.1 below).

“High” and “Very High” scores are attributed to indirect benefits concerning the assimilation of contaminants. The surrounding community contributes to pollutants nitrates, phosphates and many other toxicants) entering the streets, which in turn is channelled into the delineated wetlands by means of stormwater systems.

Table 4.1: The ecosystem services being provided by the HGM Types

Wetland Unit			HGM 1	HGM 2		
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation	2.0	2.0	
			Streamflow regulation	2.3	2.0	
			Water Quality enhancement benefits	Sediment trapping	2.7	2.3
		Phosphate assimilation		2.8	3.0	
		Nitrate assimilation		3.1	3.2	
	Direct Benefits	Regulating and supporting benefits	Toxicant assimilation	2.9	2.9	
			Erosion control	1.9	2.2	
			Carbon storage	1.3	1.7	
		Provisioning benefits	Biodiversity maintenance		0.9	1.1
			Provisioning of water for human use		0.9	0.7
Provisioning of harvestable resources			0.0	0.0		
Provisioning of cultivated foods			0.0	0.0		
Cultural benefits			Cultural heritage		0.0	0.0
			Tourism and recreation		0.4	0.4
			Education and research		1.8	1.3
Average Eco Services Score			1.5	1.5		

Source: Wetland and Biodiversity Risk Assessment Report, 2020

4.5.2.4 The Ecological Health Assessment

The Hydrology of HGM 1 and 2 have been scored “Critically Modified” and “Seriously Modified”, predominantly due to the increase in flows from stormwater inputs. It is expected that approximately 80-90% of HGM 1 and 60-70% of HGM 2 is fed by stormwater inputs. Difficulties do exist in distinguishing between naturally fed and artificially fed hillslope seeps, due to the fact that these systems are fed by means of sub-surface flows (which could originate from stormwater inputs).

The Geomorphology of HGM 1 and 2 have been determined to be “Moderately Modified” and “Natural” respectively. HGM 2’s geomorphology has not been affected by any components that have not already been taken into consideration during the hydrology modification scores. As for HGM 1, various drains/gullies that are artificial have been identified during the site assessment, with evidence of extensive erosion throughout.

The Vegetation aspect of the delineated wetlands have been affected by erosion and grazing, which effects fragile indigenous species within delineated wetlands.

The overall wetland health for HGM 1 and 2 have been scored “Seriously Modified” and “Moderately Modified” respectively. This indicates a much higher level of disturbances for HGM 1 due to the magnitude of artificial/stormwater inputs. The PES for the assessed HGM types is provided in Table 4.2 below.

Table 4.2: Summary of the scores for the wetland PES

Wetland	Hydrology		Geomorphology		Vegetation		Overall PES	
	Rating	Score	Rating	Score	Rating	Score	Rating	Score
HGM 1	Critically Modified	10	Moderately Modified	2.7	Largely Modified	4.3	Seriously Modified	6.4
HGM 2	Seriously Modified	6.5	Unmodified/Natural	0.9	Moderately Modified	2.5	Moderately Modified	3.7

Source: Wetland and Biodiversity Risk Assessment Report, 2020

4.5.2.5 The Ecological Importance and Sensitivity Assessment

The wetland EIS assessment was applied to the HGM units described in the previous section in order to assess the levels of sensitivity and ecological importance of the wetland. The results of the assessment are shown in Table 4.3.

Table 4.3: The EIS results for the delineated HGM type

Metric	HGM 1	HGM 2
Ecological importance and sensitivity	1.8	1.2
Hydrological/functional importance	2.4	2.4
Direct human benefits	0.5	0.4

Source: Wetland and Biodiversity Risk Assessment Report, 2020

The Ecological Importance and Sensitivity has been scored “Moderate” for both HGM units predominantly due to the fact that the vegetation type (Dry Coastal Hinterland) has a conservation status of “Vulnerable”.

The Hydrological/Functional Importance refers to the ability of a wetland to indirectly provide the surrounding environment of services and the importance of such functions. The hydrological/functional importance for both HGM units has been scored “High”. The following ecosystem services contribute to the level of hydrological/functional importance for the respective HGM units;

- Streamflow regulation;
- Sediment trapping;
- Phosphate assimilation;
- Nitrate assimilation;
- Toxicant assimilation; and
- Erosion control.

The Direct Human Benefits have been scored “Low” for both HGM units. This level of score illustrates the lack of provisioning to the surrounding community.

4.5.2.6 Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane *et al.*, 2014) was used to determine the appropriate buffer zone for the proposed activity. A pre-mitigation buffer zone of 33m is recommended for the identified wetlands, which can be decreased to 22m with the addition of all prescribed mitigation measures. Table 4.4 below shows the pre- and post- mitigation threat ratings for the proposed development.

Table 4.4: Pre- and post- mitigation threat ratings for the proposed development.

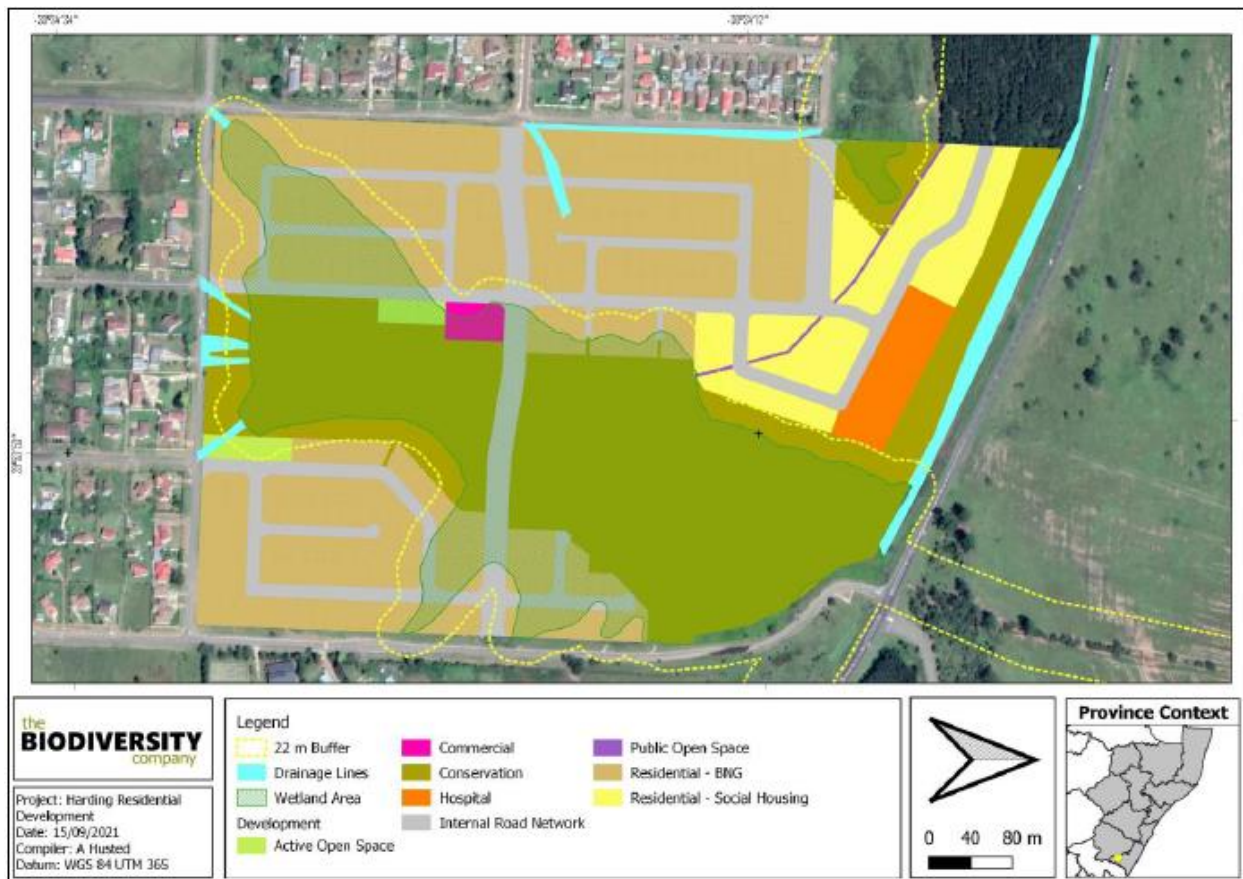
Phase	Threat	Pre-Mitigation Threat Rating	Post-Mitigation Threat Rating
		Proposed Development	
Construction Phase	Alterations to flow volumes	Very Low	Very Low
	Alterations of patterns of flows	Low	Low
	Increase in sediment inputs and turbidity	Very High	Moderate
	Increased nutrient inputs	Very Low	Very Low
	Inputs of toxic organic contaminants	Very Low	Very Low
	Inputs of toxic heavy metals	Low	Low
	Alterations of acidity (pH)	Low	Low
	Increased inputs of salts	N/A	N/A
	Change in water temperature	Very Low	Very Low
	Pathogen inputs	Very Low	Very Low
Operational Phase	Alterations to flow volumes	Moderate	Moderate
	Alterations of patterns of flows	Moderate	Moderate
	Increase in sediment inputs and turbidity	Moderate	Low
	Increased nutrient inputs	Moderate	Low
	Inputs of toxic organic contaminants	Moderate	Low
	Inputs of toxic heavy metals	Moderate	Low
	Alterations of acidity (pH)	Very Low	Very Low
	Increased inputs of salts	Very Low	Very Low
	Change in water temperature	Very Low	Very Low
	Pathogen inputs	Moderate	Low

Source: Wetland and Biodiversity Risk Assessment Report, 2020

4.5.2.7 Risk Assessment

It is evident from the proposed development layout that in spite of the designated conservation areas, portions of wetland area will be lost, which must be compensated for (Figure 4.4). A total wetland area of 4.2 ha and a buffer area measuring 2.7 ha will be lost as a result of the development (Figure 4.5), and this extent must be considered for the compensation strategy.

Figure 4.4: Wetland and buffer area overlaying the development layout



Source: Wetland and Biodiversity Risk Assessment Report, 2020

Figure 4.5: The demarcated wetland and buffer areas that will be lost



Source: Wetland and Biodiversity Risk Assessment Report, 2020

4.5.2.8 Potential Impacts Anticipated

It is the specialist’s opinion that the avoidance of buffer zones will decrease the significance ratings considerably. Three significance rating situations will be assessed during the risk assessment, including “pre-mitigation,” “post-mitigation” and “post mitigation and adherence to buffer zones.” Various aspects were determined to have “Moderate” pre-mitigation significance ratings with some not expected to be decreased to “Low” significance ratings with the application of mitigation measures. Those aspects that are not expected to be decreased in significance ratings by means of mitigation, will only be decreased to “Low” once the recommended buffer zones are implemented.

In the event that adherence to the buffer zones is not feasible in regard to the economics of the residential development, it is recommended that the third and fourth step of the mitigation hierarchy be combined to carry out wetland offsets in the form of on-site rehabilitation. This should include rectifying the stormwater inputs and redirecting these inputs by means of a stormwater plan. This phenomenon will decrease the extent

of the wetlands and improve the integrity of the wetlands significantly. In the event that the extent of wetlands decreases, another wetland assessment could be carried out 2 years after the construction of the stormwater management system. The proposed development may be expanded depending the relevant wetland assessment's conclusions if delineated wetlands are found to be significantly smaller.

4.5.2.9 Mitigation Measures

- The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;
- It is deemed important that the all wetland areas be demarcated as sensitive areas, and no construction activity, laydown yards, camps or dumping of construction material are to be permitted within the sensitive zones (where possible);
- During construction activities, all rubble generated must be removed from the site;
- The first 300 mm of soil must be stockpiled separate from the soil excavated deeper than 300 mm;
- Construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access;
- All chemicals and toxicants to be used for the construction must be stored outside the channel system and in a bunded area;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation);
- All removed soil and material must not be stockpiled within the system. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- No dumping of construction material on site may take place;
- All waste generated on site during construction must be adequately managed. Separation and recycling of different waste materials should be supported;

- The boundary of the wetland buffer that encroach into the proposed development footprint must be made visible to those individuals making use of the proposed development. This can be done by erecting signs along the wetland buffer bordering against the proposed footprint area to ensure that unwanted activities do not take place within this area. The signs will indicate the extent of the no-go area while allowing humans and animals to still make use of the wetland; and
- Signs erected along the indicated buffer zone must warn individuals against unwanted anthropogenic activities, including dumping, construction and laydown yards during the operational phase. Recreational activities can still be permitted within this area (i.e. walks, having picnics etc.). Key activities that should be disallowed within this zone includes swimming, harvesting plants and consuming water from the wetland.

4.5.3 Wetland Compensation Strategy & Conservation Management

A Wetland Compensation Strategy was undertaken in September 2021 by The Biodiversity Company and is attached as **Appendix G3**. It should be noted that the conservation management measures to minimize the impact on the designated conservation area and to improve / restore the habitat have been included in the Wetland Compensation Strategy.

The approach for the strategy was to quantify any risks to the affected wetland systems, and then to provide recommendations and rehabilitation actions to sufficiently (or adequately) compensate for these risks. This has been informed by the ecological context of the systems, and the associated conservation attributes, all of which was document in the report compiled by TBC in April 2020, titled “*Wetland and Biodiversity Risk Assessment for the proposed Harding Residential Development*”.

The layout of the development would result in the infilling and loss of wetland portions, and the associated buffer areas. It is evident from this layout that in spite of the designated conservation areas, portions of wetland area will be lost. A total wetland area of 4.2 ha and a buffer area measuring 2.7 ha will be lost as a result of the development. Due to these losses, it was recommended that a wetland offset strategy be compiled focussing on on-site rehabilitation by means of redirecting stormwater.

4.5.3.1 Development Impact

A summary of the Present Ecological State (PES) of the affected seepage wetland system is presented in Table 4.5. The extent of the proposed development is expected to result in a net loss of 2.6 hectare equivalents of wetland habitat

Table 4.5: Determination of the development impact score

Wetland Area (ha)	4.2 ha
Combined Impact Score	3.7
Combined PES Score (%)	63%
Combined Ecological Category	C (Seriously Modified)
Hectare Equivalents	2.6

Source: Wetland Compensation Strategy, 2021

4.5.3.2 Functional Value

An approach developed by Kotze *et al.* (2020) to quantify risks to regulating and supporting services was implemented for this approach, namely WET-EcoServices (Version 2). This approach requires evaluating important functional values at a defined catchment level, and then considering the WET-EcoServices results to determine a Functional Value (%) for the affected system. The score is multiplied by the extent of the wetland area to be affected to determine the hectare equivalents measure (Kotze *et al.*, 2020). The weight of the functions is based on the current and also expected benefits provided by the seepage system. For this approach, there is little to differentiate between the considered functions, with flood attenuation and water quality enhancement the two most important functions. Based on this approach, the proposed development is likely to result in a loss of 6.3 functional hectare equivalents.

Table 4.6: The effectiveness in providing regulating / supporting services

Function / Service Group	Weighting (%)	PES ¹
Flood Attenuation	40%	2.0
Streamflow Regulation	60%	2.0
Sediment Trapping & Erosion Control	40%	2.3
Water Quality Enhancement	60%	3.0
Functional Value (%)		60%
Wetland Area (ha)		4.2
Functional Hectare Equivalents		3.15

Source: Wetland Compensation Strategy, 2021

1 - These values have been sought from the baseline assessment (TBC, 2020) WET-EcoServices component

4.5.3.3 Quantifying Residual Risks

The baseline assessment (TBC, 2020) identified a total of six aspects that were rated as posing a “Moderate” post-mitigation significance risk, because of the wetland system being directly affected by the proposed development layout. These direct “Moderate” risks resulted in further investigation to determine the need and required measures to provide suitable compensation.

According to the best practice guideline for South Africa for wetland offsets (SANBI & DWS, 2019) wetland offsets are required to compensate for significant residual adverse impacts on wetlands. To determine the relevant level of (significant) residual impacts, an impact methodology designed by Eco-Pulse Consulting (Macfarlane, 2015) was implemented. The Eco-Pulse Consulting approach considers four key aspects or ultimate consequences when considering impacts to a water resource, namely water resource management, habitat conservation, species conservation and also direct use values. Based on this approach, risks posed to the four key aspects were determined to varying levels of significance (Table 4.7). This significance rating is also defined as acceptable for the species of conservation concern and social values, but compensation is required for the water resource management and habitat. The motivation for the significance ratings are summarised as follows:

- **Water Resource Management:** The affected system is a hillslope seep, adjoining a delineated valley bottom wetland that will not be directly affected by the development. The seepage wetland is not located within the major drainage network. The system is in a moderately modified state, with hydrology determined to be seriously modified, primarily due to the inflows from stormwater. The wetland is estimated to provide a relatively high level of “Indirect Benefits” due to the levels of erosion control that the wetland provides and the fact that this system is expected to assimilate phosphates, nitrates and other toxicants. In spite of the size of the wetland and considering the size of the catchment area suggests that the intensity of the risks qualify as moderately high. Based on these the functional losses have been classified as “Moderately High”, which does require compensation for the respective risks.
- The proposed development will result in a localised impact resulting in 4.2 ha of seepage wetland being directly affected by the project. The associated vegetation group is classified as Endangered, but the vegetation has been classified as degraded grassland and assigned a moderate sensitivity. The intensity of the risk has been classified as moderate. In consideration of the permanent nature of the risk, the overall risk significance was determined to be “Moderately”. Based on this, compensation should be considered.

- The development is located in an ecosystem that is listed as Vulnerable but with four associated habitat units, with predominantly moderate to high sensitivity. It is important to note that, *Kniphofia uvaria*, was limited to the valley bottom system and this local population is currently threatened by the invasive *Sesbania punicea*. No species of conservation concern were identified for the wetland system to be lost. Risks to the species is expected for the local area, with the intensity of the associated risks expected to be moderate. The overall risk significance was determined to be “Moderately Low”. Based on this, compensatory measures to address risks to species of conservation concern are not required.
- The loss of the current land uses is expected to pose a site (scale) risk, not providing key direct use values. The overall risk was determined to be “Low”.

Table 4.7: Impact significance assessment

No.	Nature of Impact	Status	Extent	Intensity	Duration	Probability	Significance	Confidence
1	Water Resource Management	Negative	Local	Moderately High	Permanent	Definite	Moderately High	High
2	Habitat Conservation	Negative	Local	Moderate	Permanent	Definite	Moderate	High
3	Species Conservation	Negative	Surrounding Area	Moderate	Permanent	Definite	Moderately Low	High
4	Direct Use Values	Negative	Site	Low	Permanent	Definite	Low	High

Source: Wetland Compensation Strategy, 2021

4.5.3.4 Compensatory Calculations

Preliminary recommendations that pertain to important actions or measures that should be implemented to provide some level of compensation for the expected loss of wetland habitat and functioning are detailed in the subsequent sections. This should be discussed with issuing and also local authorities to determine the feasibility of these recommendations to support other future developments, and the potential implications of these developments of these actions or measures.

4.5.3.4.1 *Receiving Targets*

The recommended approach to achieve the required level of compensation is a combination of averted loss and also rehabilitation. The valley bottom system will be avoided for the development and has been demarcated as a conservation area. Approximately 4.2 ha of seepage area will not be lost and has also been incorporated into the conservation area. Both these systems will require rehabilitation measures to improve the integrity and functioning of the systems.

The extent of this offset / conservation area would measure 11 ha, comprising of 4.2 ha of seepage area and 6.8 ha of valley bottom area. To determine the suitability of the prescribed offset / conservation area, the potential gains or contributions of the selected area were assessed.

The wetland offset / conservation area within the development was determined to be an acceptable candidate to contribute to the overall compensation requirements. The combination of the remaining seepage wetland and valley bottom system are generally considered to meet the requirements for like-for-like, the area to be rehabilitated is the area that will be affected by the development and the integrity and functioning of the systems can be improved.

The findings from the offset calculation below suggest that the identified wetlands, located in the offset / conservation area, will cumulatively be adequate to meet the minimum requirements for all components of the wetland functionality offset targets. Table 4.8 presents a summary of the minimum offset functionality target requirements and the offset deficit / contributions determined from the wetlands to be impacted and the potential candidate offset wetlands, respectively. It is apparent from that that a deficit remains for the offsetting of the seepage system, but a gain is expected for the offset of the seepage collective with the valley bottom area. Further to this, Table 4.9 presents the wetland conservation offset targets. There is a hectare equivalent gain for the seepage system alone, but combining the seepage area with the valley bottom system there is a considerable overall gain in conservation contributions.

Table 4.8: The calculated minimum offset functionality requirements and offset contributions

HGM Unit	Area	PES	Functional Hectare Contribution	Functional Hectare Equivalent Target	Deficit/Gain (Offset contribution)
Seep	4.2	Moderately modified	0.7	2.6	-1.9
Valley bottom	6.8	Seriously modified	2.0	-	2.0

Source: Wetland Compensation Strategy, 2021

Table 4.9: The calculated minimum offset conservation requirements and offset contributions

HGM Unit	Area	PES	Conservation Hectare Contribution	Conservation Hectare Equivalent Target	Deficit/Gain (Offset contribution)
Seep	4.2	Moderately modified	6.6	3.15	3.45
Valley bottom	6.8	Seriously modified	9.5	-	9.5

Source: Wetland Compensation Strategy, 2021

4.5.3.5 Compensatory Actions

The recommended ecological category for the conservation area is a class C (or moderately modified), but with the potential to achieve a class B (largely natural). Several actions or measures have been prescribed to help achieve the required level of compensation.

4.5.3.5.1 *Rehabilitation of Conservation Area*

It is recommended that the entirety of the conservation area be rehabilitated. This rehabilitation will require a change from the current land use of subsistence agriculture, dumping and informal access to a more natural status. The area was determined to be in a modified state, and the prescribed rehabilitation measures that could be implemented to improve the status and functioning of the system are presented in Table 4.10. The prescribed rehabilitation measures will also attempt to mitigate these risks to the receiving systems.

Table 4.10: Rehabilitation measures for the conservation area

Component	Description
Hydrology	<ul style="list-style-type: none"> Discharge of stormwater from the development area must avoid scouring at the outlets. Run-off from the parking / driving area must be diverted to a stormwater network and directed to an attenuation facility. Only clean water may be diverted back into the system. Stormwater attenuation ponds may not be constructed within the conservation areas.
Geomorphology	<ul style="list-style-type: none"> No large-scale engineering construction is required. Minor levelling and shaping of the area with a bobcat type machine prior to vegetating the area may be required. Avoid compaction of the area. In the event compaction is not avoided or identified, the topsoil must be ripped in two perpendicular directions to a 300mm depth and then lightly tilled to a fine seed bed. A locally indigenous seed-mix can then be applied. A botanist must advise on densities and supporting fertiliser applications.
Vegetation	<ul style="list-style-type: none"> All solid waste and dumping material must be removed from the area. Disturbed and bare area must be re-planted within indigenous vegetation that is representative of the vegetation type. A botanist and landscape architect must be consulted for species composition and contouring of the area.

- Infestation of alien vegetation must be managed, and all Category 1b alien plant species must be removed from the conservation area. This will have to be undertaken on a regular basis, expected to be quarterly.

4.5.3.5.2 *Implementation of Stormwater Measures*

The extent of the conservation area must be rehabilitated. This area has been transformed due to local developments, with stormwater inputs from adjacent developments. This area must be rehabilitated to better manage these stormwater inputs, and support (and enable) the management of stormwater for the proposed development. Surface run-off from this area must be directed through the conservation area. Recommended rehabilitation measures are presented in Table 4.11.

Table 4.11: Implementation of Stormwater Measures

Component	Description
Hydrology	<ul style="list-style-type: none"> • Discharge of stormwater from the development area must avoid scouring at the outlets. • Stormwater run-off from the adjacent developments must be attenuated. Only clean water is permitted back into the system. • Grass swales should be considered for the diversion of stormwater from the developed into the conservation area. Stormwater must be attenuated at an engineered facility.
Geomorphology	<ul style="list-style-type: none"> • Existing stormwater trenches must be backfilled and decommissioned. All stormwater inputs must be collectively considered and diverted to stormwater attenuation pond. This could be landscaped to be aesthetically pleasing.
Vegetation	<ul style="list-style-type: none"> • Bare areas must be ripped, and fertiliser applied. This must be undertaken prior to the wet season. A botanist and landscape architect must be consulted for species composition. • Infestation of alien vegetation must be managed, and all Category 1b alien plant species must be removed from the seepage area. This will have to be undertaken in a regular basis, expected to be quarterly.

4.5.3.5.3 *Design Recommendations*

The following recommendations pertain to the design and materials required for the proposed development, these include:

- Permeable pavement should be incorporated into the road and parking areas. This material is porous with an underlying stone reservoir which stores water, enabling infiltration;
- Rainwater should also be harvested on-site, and this water should be used for irrigation and landscape features;
- Soft or green engineering features should be incorporated into the management of stormwater. Only clean water may be discharged into the conservation area;
- Flowerbeds should be incorporated into the design of the development. This may include trees for shade, and also landscaped gardens. These beds should be sunken (below surface level) to act as small catchment areas; and
- Stormwater diversions and channels should be vegetated swales, avoid impermeable material. Litter traps / nets should be attached to stormwater outlets (discharge areas), these would need to be monitored and managed particularly after rainfall events.

4.5.3.6 Conservation Measures

Several conservation measures have been provided, these must be considered in addition to any prescribed mitigation measures and rehabilitation actions for the project. The purpose of the conservation measures is to minimise the impact on the designated conservation area and to improve / restore the habitat or keep it in the most natural state possible.

4.5.3.6.1 *Conservation of Bird Species*

- a) Management of this risk includes the installation of devices such as bird flappers, bird flight diverter spirals, bird guards, raptor protectors and the nocturnal “OWL” device to any planned powerlines;
- b) Placement of powerlines away from known important bird habitats or roosting sites such tall trees or waterbodies and wetlands for waders and water birds;
- c) Monitoring of powerlines to ensure efficacy of preventative measures; and
- d) Monitoring of avifaunal diversity in the project area in order to establish trends in bird populations.

4.5.3.6.2 Preservation of Wetland Habitat

- a) A stormwater management plan needs to be put in place and implemented for the lifetime for the project;
- b) Spill control programme must be in place to deal with hydrocarbons, oils and chemicals;
- c) Wetland / conservation areas must be clearly demarcated and identified as no-go areas; and
- d) Compacted areas must be ripped two ways (perpendicularly) to a depth of 300 mm. A seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled. The area must be shaped to a natural topography. No grazing must be permitted to allow for the recovery of the area.

4.5.3.6.3 Conservation of Protected Plant Species

Protected plant species are expected on the property and as such the following mitigation measures will need to be implemented:

- a) Areas of indigenous vegetation, even secondary communities, with the exception of approved development areas should under no circumstances be fragmented or disturbed further or used as an area for the dumping of waste or footpaths;
- b) Appropriate speed humps and mitre drains must be constructed along the access roads (every three metres of elevation) in order to slow the flow of water run-off from the road surface. This will help with erosion control;
- c) A Fire Management Plan (FMP) needs to be compiled for the conservation area; and
- d) Areas that are cleared of indigenous vegetation need to be managed to avoid the establishment and encroachment of alien invasive plants. Herbicide should be avoided as this is not restricted to the alien invasive plant species and will impact the species of conservation concern if it is not used appropriately.

4.5.3.7 Compilation of a Fire Management Plan (FMP)

Veld fires can lead to extensive habitat loss and death of species especially if there is fencing or ditches that prevent them from escaping from the danger.

4.5.3.8 Conservation of Natural Habitats

- a) Grazing of livestock (sheep and goats) on the site must be prohibited;

- b) Areas not earmarked for development that are disturbed during construction or operation should be rehabilitated immediately;
- c) Areas within the project footprint that are not developed should be identified as set-asides for biodiversity; and
- d) Awareness of the importance of these areas should be communicated to all contractors and tenants.

4.5.3.9 Development and Maintain a Structured Register

To ensure that the development causes no net loss of biodiversity values as a result of their activities a structured register of species should be compiled and maintained.

The register should include a detailed list of plant and animal species present within the project area as well as a photo library of many of these species that is kept by the Environmental Department / Representatives of the development. The species within this list should be classified into taxonomic groups and families, Red Data status using the IUCN Red List and their perceived threat status on the project site.

A biennial record must be kept of as many species as possible observed within the project area, with updates at least four times per year to cover all seasons and include migratory species. A record of species known to occur will never be complete, but will gradually become increasingly comprehensive. Such activities can involve all interested personnel. Qualified subcontractors can be appointed to assist with identifications of species.

Data must be formerly updated on an annual basis to assess progress, which can be measured by the growth in the number known to occur on the project site, and increases in the proportion of species that in the non-risk categories.

4.5.3.10 Implement an Internal Biodiversity Protection Statement

A Biodiversity Protection Statement to conserve plants and animals, and applicable for staff, tenants and contractors needs to be developed and implemented. The following activities should be prohibited by personnel and contractors within the project area and during work hours:

- Any forms of hunting of wildlife or trapping by personnel within or around the site, after or during work times;
- Starting or encouraging bush fires, unless part of a controlled fire management plan;
- Collection of any animals or animal products for consumption, medicinal or other use;

- Bringing of domestic pets onto site is prohibited;
- The intentional killing of any animals including snakes, lizards, birds or other animals. Awareness of the Animal Rescue Plan will be promoted as a means of addressing the presence of animals at risk or presenting a risk to the implementation of activities.

The development must include this information as part of the site induction process so that all workers are aware of these prohibitions, as well as including in environmentally related information campaigns such as its quarterly newsletter.

4.5.3.11 Implement an Animal Rescue Plan

An animal rescue procedure must be developed and implemented for the safe translocation of any faunal species found to be at risk from construction activities or posing a threat to the development. The rescue procedure shall include the following aspects:

- Selected staff will be professionally trained to handle venomous snakes, with particular emphasis on species likely to be encountered in and around the project area;
- A schedule will be maintained whereby a trained snake handler is available on call operational hours;
- Safe areas of similar habitat type will be identified where animals rescued from areas of risk can be released without harm to operations, surrounding communities or harm to that animal; and
- A register of all relocated species will be kept including their confirmed identification and photographs, which is used to update the species register.

4.5.3.12 Specialist Recommendations

The preliminary compensation strategy offers an idea to as the requirements of the final rehabilitation plan. The following recommendations are provided I support of the strategy:

1. Legal mechanisms must be put in place to ensure that conservation actions are secured (DWS and SANBI, 2016) for the conservation area, “A Conservation Servitude is a long-term biodiversity agreement on the title deed of the property, which prevents change of land use of a type that is incompatible with maintaining the desired wetland offset state for at least 30 years or the specific wetland offset project life (up to 99 years). The highest form of protection, however, is if the wetland receives full legal protection through the inclusion into a Protected Area under the National Environmental Management: Protected Areas Act, 1998 (Act no. 107 of 1998) (NEMPAA). The title deeds of the properties on which the conservation areas occur should be amended to include conditions such that no future development

- (mining, cultivation or construction) can take place if the wetland status would be compromised. Once the conservation servitude is put in place, a copy should be sent to the DWS regional catchment office”;
2. The offset / conservation area must be secured by means of a Biodiversity Management Agreement and conservation servitude that obliges the landowner to maintain the offset area in the desired wetland offset state for a duration of at least 30 years (DWS & SANBI, 2016);
 3. Compilation of a detailed rehabilitation plan to be implemented for the demarcated offset / compensation area. This plan is required to define roles and responsibilities, and also a financial analysis for achieving offset requirements. The following are recommendations:
 - a) An alien vegetation control and eradication plan;
 - b) Land use management plan, including the management and recreation use of the area;
 - c) Demarcation and conservation of a suitable buffer area.
 4. A rehabilitation and management plan must be compiled and implemented for the conservation area. The condition and functioning of the conservation area must be monitored by a wetland ecological on a bi-annual basis for the first two years post-development. Thereafter, the need and frequency of future monitoring needs can be determined

4.5.4 Geotechnical Assessment

A Preliminary Geotechnical Investigation was undertaken by Davies, Lynn and Partners in April 2020 and is attached as **Appendix G4**. The findings from the Investigation are discussed below.

4.5.4.1 Regional Geological Setting

The 1: 250 000 published Geological Maps of Southern Africa indicate that the site is underlain the Estcourt Formation of the Ecca Group.

Estcourt Formation: The Estcourt Formation typically comprises dark Siltstones and Shales, coarsening upwards with pene-contemporaneously deformed sandy and silty beds. The subordinate shales found in this formation are often horizontally bedded. However, horizons that are steeply inclined are increasingly prone

to slope instability. The rocks of the Estcourt Formation generally weather into clay-rich residual soils of high plasticity that can be prone to heave and swell movements with cyclical changes in in-situ moisture contents.

Alluvial Quarternary deposits are anticipated to occur within the drainage course located in the topographical depression found in the central portion of the site. Alluvial deposits typically consist of complex interlayered sequences comprising sand to gravels with pebbles, cobbles and boulders as well as soft highly compressible silt and clay deposits.

4.5.4.2 Geotechnical Classification:

The main Geotechnical concerns believed to be of Intermediate to High Risk include the following:

- Swamps and Marshes likely occurring near the River (B₃)
- Moderate soil heave potential (C₂)
- High Soil Compressibility (D₃)
- Rock or hardpan pedocretes between 10% to 40% total volume (F₂)
- Areas subject to flooding (L₂)

4.5.4.3 Conclusion from Geotechnical Investigation

1. (B₃)(L₂) The site is known to be prone to flooding during severe or intense rainfall events generally due to the presence of the Marshland/ Wetland which has been identified on site. Due to this poor drainage it is anticipated that remediation measures will need to be considered, during construction, in order to mitigate the detrimental effects of shallow groundwater conditions and flooding on the proposed new structures.
2. (C₂)(D₃) The site being underlain by the Estcourt Formation and its related subsoils is likely to encounter subsoils that are prone to cyclic heave, due to the presence of clay-like minerals, and potential high compressibility due to the deeply weathered subsoil profiles likely to be encountered. It is considered imperative that the design of the proposed new structures takes into consideration the potential for encountering these poor subsoils across the site.
3. (F₂) The nature of the underlying bedrock material and its subsequent geological formation processes has resulted in the potential for hard rock conditions to be encountered in the south eastern portion of the site. The joint spacing of the underlying bedrock material will determine the ultimate excavatability of the bedrock material underlying the site.

4. The distribution of the proposed new structures across the developmental areas would suggest that each of the proposed new structures will likely be subjected to its own specific subsurface conditions and corresponding geotechnical constraints. Accordingly, it will be difficult to provide a generalised geotechnical founding recommendation for the entire area relevant to every proposed and anticipated new structures.
5. More detailed investigations will be required during the Phase 1 and Phase 2 geotechnical investigations as per the requirement of the Generic Specifications GFSH 2.

In summary, the proposed Project site is conducive to a Housing Development provided more detailed Phase 1 and Phase 2 investigations are undertaken.

4.5.5 Heritage Survey

A Heritage Impact Assessment was undertaken in August 2021 by Umlando: Archaeological Surveys and Heritage Management and is attached as **Appendix G5**. The findings from the Heritage Impact Assessment are summarised below:

- The general area has very few recorded heritage sites. These sites are Stone Age and Iron Age, while the town has a registered historical building.
- Harding was established as a military outpost following the British annexation of East Griqualand 1874. Named after Sir Walter Harding (c 1812- 1874) who in 1858 became the first Chief Justice in Natal. It was declared as a township in 1911” (Raper 1986:198).
- There were no built structures identified within the study area as per the 1937 aerial photograph and the 1969 topographical map.
- The site is located in an area of very high palaeontological sensitivity. Dr Alan Smith undertook a desktop PIA survey for the development (see **Appendix A of the Heritage Impact Assessment Report**). The findings from the desktop PIA survey are indicated below:
 - The Estcourt Formation (basal unit of the Beaufort Group) is present on the site. This lithology is internationally renowned for palaeontological material, and it is highly likely that palaeontological material will be found during excavation of this large area.
 - A field Palaeontological Investigation should be undertaken by a suitably qualified palaeontologist. This should take place only after excavations get under way. At present the

site has little outcrop and the rock is weathered, reducing the chance of valuable palaeontological material being found.

- **Conclusion:** No heritage sites were recorded within the study area. However, the geology has high palaeontological sensitivity and monitoring during construction is required. Permits for the collection and/or destruction of fossil material will be required.

4.6 MARKET STUDY

A Market Study was undertaken by Urban Econ in November 2018 and is attached as **Appendix G2**. The main purpose of the market study is to determine the demographic composition of the market area (both primary and secondary) and to determine if there is a demand for the proposed development and what the current supply is within the study area.

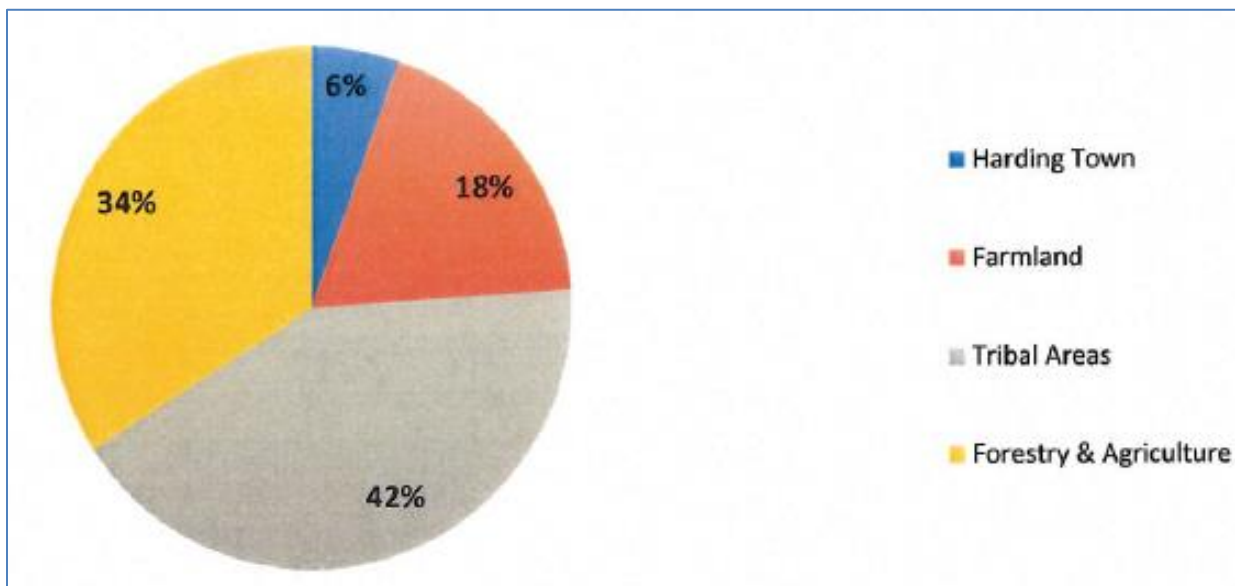
4.6.1 Umuziwabantu Housing Sector, Plan 2012

The housing sector plan aims to enable the Municipality to strategically plan housing development within its area of jurisdiction. It also serves to ensure a strategic approach to housing that ultimately leads to a spatial rationale and sustainable housing development.

4.6.1.1 Current Housing Situation

The Umuziwabantu Municipality is largely rural with a small urban core, Harding town (see Figure 4.6). Harding town, the urban core, accounts for approximately 6% of the municipal area. The remainder of the land can be largely classified as rural with farmlands accounting for 18%, Forestry and Agriculture accounting for 34% and Tribal Areas accounting for 42% of municipal land as identified in the housing sector plan.

Figure 4.6: Land Profile as per the Umuziwabantu Housing Sector Plan



Source: Market Assessment, November 2018

4.6.1.2 Key Insights

The following key insights were expressed in the Umuziwabantu Housing Sector Plan (2012):

- There is a dire need for housing mostly in rural areas of the municipality.
- Formal housing is perceived by most as safer than traditional housing.
- Most people believe that formal housing is less prone to destruction by severe climate occurrences such as flooding, lightning strikes, etc.
- Planning for future housing should ensure that residential sites are well located with regard to nodes, corridors and with easy access to economic opportunities and social facilities.

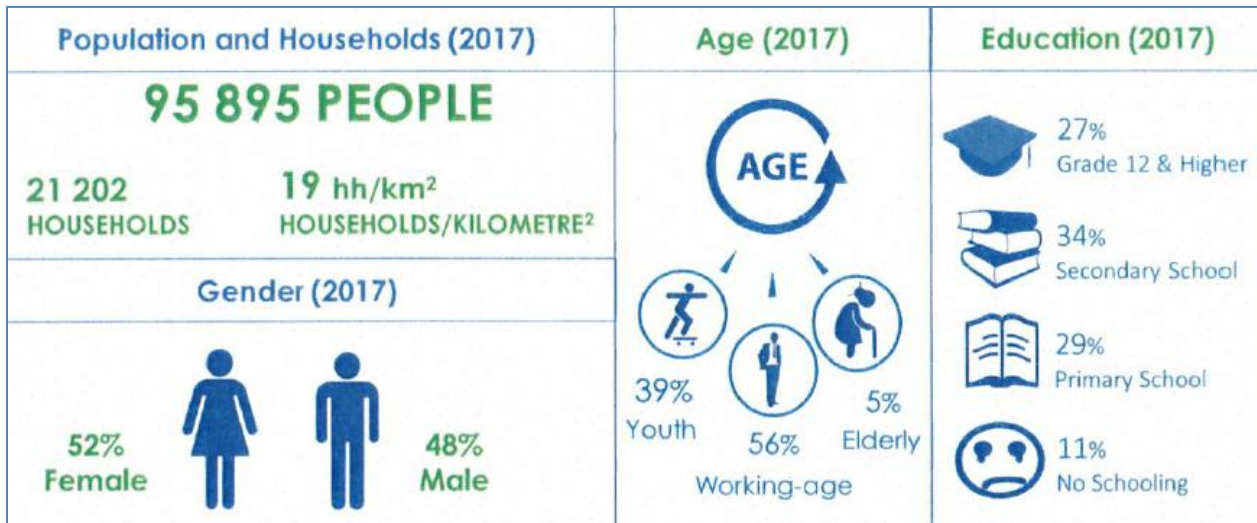
4.6.2 **Socio-Economic Profile**

4.6.2.1 Demographics

The Umuziwabantu Local Municipality caters to 21 202 households with a total catchment of 95 895 people. The municipality has a low household density of 19 households per square kilometres due to the rural and tribal or traditional nature of the land in the area. 15% of all households living within the Umuziwabantu Municipality reside in Harding, the primary town (and only proclaimed town) within the municipality.

Harding is the primary service node serving the Umuziwabantu population and is considered as a quaternary node in terms of the PSEDS and is connected to Port Shepstone and Kokstad which are respectively defined as a secondary and tertiary node. An alarming number of households (41%) comprise more than 4 individuals with 19% of households housing 7 or more individuals.

Figure 4.7: Demographic profile of the Umuziwabantu Municipality



Source: Market Assessment, November 2018

The gender split in the municipality is approximately equal with 52% females and 48% males. The municipality has a large youth base with more than two thirds (39%) of the population classified as youth (up to 14 years of age). This is most likely due to the high rate of teen pregnancy in the area which is noted as a concern in the IDP. Just over half the population (56%) residing in the Umuziwabantu is of working age (15-64 years of age), most likely driven by job migration as working individuals leave the municipality to seek employment opportunities in more urbanised areas. The elderly (65 years age and older) account for 5% of the populations.

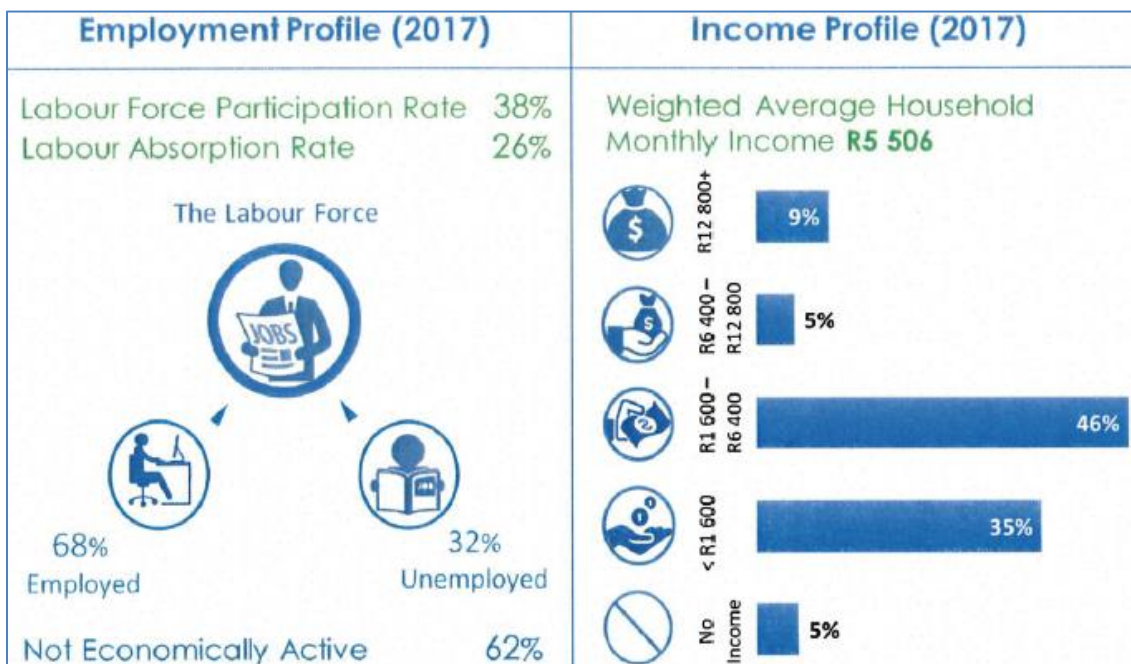
Education levels in the market area are low with only 27% of the population over the age of 20 having completed matric or studies further. An additional 34% of the catchment population have completed secondary school, 29% have completed primary school and a staggering 11% have had no formal education. The municipality holds a largely low to semi-skilled and educated population.

4.6.3 Economic Profile

The labour market in the municipality is broken down as follows: 68% of the catchment population labour force are employed whilst 32% are unemployed and seeking a job. The low employment rate is indicative of economic opportunities available within the municipality compared to surrounding urban areas where employment opportunities are significantly greater. 62% of the working-age catchment population are classified as not economically active, meaning that they choose not to work (this includes housewives, individuals who are incarcerated, individuals with disabilities or students). The high proportion of individuals who are not economically active result in a labour force participation rate of 38%. This is a measure of the active portion of the municipality’s labour force. The labour force absorption rate shows that the market population is dependent of 26% of the population which are gainfully employed.

The income profile of the catchment area shows that on average a household’s monthly income is R5 506. Almost all households in the municipality are low to middle income households (71% and 23%, respectively). Low income households earn up to R3 200 per month whilst middle income household earn between R3 200 and R51 200 per month. 5% of households have no income whilst a combined 81% of households earn an average household monthly income of up to R6 400. Given the large household sizes in the municipality, household resources are very limited.

Figure 4.8: Employment and Income Profile of the Umuziwabantu LM, 2017



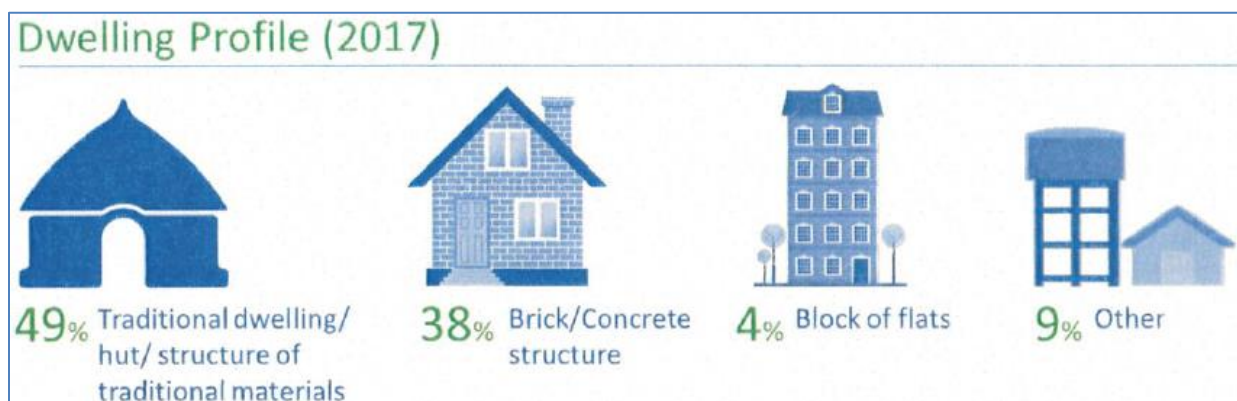
Source: Market Assessment, November 2018

4.6.4 Housing Profile

4.6.4.1 Housing Dwelling Profile

The dwelling profile of households currently in the municipality reveals that the majority of Umuziwabantu residents live in traditional dwellings/huts or structures of traditional materials (49%). This is an area for concern as these structures are more prone to environmental damage and usually have poorer access to amenities and services. These dwelling units however may provide a much cheaper accommodation option as land tenure or rental may be free or much lower than formal urban housing options. A combined 42% of households reside in formal dwelling structures such as brick structures on a separate stand (38%) or blocks of flats (4%).

Figure 4.9: Household Dwelling Profile, 2017



Source: Market Assessment, November 2018

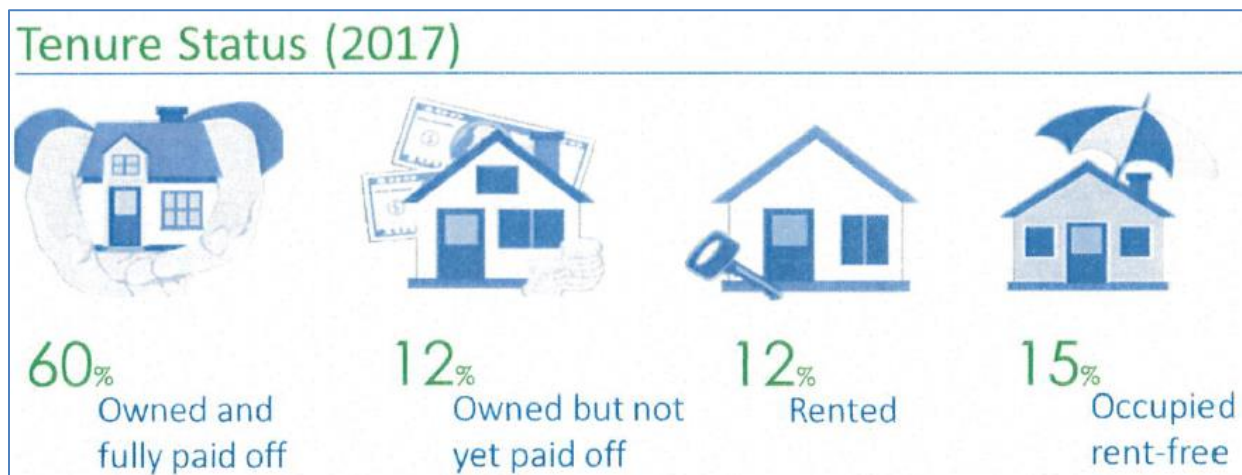
4.6.4.2 Housing Tenure Status

Majority (72%) of households within the municipality own their property whilst only 27% of households rent their accommodation. These statistics rely on reported answers by individuals, not on the transfer of title deeds.

Specifically, 60% of households in the Umuziwabantu Municipality own and have fully paid off their dwelling. This is surprising given the low household income levels in the municipality, however, many of these dwellings reside on tribal or traditional land and therefore may have received the land and/or dwelling for free or at a very discounted rate compared to urban house prices. This is further supported given the 15% of households who occupy their dwelling rent free.

A much smaller proportion of households own their dwelling but have not yet paid it off (12%) and a further 12% of households rent their dwelling and pay rental.

Figure 4.10: Household Tenure Status (2017)



Source: Market Assessment, November 2018

4.6.5 Market Analysis

This section examines the market feasibility of the proposed development.

4.6.5.1 Resident Market Assessment

The catchment area considered for the proposed development in Harding is the Umuziwabantu Local Municipality as many households travel within the municipality to the urban core, Harding, for services and employment.

4.6.5.2 Residential Market Backlog

There was a housing backlog of 13 195 residential units as of 2017. This backlog is calculated as the sum of all households living in informal housing conditions such as traditional dwellings or huts and informal dwellings in backyards or squatter camps and currently equates to 55.8% of all dwelling units in the municipality.

As of 2018, the housing backlog of 13 195 units will decrease to 8 195 units by 2023 and 4 092 units by 2028 assuming the housing projects identified in the IDP are delivered at 1 000 units per year.

4.6.5.3 Residential Market Demand

The demand model utilises projections in population and number of households in order to provide a quantitative indication of residential demand. Projections are based on observed trends in demographic and economic indicators for the local market area between 2012 and 2017.

Figure 4.11: Total demand for housing in Umuziwabantu LM, 2017-2028

	2017	2018	2023	2028
Projected Number of Households	21 202	21 549	23 373	25 352
Incremental Demand		347	1 824	1 979
Cumulative Demand		347	2 172	4 150

Source: Market Assessment, November 2018

The total number of households in the Umuziwabantu Municipality is projected to increase from 21 202 to 25 352 between 2017 and 2028, respectively, growing at an annual average growth rate of 1.64%. Whilst this market demand reflects sufficient support for the potential residential development, it does not take into account the currently housing backlog experienced in the municipality. Accounting for the current and projected housing backlog, the net effective demand model is presented below.

The net effective demand analysis for housing indicates that there will need to an additional 8 242 dwellings units (above the 9 103 units planned per the IDP) supplied within the municipality by 2028 to meet household growth in the area. It is important to note that that this is the demand for housing across all income groups.

Figure 4.12: Net effective demand for housing in the Umuziwabantu LM, 2018-2028

	2017	2018	2023	2028
Projected Number of Households	21 202	21 549	23 373	25 352
Incremental Demand		347	1 824	1 979
Cumulative Demand		347	2 172	4 150
Projected Backlog	13 195	13 195	8 195	4 092
Net Effective Demand	13 195	13 542	10 367	8 242

Source: Market Assessment, November 2018

4.6.5.4 Residential Affordability Analysis

A market affordability analysis was conducted to establish the home loan value a household could qualify for based on monthly income of the household. The affordability analysis will enable decision makers to

understand what potential buyers qualify for in terms of a loan or rental which should coincide with the price of units the affordable housing market.

The table below indicates the bonds households in the Umuziwabantu Municipality would qualify for based on their household income. The affordability analysis is conducted based on the National Credit Act requirement of 30% of monthly income for bond payment. Households in Umuziwabantu on average spend only 6.89% of household income on housing. It is therefore seems unlikely that households would be able to meet the bond requirements of the NCA and it is suggested that the proposed development focus on the rental market to provide housing at lower costs.

Figure 4.13: Umuziwabantu Affordability Analysis

Annual Household Income Category	% of Households in Market Area	No. of Households in Market Area (2018)	No. of Households in Market Area (2023)	No. of Households in Market Area (2028)	Median Annual Income	Median Monthly Income	Monthly Bond Repayment Afforded*	Affordability Classification	Potential Value of Home Loan from Lending Institute#
No Income	4.4	942	1022	1109	R 0	R 0	R 0	BNG Low	R 0
< R4,800	1.8	384	416	452	R 2 400	R 200	R 60	BNG Low	R 6 009
R4,800 - R9,600	4.9	1054	1143	1240	R 7 200	R 600	180	BNG Middle	R 18 029
R9,600 - R19,600	26.6	5728	6219	6739	R 14 600	R 1 217	R 365	BNG Upper	R 36 569
R19,600 - R38,200	37.9	8175	8867	9618	R 28 900	R 2 408	R 722	BNG Enhanced, FLISP Low, Social Housing	R 72 357
R38,200 - R76,400	9.7	2081	2257	2448	R 57 300	R 4 775	R 1,433	BNG Enhanced, FLISP Low, Social Housing	R 143 482
R76,400 - R153,800	4.7	1017	1103	1196	R 115 100	R 9 592	R 2,878	FLISP High, Bonded Low, Social Housing	R 288 227
R153,800 - R307,600	3.9	842	913	990	R 230 700	R 19 225	R 5,768	Bonded Low	R 557 686
R307,600 - R614,000	5.7	1232	1337	1450	R 460 800	R 38 400	R 11,520	Bonded Medium - High	R 1 153 869
R614,000 - R1,228,800	0.0	3	3	4	R 921 400	R 76 783	R 23,035	Bonded Medium - High	R 2 307 228
R1,228,800 - R2,457,600	0.1	24	26	28	R 1 843 200	R 153 600	R 46,080	Bonded High	R 4 615 478
> R2,457,600	0.3	68	74	80	R 2 457 600	R 204 800	R 61,440	Bonded High	R 6 153 970

Notes:
 BNG = Breaking New Ground Houses
 FLISP = Financed Linked Individual Subsidy Programme
 * Based on NCA requirement of 30% of monthly income for bond payment
 # Assumes that 30% of monthly income will be used for bond payment and the candidate is credit worthy. Based on FNB Maximum Bond Calculator using the current prime interest rate of 10.5% over a 20 year period. Calculations use the monthly bond repayment afforded as indicated in the table (calculated as per NCA requirement of 30% of monthly income for bond payment)

Source: Market Assessment, November 2018

The market affordability for Umuziwabantu reveals that the largest housing market applicable for income levels of households is the BNG enhanced, FLISP and Social Housing market which accounts for approximately 52% of all households in the municipality. This market caters to households earning an annual household income between approximately R19 601 and R153 800, highlighted and outlined in orange above. These households would be able to make a monthly bond repayment of between R 722 and R2 878, allowing them to qualify for a low bond of approximately R288 227 or qualifying for BNG enhanced, FLISP or social housing to the value of between R72 357 and R288 227.

A further 27% of the housing market in Umuziwabantu is eligible for BNG upper housing according to the affordability classification. This market caters to households earning an annual household income between approximately R9 600 and R19 600 with a potential monthly bond repayment of R365 and a total loan value of R36 569.

In the bonded market, approximately 10% of the housing market are eligible for low, medium and high bonded loans. These households earn an annual household income above R153 800 and can afford a potential loan of R557 686 and above.

It is suggested that the housing projects designed be potentially developed in line with these housing/affordability classifications. It is highly likely that the majority of households currently living in informal housing conditions (and effectively caught in the housing backlog) earn lower than average household incomes and it is therefore suggested that the majority of the proposed housing be planned for the rental market, including a mix of BNG, FLISP and social housing with a minor proportion of the development planned for bonded housing.

4.6.6 Gaps and Opportunity Analysis

4.6.6.1 Residential Gaps and Opportunities

4.6.6.1.1 Gap Analysis

DEVELOPMENT TYPE	EFFECTIVE MARKET GAP	DEVELOPMENT IMPACT
<ul style="list-style-type: none">•Medium to High Density•Residential Flats/ Apartments•BNG, FLISP and social housing with a minor proportion of bonded housing.	<ul style="list-style-type: none">•Yes•High housing backlogs•Growing household market	<ul style="list-style-type: none">•Financial - High•Social - High

Source: Market Assessment, November 2018

4.6.6.1.2 Opportunities for Development

By 2028, an additional of 4 150 residential units will be demanded in the market, with a further 4 092 residential units demanded due to the housing backlog. A total of 8 242 dwelling units will be demarcated by 2028. The potential development could reasonably be expected to capture at least 20% of the market (1 648 units) due to the large proportion of households living in informal accommodation.

This suggests that a multi-storey medium to high density residential development of approximately 1 648 units would be well received by the market. The majority (approximately 80%) of the development should cater to the BNG enhanced, FLISP or social housing market whilst fringe apartments could be targeted to the bonded market.

4.7 IMPACT OF THE PROPOSED ACTIVITY ON THE ENVIRONMENT

4.7.1 Geographical and Physical

Positive	Negative
The Umuziwabantu Local Municipality's Draft SDF has identified areas within the township of Harding for densification in order to allow for a greater variety housing options.	Should there be no development within the project area, the land will be vulnerable to illegal occupancy and informal settlements. Continuation of illegal dumping will take place.
Establishment of informal housing will be prevented due to optimal development of the site.	Prevention of illegal dumping.
Provision of waterborne sanitation to the community as well as potable water to each erf.	
The Harding Housing Development has been identified in the IDP to assist in reducing the housing backlog within the municipality.	

4.7.2 Biophysical

Positive	Negative
Loss of wetland and buffer area as a result of the development will be offset by focussing on on-site rehabilitation by means of redirecting stormwater.	Loss of approximately 6.9 ha of wetland seepage areas and portions of the 22m buffer zone.
Portions of the site that is currently used for illegal dumping and over grazing has degraded the site. The development will eliminate illegal dumping and the portions of the site that are earmarked for conservation will maintained by the Developer.	Removal of approximately 6.9 ha of vegetation ranked as having a high sensitivity by the specialist.
	Air pollution emanating from the trucks and machinery during construction.

4.7.3 Socio-Economic

Positive	Negative
Provision of formal housing within the municipality which will in turn assist in reducing the housing backlog of the municipality.	The presence of workers on the site for infrastructure development and construction related activities, may create an increased safety and security risk to the surrounding area.
Construction of internal roads and the implementation of services such as water and sanitation.	Noise pollution during the construction phases.
Provision of a hospital and commercial land uses to future residents as well as the existing surrounding community.	
Job creation during the construction and operational phases.	

4.8 MITIGATION MEASURES

A list of mitigation measures is briefly listed below. Mitigation measures will be addressed in detail in the draft EMPr (**Appendix B**).

4.8.1 Cultural and Heritage Aspects

- Due to the onsite geology having high palaeontological sensitivity, monitoring during construction is required. Permits for the collection and/or destruction of fossil material will be required.
- Before construction starts, all staff must be informed of any possible archaeological, historical or paleontological objects (e.g. tools, human remains, fossils, etc) of value look like, and must notify the engineer or contractors should such an item be uncovered.
- All work should cease immediately if any archaeological, historical or paleontological remains are discovered during development and AMAFA should be notified.

4.8.2 Stormwater

- Plan and install appropriate stormwater control measures.
- Discharge of stormwater from the development area must avoid scouring at the outlets.
- Run-off from the parking / driving area must be diverted to a stormwater network and directed to an attenuation facility.
- Rainwater should also be harvested on-site, and this water should be used for irrigation and landscape features.
- Permeable pavement should be incorporated into the road and parking areas. This material is porous with an underlying stone reservoir which stores water, enabling infiltration.
- Grass swales should be considered for the diversion of stormwater from the developed into the conservation area. Stormwater must be attenuated at an engineered facility.
- Flowerbeds should be incorporated into the design of the development. This may include trees for shade, and also landscaped gardens. These beds should be sunken (below surface level) to act as small catchment areas.
- Litter traps / nets should be attached to stormwater outlets (discharge areas), these would need to be monitored and managed particularly after rainfall events.
- Stormwater run-off from the adjacent developments must be attenuated.
- Existing stormwater trenches must be backfilled and decommissioned. All stormwater inputs must be collectively considered and diverted to stormwater attenuation pond.
- Soft or green engineering features should be incorporated into the management of stormwater. Only clean water may be discharged into the conservation area.
- Earth, stone and rubble is to be properly disposed of to prevent obstruction of natural water pathways over the site. These materials must not be placed in storm-water channels, drainage lines or rivers.
- Disturbed surfaces must be re-vegetated immediately after the completion of construction activities.

4.8.3 Ecological Aspects

- Infestation of alien vegetation must be managed, and all Category 1b alien plant species must be removed from the seepage area. This will have to be undertaken in a regular basis, expected to be quarterly.
- All solid waste and dumping material must be removed from the area.

- No vegetation may be cleared without prior permission from the engineer, ECO, or ecological specialists if required.
- Bare areas must be ripped, and fertiliser applied. This must be undertaken prior to the wet season.
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil.
- No trees are to be cleared unless they are exotic invaders which must be verified by the ECO.
- Adequate sanitation and ablution facilities must be provided for construction workers to avoid use of open space and watercourses as toilets or washing facilities.
- Areas that are cleared of indigenous vegetation need to be managed to avoid the establishment and encroachment of alien invasive plants. Herbicide should be avoided as this is not restricted to the alien invasive plant species and will impact the species of conservation concern if it is not used appropriately.
- Fire Management Plan (FMP) needs to be compiled for the conservation area.

4.8.4 Water Quality / Watercourses

- The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly.
- Construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access.
- All chemicals and toxicants to be used for the construction must be stored outside the channel system and in a bunded area.
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site.
- Storage areas that contain chemicals and hazardous substances must be bunded with an approved impermeable lining. The ECO must approve the location and storage of any chemicals and hazardous substances on site.
- Mixing or decanting of all chemicals and hazardous substances must take place either on a tray or on an impermeable surface.
- Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded area as soon after detection as possible to minimise pollution risk and reduced bunding capacity.
- Toilets and ablution facilities during the construction phase should not be within a distance of 100m from any natural water bodies.

4.8.5 Soil Erosion and Compaction

- The first 300 mm of soil must be stockpiled separate from the soil excavated deeper than 300 mm.
- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.
- Any topsoil that is removed during construction must be appropriately removed and stored. This includes on-going maintenance of such topsoil piles so that they can be utilised for re-vegetation purposes when necessary.
- All removed soil and material must not be stockpiled within the system. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.
- All waste generated on site during construction must be adequately managed.
- When vegetation is to be removed, it must be done in phases to ensure that a minimum area of soil is exposed to potential erosion at any one time.
- Erosion control measures must be implemented in areas sensitive to erosion and where erosion has already occurred such as edges of slopes, exposed soil etc. These measures include but are not limited to - the use of sand bags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells which must be used in the protection of slopes.
- Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching.

4.9 NEED AND DESIRABILITY

The need and desirability for the Harding Township Establishment Development is evident in the SDF and IDP of the Umuziwabantu Municipality, as it has identified the project area as an area for housing developments. The implementation of the housing development will assist in mitigating the establishment of informal settlements. Given that this project includes FLISP housing, social housing and serviced sites, it will cater for all income groups as there is a combination of housing typologies.

Table 4.12 below was adapted from the 2014 BAR Template of the Department of Environmental Affairs. This table was inserted to motivate for the need and desirability of the proposed development.

Table 4.12: Needs and Desirability

1. Is the activity permitted in terms of the property's existing land use rights?	YES	
The proposed development is permitted in terms of the existing land use rights as majority of the properties have been zoned as residential in line with the development proposal.		
2. Will the activity be in line with the following?		
(a) Provincial Spatial Development Framework (PSDF)	YES	
The proposed development addresses two spatial principles, namely the Principal of Sustainable Communities and the Principal of Spatial Concentration. The proposed development will provide a mix of housing units which will include municipal services such as water and sanitation.		
(b) Urban edge / Edge of Built environment for the area	YES	
The proposed development is an expansion of the existing Town of Harding. Furthermore, the site falls within the Municipal Land Use Scheme.		
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES	
The Harding Housing Development has been identified in the IDP to assist in reducing the housing backlog within the municipality. The Umuziwabantu Local Municipality's Draft SDF has identified areas within the township of Harding for densification in order to allow for a greater variety housing options as such the proposed project is aligned with the municipal SDF.		
(d) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)		YES
As per Ugu District Environmental Management Framework, 2018, the town of Harding has been identified within the Urban EMZ which is aligned to the proposed development.		
(e) Any other Plans (e.g. Guide Plan)	YES	
The Umuziwabantu Municipal Housing Sector Plan (2012), Harding was identified as the Urban Core of the Municipality. From this plan, the following key points were identified: there is a dire need for housing mostly in rural areas of the municipality; formal housing is perceived by most as safer than traditional housing and planning for future housing should ensure that residential sites are well located with regard to nodes, corridors and with easy access to economic opportunities and social facilities.		
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES	
Please see above (2c).		

4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)?	YES	
The implementation of the housing development will assist in reducing the establishment of informal settlements and housing backlog within the municipality. Given that this project entails a combination of housing typologies, it will cater for all income groups. The proposed development will also include the construction of water networks and proper sanitation infrastructure.		
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?		NO
The sewer reticulation from the development will tie into the existing sewer system by means of 160mm diameter pipes. The proposed sewer reticulation will be directed through underground pipes to the south east portion of the site where it will be discharged, into the existing pumpstation. Upgrades will be required to the existing sewer pumpstation. It should be noted that due to the district municipality presently having some potential issues with their pumpstation, it is recommended that the developer make allowance for a sewer attenuation chamber, to cater for the excess sludge and sewer demands, as an interim solution.		
6. Is this project part of a national programme to address an issue of national concern or importance?	YES	
Throughout the country, there are many people who lack proper housing structures and access to basic services. The aim of this development is therefore to reduce the establishments of informal settlements and construct houses that can be utilised by all income earners.		
7. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES	
Majority of the land for the proposed development is vacant. All environmentally sensitive areas has been demarcated and included into the layout. The location to the Harding CBD is relatively close, especially for those that will be working in the CBD.		
8. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES	
The purpose of this development is to address the municipality's housing backlog and need for more houses due to the expanding population and urbanisation. A total wetland area of 4.2 ha and a buffer area measuring 2.7 ha will be lost as a result of the development. In order to accommodate for the encroachment and loss of the seepage areas and buffer zone, a wetland compensation strategy focussing on on-site rehabilitation by means of redirecting stormwater was compiled as per the specialist's recommendation.		
9. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES	
There are many other proposed housing developments in the municipality. All of these developments will contribute positive to the eradication of the Municipality's housing backlog.		

10. Will any person's rights be negatively affected by the proposed activity/ies?		NO
This development will not infringe on any person's rights, as the proposed development will entail the construction of various housing typologies which can meet the needs of all income earners.		
11. What will the benefits be to society in general and to the local communities?		
<ul style="list-style-type: none"> • Access to municipal services such as water and sanitation. • Provision of commercial and health facilities. • Job creation during the construction phase. • Optimal development of the site will prevent illegal occupation of the land which will affect the surrounding communities • Prevention of illegal dumping. • Prevention of informal settlements. 		

5 IMPACT ASSESSMENT

5.1 INTRODUCTION

The impact assessment aims at identifying potential environmental impacts (both positive and negative impacts) and evaluating these impacts in terms of its significance. This assessment is provided in the form of a systematic analysis framework to evaluate the nature, extent, duration, intensity, probability and significance of the various impacts. **The significance of the impacts is considered both without and with mitigation and management measures. The mitigation and management measures relating to the potential impacts identified as potentially significant will be addressed in detail in the Environmental Impact Assessment report and draft Environmental Management Plan.**

5.2 IMPACT ASSESSMENT CRITERIA

The assessment of the potential impacts of the envisaged development is undertaken in accordance with the broad criteria required by the integrated environmental management procedure and includes the following:

- Nature of Impact
- Extent/Scale
- Duration
- Intensity
- Probability

5.2.1 Nature of impact

A brief description of the type of impact the proposed development will have on the affected environment.

5.2.2 Extent/Scale

The physical extent of the impact.

5.2.2.1 Footprint

The impacted area extends only as far as the actual footprint of the activity.

5.2.2.2 Site

The impact will affect the entire or substantial portion of the site/property.

5.2.2.3 Local

The impact could affect the area including neighbouring properties and transport routes.

5.2.2.4 Regional

Impact could be widespread with regional implication.

5.2.2.5 National

Impact could have a widespread national level implication.

5.2.3 Duration

The duration of the impact.

5.2.3.1 Short term

The impact is quickly reversible within a period of one year, or limited to the construction phase.

5.2.3.2 Medium term

The impact will have a medium term lifespan (project lifespan 1 – 10 years).

5.2.3.3 Long term

The impact will have a long term lifespan (project lifespan > 10 years).

5.2.3.4 Permanent

The impact will be permanent beyond the lifespan of the development.

5.2.4 **Intensity**

This criteria evaluates intensity of the impact and are rated as follows:

5.2.4.1 Minor

The activity will only have a minor impact on the affected environment in such a way that the natural processes or functions are not affected.

5.2.4.2 Low

The activity will have a low impact on the affected environment

5.2.4.3 Medium

The activity will have a medium impact on the affected environment, but function and process continue, albeit in a modified way.

5.2.4.4 High

The activity will have a high impact on the affected environment which may be disturbed to the extent where it temporarily or permanently ceases.

5.2.4.5 Very high

The activity will have a very high impact on the affected environment which may be disturbed to the extent where it temporarily or permanently ceases.

5.2.5 **Probability**

This describes the likelihood of the impacts actually occurring.

5.2.5.1 Improbable

The possibility of the impact occurring is highly improbable (less than 5% of impact occurring).

5.2.5.2 Low

The possibility of the impact occurring is very low, due either to the circumstances, design or experience (between 5% to 20% of impact occurring).

5.2.5.3 Medium

There is a possibility that the impact will occur to the extent that provision must be made therefore (between 20% to 80% of impact occurring).

5.2.5.4 High

There is a high possibility that the impact will occur to the extent that provision must be made therefore (between 80% to 95% of impact occurring).

5.2.5.5 Definite

The impact will definitely take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect (between 95% to 100% of impact occurring).

5.2.6 **Determination of significance**

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the extent, duration, intensity and probability of the impacts.

5.2.6.1 No significance

The impact is not substantial and does not require any mitigatory action.

5.2.6.2 Low

The impact is of little importance, but may require limited mitigation.

5.2.6.3 Medium

The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.

5.2.6.4 High

The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation and management is essential.

5.3 ASSESSMENT OF POTENTIAL IMPACTS

5.3.1 Physical and landscape characteristics

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM*	Mitigation	WM**
1. Impact of development on natural drainage patterns, caused by surface clearance and associated decrease of vegetation cover, leading to increased surface runoff and erosion.	C/O	Negative	Site	Long	Medium	Medium	High	1. Construction activities must be restricted to the construction site to minimize the impacts of the construction phase. 2. Discharge of stormwater from the development area must avoid scouring at the outlets. 3. Stormwater attenuation ponds may not be constructed within the conservation areas. 4. Disturbed and bare area must be re-planted within indigenous vegetation that is representative of the vegetation type. 5. Implementation of the Stormwater Management Plan.	Low

* WOM: Without Mitigation

** WM: With Mitigation

5.3.2 Ecological characteristics

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Degradation, destruction and fragmentation of highly sensitive habitats, if construction work or waste material is allowed to penetrate these habitats.	C	Negative	Site	Permanent	Medium	High	High	1. All dumping of waste material, especially bricks and contaminated materials or soils, into the environment must be prevented. 2. Solid waste is to be disposed legally off-site in the relevant waste disposal manner.	Low

								3. No storage of vehicles or equipment will be allowed outside of the designated area	
2. Spread of IAPs into disturbed areas / continued encroachment by IAPs during operational phase.	C/O	Negative	Local	Medium	Medium	High	High	4. Solid waste is to be disposed legally off-site in the relevant waste disposal manner. 5. Implementation of an alien vegetation management plan for the site is required. This is especially in areas that are cleared of vegetation and left exposed. 6. Upon completion of construction any exposed areas must be re-vegetated with local indigenous plants to prevent IAP encroachment.	Low
3. Impact on surrounding vegetation during construction (e.g. collection of firewood, veld fires, etc.).	C	Negative	Local	Short	Medium	Low	Medium	1. Construction area should be demarcated, and construction staff should loiter into adjacent properties. 2. No harvesting of firewood from the site or from the areas adjacent to it. 3. Under no circumstances are the staff allowed to start a fire.	Low
4. Loss of sensitive wetland habitats	O	Negative	Site	Permanent	High	Definite	High	1. Due to the loss of 4.2 ha wetland area and 2.7 ha of the buffer area as a result of the proposed development, the compensatory measures in the wetland offset strategy must be adhered to. These measures include rehabilitation of the conservation area; implementation of stormwater measures and conservation measures (see Appendix G3 for Wetland Offset Strategy). 2. All removed soil and material must not be stockpiled within the system. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. 3. Areas that are cleared of indigenous vegetation need to be managed to avoid the	Low

								establishment and encroachment of alien invasive plants. 4. Herbicide should be avoided as this is not restricted to the alien invasive plant species.	
5. Introduction of pest species as a result of the increase in waste and new habitats that are created in the area.	O	Negative	Site	Long	Medium	High	Medium-high	1. Suitable solid waste disposal facilities must be available for the housing development during the operational phase as the lack of such facilities will lead to rubbish dumping, thereby leading to an increase in pest species and associated health hazards.	Low

5.3.3 Soil characteristics and geology

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Soil erosion and subsequent sedimentation of wetland (due to stormwater runoff).	C	Negative	Site	Short	Medium	High	High	1. Grass swales should be considered for the diversion of stormwater from the developed into the conservation area. 2. Soft or green engineering features should be incorporated into the management of stormwater.	Low
2. Spilling of hazardous chemicals into the soil and penetrating sensitive habitats	C	Negative	Site	Short	Medium	High	High	1. Leaking equipment shall be repaired immediately or be removed from site to facilitate repair. 2. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. 3. Materials must be stored in leak-proof, sealable containers or packaging.	Low
3. Soil pollution (cement powder, diesel, oil etc.) during construction	C	Negative	Site	Short	Medium	Medium	Medium	1. Any possible contamination of topsoil by hydrocarbons, concrete or concrete water must be avoided and an emergency spill kit must always be available on site. 2. Drip trays or any form of oil absorbent material must be placed	Low

								<p>underneath vehicles/machinery and equipment when not in use.</p> <p>3. Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.</p> <p>4. All vehicles and equipment must be maintained, and all re-fueling and servicing of equipment is to take place in demarcated areas outside of the project area.</p>	
5. Soil Erosion from site clearance activities during construction	C	Negative	Site	Medium	Medium	Medium	Medium	<p>1. Any topsoil that is removed during construction must be appropriately removed and stored. This includes on-going maintenance of such topsoil piles so that they can be utilised for re-vegetation purposes when necessary.</p> <p>2. Bare areas must be ripped, and fertiliser applied. This must be undertaken prior to the wet season.</p>	Low

5.3.4 Fauna

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Displacement of faunal community due to habitat loss and disturbance (noise, dust and vibration) and/or direct mortalities	C	Negative	Local	Short term	Medium	High	Medium	<p>1. If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action. This is applicable to all species, especially smaller species such as rodents, reptiles and amphibians.</p> <p>2. Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process.</p>	Low

									3. Any open trenches that are left open for more than two hours, should have at least one end that is sloped/tapered, in order to allow animals that fall in, to escape. If this is not possible, then branches should be placed inside the trenches to allow small animals to climb out of the trenches	
2. Installation of electrical transmission lines resulting in bird strikes and electrocutions	O	Negative	Site	Long term	High	Medium	Medium	Medium	1. Bird flaps/markers must be installed on any telephone or electric cables to prevent any bird collisions. This is particularly pertinent to movement to and from the valley-bottom wetland.	Low

5.3.5 Climate

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Soil erosion due to heavy rainfall during thunderstorms in summer, especially during construction phase.	C	Negative	Site	Short	Medium	Medium	Medium	1. Stormwater diversions and channels should be vegetated swales, avoid impermeable material. Litter traps / nets should be attached to stormwater outlets (discharge areas), these would need to be monitored and managed particularly after rainfall events. 2. Rainwater should also be harvested on-site, and this water should be used for irrigation and landscape features. 3. Implementation of the Stormwater Management Plan.	Low
2. Increased proliferation of alien vegetation: Changing temperatures and weather conditions allow certain species to flourish where	C	Negative	Site	Short	Low	Medium	Medium	1. Solid waste is to be disposed legally off-site in the relevant waste disposal manner. 2. Implementation of an alien vegetation management plan for the site is required. This is especially in areas that are cleared of vegetation and left exposed.	Low

they would not normally.									3. Upon completion of construction any exposed areas must be re-vegetated with local indigenous plants to prevent IAP encroachment.	
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5.3.6 Ground and surface water

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Spilling of sewage into the surrounding habitats and sensitive areas.	O	Negative	Site	Short	High	Medium	High	1. Have action plans on site, and training for contactors and employees in the event of sewage spills, leaks and other impacts to the surrounding environment. 2. Leaking equipment shall be repaired immediately or be removed from site to facilitate repair.	Low
3. Loss of wetland seepage areas and associated 22m buffer zone.	C/O	Negative	Site	Permanent	Medium	High	High	1. The compensatory measures in the wetland offset strategy must be adhered to. These measures include rehabilitation of the conservation area; implementation of stormwater measures and conservation measures (see Appendix G3 for Wetland Offset Strategy).	High
4. Change in surface and sub-surface flow	O	Negative	Site	Medium	Medium	Medium	Medium	1. All removed soil and material must not be stockpiled within the system. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. 2. All removed soil and material must not be stockpiled within the system. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.	Low

								3. All removed soil and material must not be stockpiled within the system. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.	
5. Compaction	O	Negative	Site	Medium	Medium	Medium	Medium	1. Compacted areas must be ripped two ways (perpendicularly) to a depth of 300 mm. A seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled. The area must be shaped to a natural topography. No grazing must be permitted to allow for the recovery of the area.	Low

5.3.7 Archaeological, historical and cultural significance

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Impact on sites with valuable archaeological, history and cultural significance.	C/O	Negative	Site	Short	Medium	Low	Low	1. KZN Amafa should be contacted if any heritage objects are identified during earth-moving activities. 2. Heritage material (if any identified) should not be destroyed or removed from site. 3. Should any remains be found that is potentially human remains, the South African Police Service should also be contacted.	No significance
4. Impact on palaeontological sensitive material.	C/O	Negative	Site	Short	Medium	Medium	High	1. Monitoring during construction and earthworks is required. 2. Permits for the collection and/or destruction of fossil material will be required from AMAFA.	Low

5.3.8 Socio-economic impacts

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Direct employment creation: construction team, land surveyors, plumbers, electricians etc.	C	Positive	Regional	Short	Medium	High	Medium	No mitigation required.	Medium (positive)
2. Indirect job creation (e.g. building suppliers) and induced job creation (broader local economy).	C/O	Positive	Regional	Short	Medium	Medium	Medium	No mitigation required.	Medium (positive)
3. Job creation during operation phase (domestic workers, maintenance, etc.).	O	Positive	Local	Long	Medium	Medium	Medium	No mitigation required.	Medium (positive)
4. Impact of crime/security risk to surrounding areas.	C	Positive	Regional	Short	Medium	High	Medium	1. Construction workers should always be supervised. 2. Construction activities should be kept to normal working hours e.g. from 7am until 5pm during weekdays. 3. Property owners surrounding the construction areas should be informed of the construction schedules and activities. 4. Workers conduct should be guided by a code of conduct to be developed by the contractors. 5. The construction areas should be fenced to avoid unauthorized entry.	Low

5.3.9 Engineering Services

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Traffic impacts during construction activities	C	Negative	Local	Shorty	Medium	Medium	Low	<ol style="list-style-type: none"> It must be ensured that a backlog of traffic does not develop at access points during peak hours, through the implementation of an efficient and effective access control system. Construction vehicles must adhere to speed limits. 	Low
2. Increase in demand of services delivery (water, sanitation, waste disposal)	O	Negative	Regional	Long	High	High	High	<ol style="list-style-type: none"> The municipality has confirmed that there is sufficient water supply to accommodate the proposed development. It is recommended that the developer make allowance for a sewer attenuation chamber, to cater for the excess sludge and sewer demands, as an interim solution. 	Low
3. Increased soil erosion and stormwater runoff due to increased quantity of stormwater flow.	C/O	Negative	Site	Long	Medium	Medium	Medium	<ol style="list-style-type: none"> Permeable pavement should be incorporated into the road and parking areas. This material is porous with an underlying stone reservoir which stores water, enabling infiltration. Soft or green engineering features should be incorporated into the management of stormwater. Implementation of the Stormwater Management Plan. 	Low
4. Capacity of power grid to supply electricity to the proposed development.	O	Negative	Regional	Long	Medium	Medium	Medium	<ol style="list-style-type: none"> Residents should be encouraged to practice energy conservation and make use electricity efficiently. Light sources should be energy efficient and long lasting. It is proposed that energy efficient light bulbs are installed at basic fit out. 	Medium
5. Capacity of existing landfill sites to accommodate additional waste	C/O	Negative	Regional	Long	Medium	Medium	Medium	<ol style="list-style-type: none"> Sorting of waste and the concept of recycling and reusable refuse should be encouraged. 	Medium

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
generated by the proposed development (<i>this is a cumulative impact caused by all waste generating activities throughout the region</i>).								2. Recyclable materials can be collected by small business enterprises and assist in ensuring sustainability within the community.	
6. Impact of waste generated and risk of illegal dumping and littering on water resources.	C/O	Negative	Local	Long	Low	Low	Low	1. Litter traps / nets should be attached to stormwater outlets (discharge areas), these would need to be monitored and managed particularly after rainfall events. 2. A suitable solid waste disposal facility must be available for the housing development during the operational phase as the lack of such facilities will lead to rubbish dumping.	Low

5.3.10 Potential Environmental Pollution

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Increase in air pollution (dust) during construction (e.g. construction vehicles, excavation, earthworks, burning of waste products etc.).	C	Negative	Local	Short	Medium	High	Medium	1. Dust reducing mitigation measures must be put in place and must be strictly adhered to. 2. Air filters on all mechanized equipment must be properly designed and maintained. 3. Onsite burning of waste is not permitted. 4. A dust suppression programme should be implemented by means of periodic water sprinkling. 5. All industrial activities are subject to operating within the conditions of national legislation, including the National Environmental	Low

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
								Management: Air Quality Act No. 39 of 2004. 6. Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.	
2. Increase in ambient noise level affecting surrounding properties.	C/O	Negative	Local	Long	Low	Low	Low	1. Silencers on diesel-powered equipment must be properly designed and maintained. 2. Construction activities should be limited to normal office hours. 3. Adjacent landowners should be notified of extremely noisy activities at least 24 hours prior to such activities commencing. 4. Construction should take place between 07:00- 17:00. Mondays to Fridays	Low
3. Visual impact of development on landscape ("sense of place").	O	Negative	Local	Long	Medium	Medium	Medium	1. Ensure that the Architectural design is sympathetic to the surrounding areas. 2. All construction material must be stored in one place out of the direct eyesight of pedestrians. 3. The Architectural code must be adhered to during construction.	Low
4. Impact of lighting on surrounding properties, including light trespass and over-illumination. Apart from being a visual impact, over-illumination is also a waste of energy.	C/O	Negative	Local	Long	Medium	Low	Low	1. Avoid shiny metals in structures. If possible, shiny metal structures should be darkened or screened to prevent glare. 2. Night-time light sources must be directed away from residential areas. 3. Incorporate measures for visual screening (e.g. using shade cloth) in the EMP. 4. Avoid construction activities outside of normal working hours.	Low

5.4 CUMULATIVE IMPACTS

Cumulative impact, in relation to an activity, means the impact of an activity that by itself may not be significant, but may become significant when added to the existing and potential impacts emanating from similar or diverse activities or undertakings in the area. Cumulative impacts are those which have incremental impacts of the activity as a whole, and, others that past, present and future activities will have on a common resource. The following cumulative impacts have been identified:

- Capacity of existing landfill sites to accommodate additional waste generated by the proposed development.
- The additional population could potentially put pressure on existing social facilities.
- Additional population will put pressure on existing services such as road, water and sewerage. It should be noted that the services will be upgraded to accommodate for the additional population.
- Soil Erosion and soil pollution.

6 PUBLIC PARTICIPATION

6.1 INTRODUCTION

According to Section 41 of the Environmental Impact Assessment Regulations, the following is required for the public participation process:

- (a) Fixing a notice board at a place conspicuous to the public at the boundary or on the fence of
 - (i) the site where the activity to which the application relates is or is to be undertaken; and
 - (ii) any alternative site;

- (b) Giving written notice in any of the manners provided for in section 47D of the Act, to-
 - (i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
 - (ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
 - (iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
 - (iv) the municipality which has jurisdiction in the area;
 - (v) any organ of state having jurisdiction in respect of any aspect of the activity; and
 - (vi) any other party as required by the competent authority;

- (c) Placing an advertisement in –
 - (i) one local newspaper; or
 - (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

- (d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or local municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and

- (e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desiring of but unable to participate in the process due to-
 - (i) illiteracy;
 - (ii) disability; or
 - (iii) any other disadvantage.

6.1.1 Submission of EIA application forms

The appropriate EIA application forms were completed and submitted to DEDTEA as required by the EIA regulations. Reference Number **DC21/0013/2021** was allocated to the proposed development.

6.1.2 Newspaper Advertisements and Site Notices

The EIA regulations require that the proposed project be advertised. The EIA process was advertised on the 07 May 2021 in the South Coast Herald in English (**Appendix H1**) and in the Ugu Eyethu in isiZulu (**Appendix H2**). Site Notices were also placed at various locations on the site boundary to ensure that it is visible and accessible (see **Appendix H3** for a copy of the site notice). The purpose of the advertisements and site notice's is to notify I&APs of the EIA process for the proposed development and to invite them to register as I&APs.

In addition to the site notices and newspaper adverts, background information documents (**Appendix H4**) were distributed to the surrounding communities.

6.1.3 Register of interested and affected parties

According to the Environmental Impact Assessment Regulations of 2014, a register of interested and affected parties must be kept during the EIA process.

In compliance with the POPI Act, the register of interested and affected parties is not included as an Appendix in this Draft EIR and will only be made available to the competent authority (DEDTEA).

6.1.4 Distribution of Scoping Report

The following governmental and non-government authorities were provided with a copy of the Scoping Report (DC21/0013/2021) for comment.

- Department of Economic Development, Tourism and Environmental Affairs
- Department of Agriculture and Rural Development
- Department of Water and Sanitation
- Department of Transport
- Department of Health
- Ezemvelo KZN Wildlife
- Ugu District Municipality
- Umuziwabantu Local Municipality
- Ward Councillor
- SANRAL
- KZN AMAFA

In compliance with the POPI Act, the Receipt of Acknowledgements is not included as an Appendix in this Draft EIR and will only be made available to the competent authority (DEDTEA).

The following were provided with a copy of the Background Information Document for comment:

- Department of Mineral Resources
- Eskom

The following stakeholders commented on the Scoping Report (DC23/0015/2019):

- Department of Economic Development, Tourism and Environmental Affairs
- Department of Agriculture and Rural Development
- Department of Water and Sanitation

- Department of Health
- Ezemvelo KZN Wildlife
- Ward Councillor
- KZN AMAFA (Interim comment)

6.1.5 Distribution of Draft Environmental Impact Report

The following governmental and non-government authorities were provided with a copy of the Draft Environmental Impact Report for comment.

- Department of Economic Development, Tourism and Environmental Affairs
- Department of Agriculture and Rural Development
- Department of Water and Sanitation
- Department of Transport
- Department of Health
- Ezemvelo KZN Wildlife
- Ugu District Municipality (Environmental Department)
- Umuziwabantu Local Municipality
- Ward Councillor 1
- SANRAL
- KZN AMAFA

Emails were sent to registered interested and affected parties (IAPs) notifying them of the availability to comment on the Draft Environmental Impact Report.

A Comments and Response Report regarding the comments received has been included as **Appendix A**.

7 SUMMARY RECOMMENDATIONS OF EAP

7.1 KEY FINDINGS

The key findings are as follows:

- Two wetland types were identified within the proposed site, namely an unchanneled valley bottom (HGM 1) and a hillslope seep (HGM 2). The overall present ecological state of HGM 1 and 2 has been scored “Seriously Modified” and “Moderately Modified” respectively.
- The buffer tool assessment was used to determine the required buffer size for the proposed development. The results from this assessment suggested a post-mitigation buffer size of 22 m.
- A total wetland area of 4.2 ha and a buffer area measuring 2.7 ha will be lost as a result of the development. In order to accommodate for the encroachment and loss of the seepage areas and buffer zone, a wetland compensation strategy focussing on on-site rehabilitation was compiled.
- The project area is situated across two vegetation types i.e. Dry Coast Hinterland Grassland and Highveld Alluvial Vegetation. The project area overlaps entirely with an ecosystem that is listed as Vulnerable (VU).
- A protected species, *Kniphofia uvaria*, was recorded within the unchanneled valley bottom wetland.
- No heritage sites were recorded within the study area. However, the geology has high palaeontological sensitivity.

7.2 RECOMMENDATIONS

The recommendations listed below are from the specialist studies and EAPs opinion but should also be considered in drafting the Environmental Authorisation.

- An action plan must be in place in the event of leaks and bursts of the proposed sewage pipelines.
- The measures included in the Stormwater Management Plan must be implemented. In addition, the rehabilitation measures regarding stormwater management which is included in the Wetland Compensatory Strategy must be implemented to improve the status and functioning of the wetland system.

- The conservation measures provided in the Wetland Compensatory Strategy must be adhered to, to minimise the impact on the designated conservation area and to improve / restore the habitat and keep it in the most natural state as possible.
- The offset / conservation area must be secured by means of a Biodiversity Management Agreement and conservation servitude that obliges the landowner to maintain the offset area in the desired wetland offset state for a duration of at least 30 years as recommended by the specialist.
- A rehabilitation and management plan must be compiled and implemented for the conservation area prior to commencement with the construction phase.
- All prescribed mitigation measures from specialists must be adhered to.
- A Water Use License Application will need to be applied for prior to construction.
- A qualified palaeontologist needs to visit the site during construction due to the high palaeontological sensitivity of the site. Permits to destroy and/or collect palaeontological material will be required from KZN AMAFA.

7.3 OPINION OF EAP

It is the opinion of the Environmental Assessment Practitioner that the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs consider authorizing the proposed activity and the preferred development layout. This consideration should however be subject to the implementation of all the mitigation and management measures as described in the draft EMP as well as the findings of all specialist studies.

As indicated in Section 5, the proposed activity will result in a number of potential negative impacts to the site. The impacts with a high or medium level of significance will require the specific mitigation measures as outlined in Section 4.8 and the EMPr (**Appendix B**). The proposed development is also in accordance with the IDP and SDF of the Umuziwabantu Local Municipality.

It is the opinion of the EAP that the information contained in the Environmental Impact Assessment Report, and the Specialist Studies which have been compiled to address specific areas of concern, provided sufficient information to undertake a sound assessment of the proposal and provide an informed recommendation with a sufficient degree of confidence.